3.1.1 Grants received from Government and non-governmental agencies for research projects / endowments in the institution during the years (2021-22)

S.No	Name of the Principal Investigator/Co-investigator	Department of Principal Investigator	Name of the Funding Agency	Amount Sanctioned	Duration of the project	Grants received	
						Cheque page no	Statement page no
1	Mr.T.KRANTHI KUMAR	Electrical and Electronics Engineering	Conscience Technologies	3.86 Lakhs	5 Months	96	100
2	Mrs.S. SRAVANI	Computer Science Engineering	MANAC Infotech	3.65 Lakhs	6 Months	99	106
3	Dr. Shaker Basha	Computer Science Engineering	SashakT HR Services Pvt Ltd	0.75 Lakhs	6 Months	98	104
4	Mr.G.SRINIVAS	Electronics and Communication Engineering	MINDWAVE Informatics	0.75 Lakhs	4 Months	97	102

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Avanthi Institute of Engg. & Tech
Gunthapally (V), Abdullapurmet (Mdl), R.R. Dist.

CONSCIENCE TECHNOLOGIES

A Right Platform For All Engineers...

Date: 13/07/2021,

To,

The Principal,

Avanthi Institute of Engineering and Technology,

Gunthapally, Hyderabad.

Attention: Dr.T.KRANTHI KUMAR, Associate Professor of Department of Electrical and Electronics Engineering.

Subject: Design of Automatic solar street lights- Regarding

I am pleased to inform you that the R&D Team at CONSCIENCE TECHNOLOGIES, Hyderabad is pleased to approve a grant of INR 3.86 lakhs for the project "Design of Automatic solar street lights"

You are requested to prepare a detailed schedule and roadmap for the project. Completion and also the detailing on the utilization of funds within 15 days to release the payment

Looking forward to a meaningful collaboration with AVIH, Gunthapally

Regards

Conscience Technologies * DSNR, HYD-50 *

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#17-83/2C, 3rd Floor, Opp:Bank of Maharashtra,
Annapurna Function Hall Line, Dilsukhnagar, Hyderabad-500060 E-mail:
www.consciencetechnologies.com PH: 040 60 12 11 99

AVANTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Approved by AICTE, Recg. By Govt. of T.S & Affiliated to JNTUH, Hyderabad)
NAAC "B++" Accredited Institute
Gunthapally (V), Abdullapurmet(M), RR Dist, Near Ramoji Film City, Hyderabad -501512.
www.aietg.ac.in email: principal.avanthi@gmail.com

Dr.G. Ramachandra Reddy, M.Tech, Ph.D
Principal

AVIH/2021/R&D PROJECT

Dt:27 .07.2021,

TO
The Manager,
CONSCIENCE TECHNOLOGIES,
Hyderabad.

Sub: Design of Automatic solar street lights.

Respected Sir,

With reference to letter received from your end regarding "**Design of Automatic solar street lights**". We are happy to submit detailed proposal along with the milestones of Design and hardware Implementation of Design of Automatic solar street lights. We request you to discuss with your internal R&D team and communicate for further discussion.

Thank you and looking forward for your collaboration.

Principle Investigator

PRINCIPAL
Avanthi Institute of Engg. & Tech
Gunthapally (V), Abdullapurmet (Mdl), R.R. Dist.

Section A: General Information:

Project Title	Design of Automatic solar street lights
Project Type Research Design &Demonstration of Automated Street Light Controller Research Other	Design of Automatic solar street lights
Project Location/s (District State)(Must be in India)	Avanthi Institute of Engineering and Technology, Gunthapally, Hyderabad
Stage of development (initial concept proof of demonstration/scale up)	Proof of Concept - Demonstration
Lead Implementing Organization	Avanthi Institute of Engineering and Technology, Gunthapally, Hyderabad
Any Partnering: Organization: In INDIA	NO
(1) Total Funding Request(INR In lakhs)	3,86,000 Rs/-
(II) Contribution in Cash/kind from lead/partnering institution if any	NO
Total cost (I+II)=	3,86,000 Rs/-

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Gunthapally (V), Abdullapurmet (Mdl), R.R. Dist.

Section B: Project Information : Report submitted

Project Description:

DESIGN OF AUTOMATIC SOLAR STREET LIGHTS

Abstract—An automatic control circuit of LED street lamp is designed. The circuit is supplied with solar cell and stored electric energy with battery. It has three working modes of light control, delay quenching and delay plus low power. Under the light control mode, the LED street lamp is turned off in daytime and lit at night automatically. Under the delay quenching mode, the LED street lamp is turned off in daytime. It would be lit at night automatically and turned off after the setting time. Under the delay plus low power mode, the LED street lamp is lit at night automatically and changed into pulsed lighting in low power after the setting time. It would be turned off in daytime. The circuit also has the functions of protecting the battery from the over voltage or under voltage and automatic restoration of charging.

INTRODUCTION

Solar energy is a renewable energy of huge, long and endless and no pollution. Solar power street lamp do not need staff management and control, so it can be easily installed in the plazas, schools, parks, streets and other places. White LED lamp has the advantages of long life, energy saving, small size, good shock resistant, high efficiency and low driving voltage. A solar street lamp automatic control circuit using white LED lamp for the lighting source is designed in this paper

CIRCUIT AND WORKING PRINCIPLE

The system is mainly composed of six parts such as solar cell, protection circuit of charge and discharge, battery, control circuit, LED driving circuit and LED lamp. Thestructure frame of the circuit is shown in figure 1; the schematic is shown in figure 2.

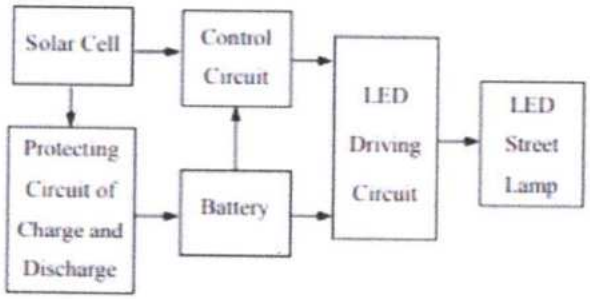

Figure1 Structure Frame of the Circuit of Design of Solar

LED Street Lamp Automatic Control Circuit

Battery Protecting Circuit of Charge and Discharge

The charge protection circuit uses the lead-acid battery(12V, 12Ah) as power supply, resistances R12 and R13 constitute a voltage division circuit, potentialmeter RP3 and resistance R11 constitute the

other. U4 and R24 constitute a hysteresis comparator. The voltage-dividing on RP3 inputs into non-inverting input end of U4. The voltage-dividing on R13 inputs into the inverted input end of U4. When the voltage of battery is higher than the voltage of the set over voltage(14.4V), the voltage of the non-inverting input end of U4 is changed higher than the voltage of the inverted input end. Then the output voltage of U4 is high level, transistor Q2 conducts saturably, relay RY operates, and the charging circuit breaks preventing battery over voltage

Resistances R1 and R2 constitute a voltage division circuit; potentiometer RP1 and resistance R3 constitute the other. U1 is a comparator. The voltage-dividing on R2 inputsinto the inverted input end of U1. The voltage-dividing on RP1 inputs into the non-inverting input end of U1. When the voltage of battery is lower than the voltage of the set under voltage(10.8V), the voltage of the non-inverting input end of U1 is higher than the inverted input end, the output voltage of U1 is high level, under voltage indicating lamp LED1 lights, the output voltage of U2 is low level, and LED driving circuit does not work to prevent the battery continue discharging.

Light Control Circuit

When the output voltage of solar cell is less than 2.3V, it is defined as night. Otherwise, it is the daytime. Resistances R6 and R7 constitute a voltage division circuit; potentiometer RP2 and resistance R5 constitute the other. The voltage-dividing on R7 inputs into the inverted input end of U2, the voltage-dividing on RP2 inputs into the non-inverting input end of U2. In the daytime, the voltage of the inverted input end of U2 is higher than the non-inverting input end so that the output voltage of U2 is low level. At night, the voltage of the non-inverting input end of U2 is higher than the inverted input end so that the output voltage of U2 is high level. Then the output voltage of U3 is high level, turning on the MOSFET Q3 and lighting LED street lamp.

Delay Circuit

The delay circuit consists of CD4060, capacitor C4, C5, resistances R16, R26, R27 and potentiometer RP5. Typical RC oscillator circuit consists of two inverters, capacitor C5, resistance R26 and potentiometer RP5. Pulse signal is generated by 14 ripple-carry binary frequency divider to achieve the purpose of time-delay. The oscillating period of oscillator's output is shown as follows.

$$T = 2.2 \times C_5 \times RP_5$$

If the delay time is t,

$$t = 2^{14} T$$

The value of C6 is 2.2uF, the maximum value of RP5 is 2MΩ, and the maximum for the oscillating period is 9.68 seconds. So the maximum delay time of CD4060 output is 158597.12 seconds (about 44 hours). The lighting time of LED is 22 hours. We can change the lighting time of LED through changing the oscillating period by regulating RP5. LED is turned off after the delay time

Power Regulating Circuit

Power regulating circuit consists of NE555 and the peripheral circuit. When potentiometer RP4 is on the middle position, the charge time is approximately equal to the discharge time and the duty cycle of pulse is approximately 50%. When regulating RP4, the duty cycle is changed. If the duty cycle is D, the minimum and maximum of D will be

$$D_{min} = R_{25} / (R_{25} + R_{22} + RP_4)$$

$$D_{max} = (R_{25} + RP_4) / (R_{25} + R_{22} + RP_4)$$

As measured, duty cycle range is 0.1% ~ 99.7%. The pulse of output of NE555 drives the Q3, and Q3 conducts discontinuously and changes the power-driven LED street lamp. Reducing the duty cycle, LED street lamp would reduce the power dissipation. The persistence of vision time is about 0.05seconds ~ 0.1 secondsWhen the driving frequency is high enough, people's naked eye would not feel scintillation. The oscillating period of the pulse is shown as follows

$$T = 0.693(R_{22} + R_{25} + RP_4)C_3$$

So the driving frequency of this circuit is 479.4Hz, the oscillating period is about 0.002s. It is far less than the persistence of vision time, so people's naked eye does not feel scintillation. LED has a strong luminescence instantaneous. Because of the persistence of vision, subjective brightness is not significantly reduced, but the power is reduced. So it can effectively reduce the power dissipation.

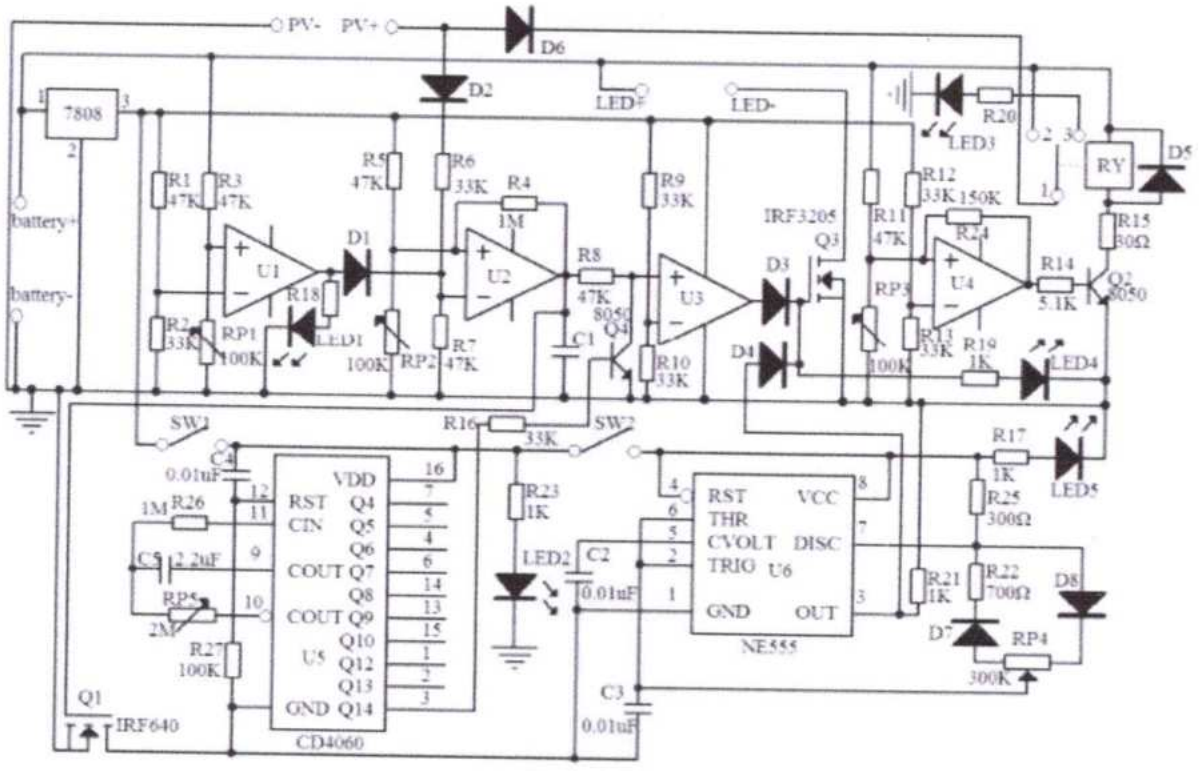

Figure2. Schematic of Design of Solar LED Street Lamp Automatic Control Circuit

LED driving circuit

Resistances R9 and R10 constitute a voltage division circuit, the voltage-dividing on R10 inputs into the inverted input end of U3. The output of U2 connects the noninverting input end of U3. The output voltage of U2 is low level in the daytime. The voltage of the inverted input end of U3 is higher than the non-inverting input end, so the output voltage of U3 is low level. The output voltage of U2 is high level at night, so the voltage of the non-inverting input end of U3 is higher than the inverted input end so that the output voltage of U3 is high level. Then LED street lamp is lit. The base of transistor Q4 connects the output of CD4060. After the delay time, the output voltage of CD4060 is high level to turn on the transistor Q4 and change the voltage of the non-inverting input end of U3 down to 0.3V. The voltage of the inverted input end of U3 is higher than the non-inverting input end. Then the output voltage of U3 is low level. MOSFET Q3 is turned off, turning off the LED street lamp.

COMPONENT SELECTION AND DEBUGGING

Q3 is selected as Power MOSFET IRF3205. The electrical characters are shown as follows

$$I_D = 110A, V_{(BR)DSS} = 55V, P_D = 200W$$

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Taking into account the factors of margin of power and ambient temperature, the actual current I is selected 60A. If the power is P, when the value of voltage U is 12V, because P=UI, so the maximum load power is 720W, it could reach to the power requirement of the general lighting places.

The value of under voltage is 10.8V. When the voltage of battery is lower than 10.8V, the relay RY operates, relay contacts 1 and 3 connect, 1 and 2 disconnect. The under voltage indicating lamp LED1 is turned on. The voltage of resume charging is 13.2V. When the voltage of battery is lower than 13.2V, the relay RY releases, relay contactresumes charging the battery and the over voltage indicating lamp LED3 is turned off. RP3 is used for regulating the voltage of over voltage and R24 is used for regulating the voltage of resume charging. It is worth noting that they would interact with each other when regulating them. Both of them are achieved through regulate repeatedly.

Solar cell is also a light control sensor. The output voltage of solar cell is the distinction sign between day and night. When it is higher than 2.3V, the environment is defined as the daytime and LED street lamp is turned off. Contrarily, the environment is defined as the night and LED street lamp is turned on. 2.3V is the critical voltage and it can be set by regulating RP2. In order to prevent the formation oscillation of street lamp turning on and off repeatedly on the critical point when at the dawn and dark, resistance R4 is connected between the output of U2 and the non-inverting input end. R4 could prevent the formation oscillation. The circuit has three working modes and they are controlled by SW1 and SW2. The functions of SW1 and SW2 are shown in table 1

TABLE1 THE FUNCTIONS OF SW_1 AND SW_2

SW_1	disconnection	connection	connection
SW_2	voluntariness	disconnection	connection
working modes	light control	delay quenching	delay plus low power

IV. CONCLUSION

Because the circuit has three working modes of light control, delay quenching and delay plus low power, it can be used in different situations flexibly and conveniently. When it works under light control mode, it is applied to the place that the LED street lamp is turned off in daytime and lit at night automatically. When it works under delay quenching mode, it is applied to the place that does not need light at midnight such as night market. When it works under the delay plus low power mode, it is applied to the place that does not need much of lighting at the latter half of the night such as campus. The LED street lamp automatic control circuit can also be used for the place such as streets, shops, advertising light boxes and so on.

Section C: Financial requirement (all figure must be INR)

S. No	Item Head	Total (in Lakh)
Capital Component		
1	Permanent Equipment (Located in lab/implementing organization) as per billing	40,000/-
2	Fabricated systems/demonstration models (located at beneficiary location)	97,000/-
A	Subtotal (Capital Items)	1,37,000/-
General Component		
1	Manpower and Contingencies	1,55,000/-
2	Consumables	75,000/-
3	Travel	10,000/-
4	Overhead	--------
5	PC	---------
6	Printer and Scanner	9,000/-
B	Subtotal (General)	2,49,000/-
C	**Total cost of the project (A+B)**	3,86,000/-

I. **Project Cost:3,86,000/-**
II. **Contribution of consortium (if any):**
III. **Total Budget (I+II):3,86,000/-**

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Gunthapally (V), Abdullapurmet (Mdl), R.R. Dist.

Section D: Applicant Details

Name of the Lead Organization	Avanthi Institute of Engineering and Technology	
Address,Please include phone numbers, fax, emails and website	Gunthapally (V), Abdullapurmet(M), RR Dist, Near Ramoji Film City, Hyderabad -501512. email: principal.avanthi@gmail.com Ph No:9849714307 www.aietg.ac.in	
Applicant TypeBroad: Government/Non-Government Sub entity:Academic or research institution	ACADEMIC INSTITUTION	
Primary Point of Contact Lead Principal investigator (PI)	Name:	Dr. T.Kranthi Kumar
	Designation	Associate Professor
	Email	Avanthieee2005@gmail.com
	Telephone	9652224466
	Mobile	9652224466
Secondary Point of Contact	Name:	Dr Ramachandra Reddy
	Designation	Associate Professor
	Email	principal.avanthi@gmail.com
	Telephone	9849714307
	Mobile	9849714234

Information on Lead PI	**Expertise available with the Principal Investigator**
	Dr. T.Kranthi Kumar, Associate Professor, Dept. Of Electrical and Electronics Engineering, he would mentor the proposed research project from time to time. The Principal Investigator has gained good knowledge on Power systems and its related areas. 1.Guided five M. Tech project students based on his Research area. Guided four B. Tech project students out of his research Area. 2) During his research, PI has acquired knowledge of automatic control and fault and obstacle detection system for street lamps & used them for the above said project works. The tools learned by PI are as follows: Computational skills: Simulation Software: the microcontroller used is Arduino mega 2560 which has to be programmed for these tasks. Word Processing: MS Office.

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1.Annexure 1:Monitoring & Evaluation approach

Time Schedule of Activities Giving milestones through BAR Diagram						
S.No	**WORKPLAN**	**1ST Month**	**2nd Month**	**3rd Month**	**4th Month**	**5th Month**
1	Basic Study of the literature related for the project implementation consolidation of the available expertise. Planning of execution of the proposed project scheme					
2	Procurement of experimental equipment and installation					
3	Design of basic simulation of the project and control strategy using Embedded C & Embedded RTOS					
4	Implementation of research project and operational control of the test facility using Embedded C & Embedded RTOS					
5	Annual review of the progress of the project and effective guidance for implementation					
6	Commissioning of the project hardware					
7	Testing of the project and code					
8	Experimental validation of the project					
9	Report Writing					

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Avanthi Institute of Engineering and Technology, Gunthapally, Hyderabad

S No	Infrastructure Facility	Yes/No/Not required/Full or Sharing Bases
1	Workshop Facility	Yes
2	Water & Electricity	Yes
3	Laboratory Space/Furniture	Yes
4	Power Generator	Yes
5	AC Room or AC	Yes
6	Telecommunication including e-mail &fax	Yes
7	Transportation	Yes
8	Administrative/ Secretarial support	Yes
9	Information facilities like Internet Library	Yes
10	Computational facilities	Yes
11	Animal/Glass House	Not required
12	Any other special facility being provided	R&D Lab

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NAAC "B++" Accredited Institute
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www.aietg.ac.in email: principal.avanthi@gmail.com

AVIH/2021/ R&D PROJECT/01

Dt: 03.08.2021

TO
The Manager,
CONSCIENCE TECHNOLOGIES,
Hyderabad.

Sub: Design of Automatic solar street lights.

Respected Sir,

We are pleased to appoint faculty for coordination of Design of Automatic solar street lights. We are happy to submit detailed proposal along with the milestones of microcontroller used is Arduino mega 2560.

Details of the Faculty:

Dr. T.Kranthi Kumar, Associate Professor
Department of EEE
Phone Number: 9652224466

Thank you and looking forward for your collaboration.

Principal Investigator

PRINCIPAL
Avanthi Institute of Engg. & Tech
Gunthapally (V), Abdullapurmet (Mdl), R.R. Dist.

CONSCIENCE TECHNOLOGIES

A Right Platform For All Engineers...

Date: 10.08.2022,

To,

The Principal,

Avanthi Institute of Engineering and Technology,

Gunthapally, Hyderabad.

Subject: Design of Automatic solar street lights - Regarding

With reference to communication along with detailed submission of project milestones. We are pleased to invite for an internal discussion on execution of the project and other design and implementation regarding development of Design of Automatic solar street lights. We are deputing Engineer for the above state of project.

Details of the Engineer:

Mr.M.Manohar babu

Phone Number: 9505379414

Thank you and looking forward for your response.

Regards

Managing Partner Conscience Technology

Conscience Technologies * DSNR *

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#17-83/2C, 3rd Floor, Opp:Bank of Maharashtra,
Annapurna Function Hall Line, Dilsukhnagar, Hyderabad-500060 Email: info@consciencetechnologies.com
www.consciencetechnologies.com PH: 040 60 12 11 99

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WORK ORDER

Date: 12/08/2021,

HYDERABAD,

To
The Principal,
Avanthi Institute of Engineering& Technology,
Gunthapally, Abdullapurmet Mandal, Hyderabad.

Sub: Design of Automatic solar street lights

Further to your offer for preparing of Design of Automatic solar street lights as per the quotation, we are pleased to place the work order as below.

S.NO	Description	Quantity in no	Unit Cost Rs.	Total Cost in Rs.
1	Design of Automatic solar street lights	20	19,300	3,86,000/-

Work Order Valid: One Year (12th August 2021 to 11th August 2022)

Terms& Conditions:

- Preparation of detailed drawings/Lay outs based on the reference design provided by the customer.
- Taking physical design for review and approval of our customer
- Submission of designs/lay outs for review and approval of our customer
- Incorporate any comments/feed back given by customer in the design/layouts
- Preparation of designs, lay outs, algorithms, part design, bill of materials for all designs.
- Preparation of built up designs, lay outs after completion of fabrication/Installation at site.

For CONSCIENCE TECHNOLOGIES

MANAGER

PRINCIPAL
Avanthi Institute of Engg. & Tech
Gunthapally (V), Abdullapurmet (Mdl), R.R. Dist.

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Annapurna Function Hall Line, Dilsukhnagar, Hyderabad-500060 Email: info@consciencetechnologies.com
www.consciencetechnologies.com PH: 040 60 12 11 99

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Gunthapally (V), Abdullapurmet(M), RR Dist, Near Ramoji Film City, Hyderabad -501512.
www.aietg.ac.in email: principal.avanthi@gmail.com

Hyderabad,
Date: 24.01.2022.

From
The Principal,
Avanthi Institute of Engineering and Technology,
Hyderabad.

To
The Manager,
CONSCIENCE TECHNOLOGIES,
Hyderabad.

Respected Sir,

Sub: Project Completion-reg.

The project has been completed on a given time bond. It has been a great achievement by us to complete the prestigious project on time. It has been a great privilege, working in association with you and looking forward to working with you in future projects. We request you to please come along with your team for collecting, retrieving of important and confidential data.

Looking forward to a quick response from your side

Thanking you,

Principal

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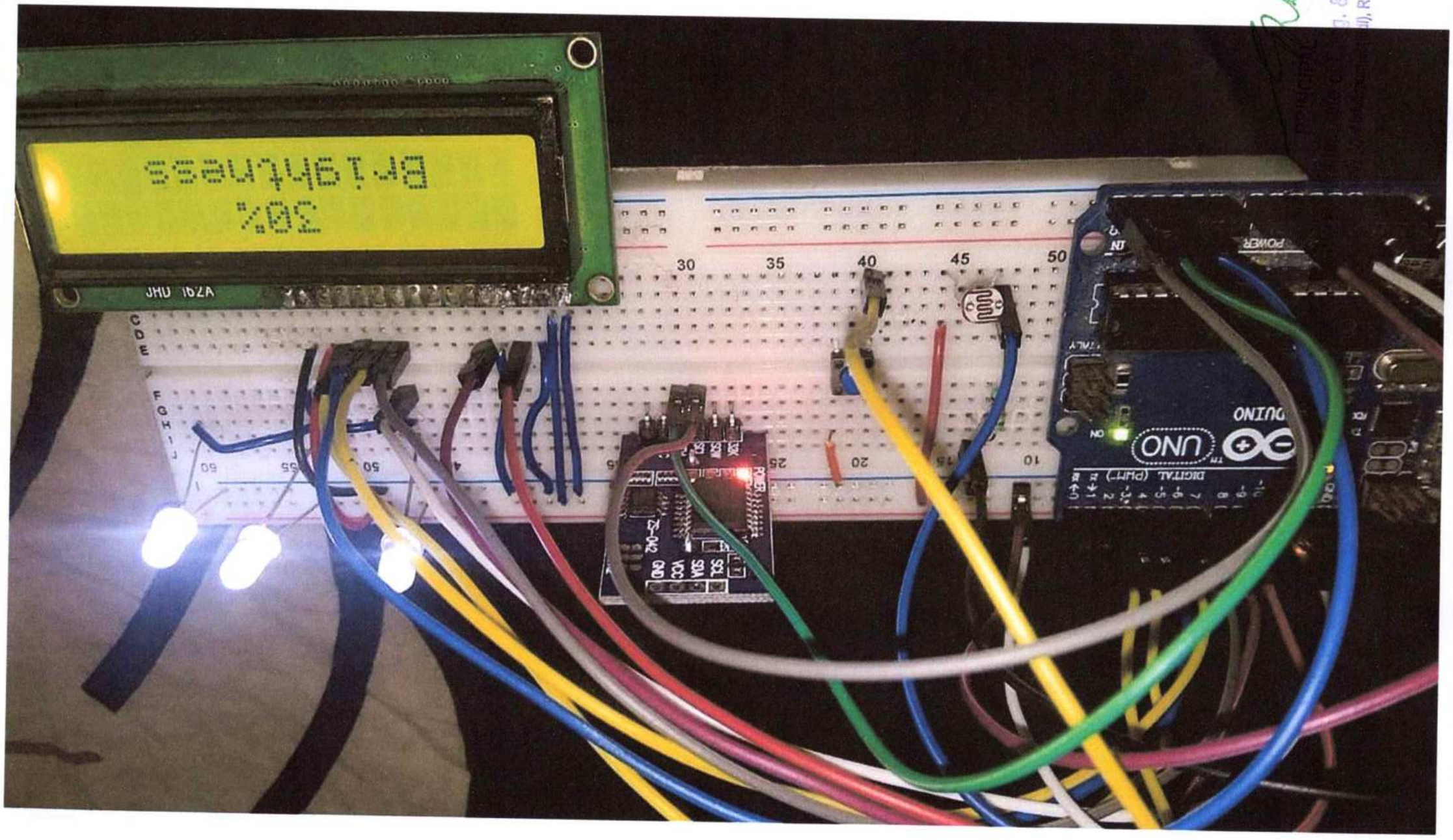
Gunthapally (V), Abdullapurmet (Mdl), R.R. Dis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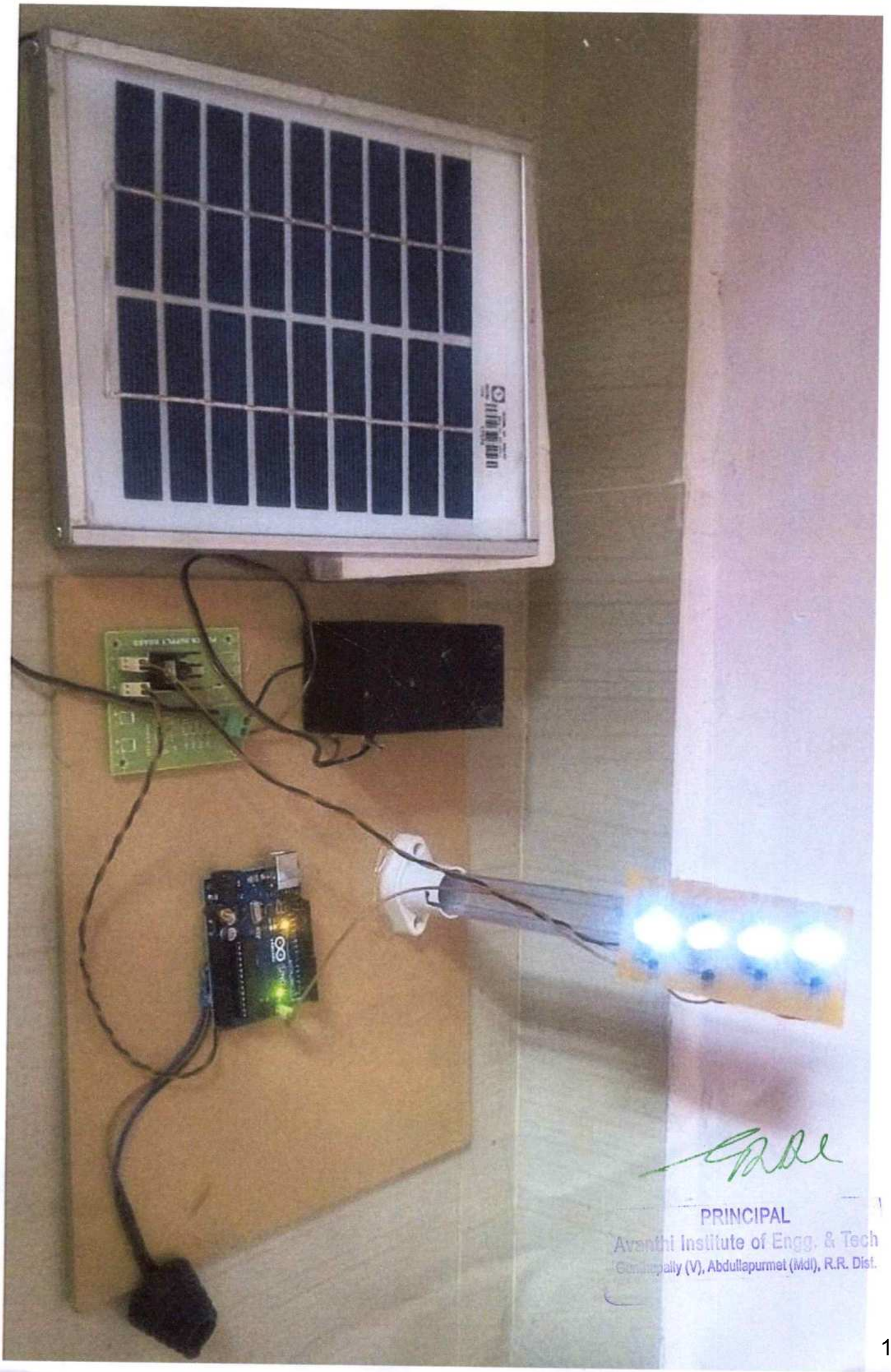

PRINCIPAL
Avanthi Institute of Engg. & Tech
Gunthapally (V), Abdullapurmet (Mdl), R.R. Dist.

MANAC
Infotech (P) Limited

Date: 03/01/2022,

To

The principal,

Avanthi Institute of Engineering and Technology,

Gunthapally (V), Abdullapurmet (M), Hyderabad, Telangana.

Subject: Request for Enhancements of project" **Detection Of Chronic Kidney Disease Using Machine Learning Algorithm**"

Dear Sir,

I hope this letter finds you in good health and high spirits. I am writing to you as the Managing Director, MANAC infotech (P) Ltd , 201, 2nd, Sagarview Building, Dilsukhnagar, Hyderabad, Telangana with regard to a project that our agency funded in collaboration with your esteemed college.

Firstly, I would like to express my gratitude for the opportunity given to us to collaborate on such a promising project. After careful evaluation and analysis, we have identified several areas where the project could benefit from additional enhancements. These enhancements would undoubtedly contribute to further elevating the overall quality and impact of the project.

We are open to further collaboration with your college in terms of sharing our expertise and resources to facilitate the successful implementation of these enhancements. Meanwhile we will start the process of payment. We kindly request your prompt attention and favorable consideration of our proposal. We would be more than willing to provide any additional supporting documentation or answer any queries you may have.

Thank you for your time and support. We eagerly await your positive response and look forward to our continued collaboration for the advancement of this admirable project.

PRINCIPAL
Avanthi Institute of Engg. & Tech
Gunthapally (V), Abdullapurmet (Mdl), R.R. Dist.

Managing Director

AVANTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

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www.aietg.ac.in email: principal.avanthi@gmail.com

Dr.G. Ramachandra Reddy, M.Tech, Ph.D
Principal

AVIH/2022/R & D PROJECT

Dt: 07/01/2022,

TO
The Manager,
MANA Infotech (P) Limited,
Dilsukhnagar, Hyderabad.

Sub: Detection Of Chronic Kidney Disease Using Machine Learning Algorithm.

Respected Sir,

With reference to letter received from your end regarding **Detection Of Chronic Kidney Disease Using Machine Learning Algorithm,** We are happy to submit detailed proposal along with the milestones of Design and hardware Implementation of Detection Of Chronic Kidney Disease Using Machine Learning Algorithm. We request you to discuss with your internal R&D team and communicate for further discussion.

Thank you and looking forward for your collaboration.

Principal Investigator

PRINCIPAL
Avanthi Institute of Engg. & Tech.
Gunthapally (V), Abdullapurmet (Mdl), R.R. Dist.

Section A: General Information:

Project Title	Detection Of Chronic Kidney Disease Using Machine Learning Algorithm
Project Type Research Design & Demonstration of Automated Street Light Controller Research Other	Detection Of Chronic Kidney Disease Using Machine Learning Algorithm
Project Location/s (District State)(Must be in India)	Avanthi Institute of Engineering and Technology, Gunthapally, Hyderabad
Stage of development (initial concept proof of demonstration/scale up)	Proof of Concept - Demonstration
Lead Implementing Organization	Avanthi Institute of Engineering and Technology, Gunthapally, Hyderabad
Any Partnering: Organization: In INDIA	NO
(1) Total Funding Request(INR In lakh)	3,65,000 Rs/-
(II) Contribution in Cash/kind from lead/partnering institution if any	NO
Total cost (I+II)=	3,65,000 Rs/-

PRINCIPAL
Avanthi Institute of Engg. & Tech
Gunthapally (V), Abdullapurmet (Mdl), R.R. Dist.

Section B: Project Information : Report submitted

Project Description:

Chronic kidney disease (CDK) is defined by the presence of kidney damage which lasts longer than three months with decreased glomerular filtration rate (GFR). Chronic kidney disease involves condition like heart disease, high blood pressure or anemia. CDK can be caused by various reasons which include diabetes, high blood pressure, and polycystic kidney disease. People with glomerular filtration rate <60 ml\min/1.73 m^2 for 3 months are classified as having CDK. In this current work focus is on predicting that the patient is CKD or nonCKD. To predict this various machine learning algorithms have been use. Different classifications models have been built using different classification algorithms to predict weather the patient is suffering from Chronic disease or not. This Prediction is performed using Naive Bayes Classifier and K-Nearest Neigbour algorithm. The data used is collected from the UCI Repository with 400 data sets with 25 attributes. This data has been fed into Classification algorithms.

The experimental results show that Naïve Bayes Algorithm gives an accuracy of 96.25%, whereas K-Nearest Neigbour came up with an accuracy of 100%.

Keywords – Chronic kidney disease, Data Mining, Machine Learning, Classification algorithm's, Naïve Bayes, K-Nearest Neigbour, feature selection.

Introduction

Chronic Kidney disease can also be termed as kidney failure. One in Ten people worldwide are suffering from kidney disease. 10% of the population worldwide suffers from chronic kidney disease; one in five men and one in four women from age group from 60 to 75 have CKD as per National Kidney Foundation [15]. The present work focuses on predicting weather a person is suffering from CKD or not using Data mining using Machine Learning. Data Mining [10] is the process of searching large data sets and discovering patterns and trends and transforming it into understandable data using Data pre-processing, Visualization. Machine Learning is the field of computer which uses statistical techniques to give the ability to learn to computer. Machine learning can be both Supervised and Unsupervised learning. Supervised learning can be defined as when we map an input to a desired output [12], [13]. Machine learning algorithms are provided to support future predictions. There are various supervised machine learning algorithms like Logistic regression, multi-class classification, support vector machine, K-nearest neighbour, Naïve Bayes, Random forest and many more. In un-Supervised learning algorithm

we train the data using info which is not labelled. In this algorithm we divide the data into 2 groups based on similarity and reducing the dimensionality. Most common unsupervised learning approaches are clustering algorithms. There are various clustering algorithms like Hierarchical clustering, K-means clustering and many more [12], [14]. Feature Selection also called as variable selection, attribute selection or feature extraction. It uses relevant data sets and avoids redundant and irrelevant data. It reduces the dimensionality by using small subsets from the original dataset it helps in easy calculation of results and attaining Shorter training times [11]

In this research we have used machine learning to detect CKD and Non-CKD by using 10 attributed which Contribute to kidney disease. The data used consist of record of 400 people. The data set has various missing data. We have used this data sets and classification algorithms to build a classification model for prediction of CKD. The model with the best accuracy prediction is taken. This will help to achieve fast and accurate results for CKD prediction, which will reduce the time for disease prediction and provide benefits to both doctors and patients in providing early treatment and speedy recovery.

Figure 1: Stages of chronic kidney disease

Figure 1 explains various stages of chronic kidney disease based on glomerular filtration rate. There are five stages in chronic kidney disease. In Stage 1 the GFR value is equal or less than 90ml/min and the patient do not feel any kind of problem and this is the reason why this stage goes undetected. In stage 2 the GFR value decreases from 60-89ml/min. In this stage kidney suffers from mild damage. In stage 3 the kidney suffers from moderate damage and the GFR value now ranges from 30-59 ml/min. When the GFR value reduces to 15-29 ml/min the patient is suffering from severe chronic kidney disease and this stage is called as stage 4. The patient may now face health issues like high blood pressure, heart problems. In stage 5 the kidney loses its ability to filter out waste material from the blood. The GFR value in stage 5 is less than 15 ml/min, at this stage the patient is advised to undergo medical treatments as the kidneys have lost their ability to filter out waste.

Dataset And Attributes

We have downloaded Chronic Kidney Disease datasets from publically available data from UCI Machine Learning Repository [16]. Table 1 gives a list of all the attributes taken

Table 1. Attributes for chronic kidney disease prediction

Attribute	Values
Age	Numerical
blood pressure	Numerical
specific gravity	Nominal sg(.005,1.010,1.015,1.020,1.025)
Albumin	Nominal al - (0,1,2,3,4,5)
Sugar	Nominal su - (0,1,2,3,4,5)
red blood cells	Nominal rbc - (normal,abnormal)
pus cell	Nominal pc - (normal,abnormal)
pus cell clumps	Nominal pcc- (present,notpresent)
Bacteria	Nominal ba - (present,notpresent)
blood glucose random	Numerical
blood urea	Numerical
serum creatinine	Numerical
Sodium	Numerical
Potassium	Numerical
Haemoglobin	Numerical
Packed cell volume	Numerical
white blood cell count	Numerical
red blood cell count	Numerical
Hypertension	Nominal htn - (yes,no)
diabetes mellitus	Nominal dm - (yes,no)
coronary artery	Nominal cad - (yes,no)
Appetite	Nominal appet - (good,poor)
pedal edema	Nominal pe - (yes,no)
Anemia	Nominal ane- (yes,no)
Class	Nominal class - (ckd,notckd)

Table 1 describes 25 chronic kidney disease related attributes which are taken form UCI repository, it consist of Record of 400 Patients with 25 attributes. The Data Set is real and consists of Nominal, Numerical and Class attributes.

Methodology

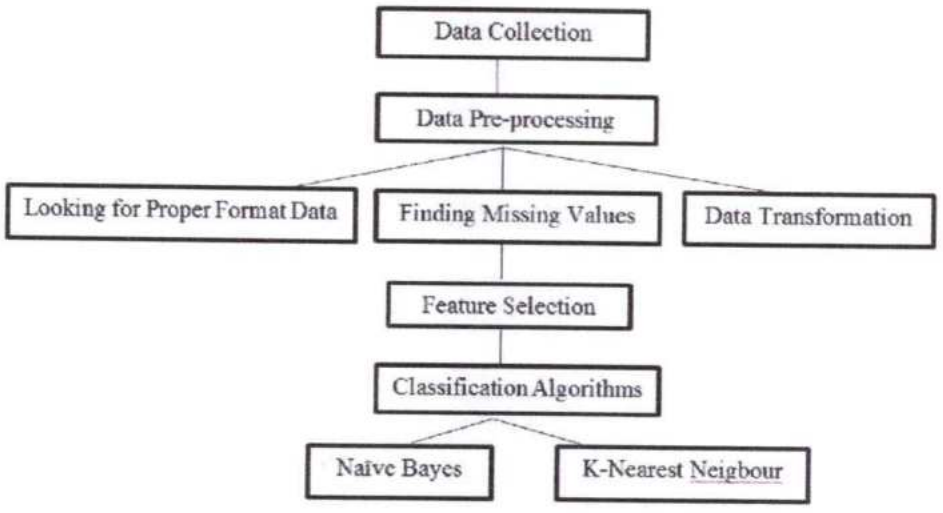

Figure 2. Components of methodology for chronic kidney disease prediction

Figure 2 describes the components of methodology used for CKD prediction. Steps involved in this process of chronic kidney disease prediction are:

1.1. Data Collection

In this research paper we have used Real world data set for predicting CKD status of a patient. The data collected is widely used data and is available at UCI Machine Learning Repository. This Real data belongs to Apollo Hospital in Tamilnadu, India over a period of 2 months. The data set available is specifically used for Chronic Kidney Disease research. It consists of record of 400 people with their respective 25 CKD related attributes. The data consisted of real numbers, Decimal values and Nominal values.

1.2. Data Pre-Processing

Data pre-processing is a way to convert the noisy and huge data into relevant and clean data, as the data available is Real world data, so it contains inaccurate data, missing values and other Noisy data, for removing this inconsistent data from the Dataset, the proposed system have to clean the raw data.

This is an important part to complete the prediction model. It reduces the dimensionality and helps the machine to achieve better results. This is one of the most time consuming stage in building a classification model.

Following data pre-processing steps are followed:

1.2.1. **Looking Up For Proper Format:** As we have made our model using python, so we need a csv file (comma separated value) for our code. The data downloaded is in the form of RAR file, so we extract the data from the text file available and save it into a csv file so that our python code can read it. This is the first most important step, if the data is not available in requires format then we cannot design the classification model.

1.2.2. **Finding Missing Values:** When the data collected is real world data, and then it will contain missing values. This brings more change in the prediction accuracy. Sometimes these missing values can be simply deleted or ignored if they are not large in number. It is the simplest way to handle the missing data but it is not considered healthy for the model as the missing value can be an important attribute contributing to the disease. The missing values can also be replaced by zero this will not bring any change as whole, but this method cannot be much yielding. So an efficient way to handle missing values is to use mean, average of the observed attribute or value. This way we lead to more genuine data and better prediction results.

1.2.3. **Data Transformation**: In this step we transform the given real data into required format. The data downloaded consist of Nominal, Real and Decimal values. In this step we convert the Nominal data into numerical data of the form 0 and 1. The positive value is assigned the value of 1 and the negative value is assigned the value of 0. Now the resultant csv file comprises of all the integer and decimal values for different CKD related attributes.

Feature Selection

In this step we select subset of relevant attributes from the total give attributes. This stage helps in reducing the dimensionality and making the model simpler and easy to use, thus leading to short training time and high accuracy.

To obtain highly dependent features for CKD prediction we have used Correlation and dependence method. The term correlation can be defined as mutual relationship between two. In this those attributes are chosen which highly influence the occurrence of Chronic Kidney Disease. By using the correlation it is found that 5 attributed were highly correlated to the occurrence of CKD from the total of 25 attributes.

The 5 attributes selected from a total of 25 attributes are:

1. specific gravity

2. diabetes mellitus_N

3. albumin

4. packed cell volume

5. red blood cells_N

Classification Algorithms

we have used K- Nearest Neigbour and Naïve Bayes as our classification algorithm

K-Nearest Neigbour

For finding a class for a new data point KNN scans through all the previous experiences known as data points and looks up the closest experience to find a solution [17].This algorithm is inspired by human reasoning. The data of previous data points is maintained and the class of a new data point is determined by the majority of nearest data points. This algorithm is fast and easy

5.1. Naive Bayes

Naïve Bayes are probabilistic classifiers, which are based on Bayes Theorem [18]. In Naïve Bayes each value is marked independent of the other values and features. Each value contributes independently to the probability. The higher the probabilistic value the higher are the chances of data point belonging to that class or category. Naïve Bayes algorithm uses the concept of Maximum Likelihood for prediction. This algorithm is fast and can be used for making real time predictions such as sentiment analysis.

7. Results

This study is carried to predict weather a patient is suffering from Chronic Kidney Disease or not. This Prediction model is created in Python programming language. In our classification model we have used K-Nearest Neigbour and Naïve Bayes as our classification algorithms; both the classification algorithms were applied to the same data set collected from UCI Repository.

Filtered dataset of 400 people with 5 CKD related attributes from a total of 25 attributes is used. The Filtered attributed are - Specific gravity, diabetes mellitus_N, albumin, packed cell volume and red blood cells_N.

Table 2. Predictive accuracy of classification algorithms

Algorithm	Accuracy
Naïve Bayes Classifier	96.25%
K-Nearest Neigbour	100%

Table 2 represent the prediction accuracy of both Naïve Bayes and K-Nearest Neigbour algorithms. Both the prediction accuracies are compared. Naïve Bayes performed with an accuracy of 96.25% and KNN performed with an accuracy of 100%.

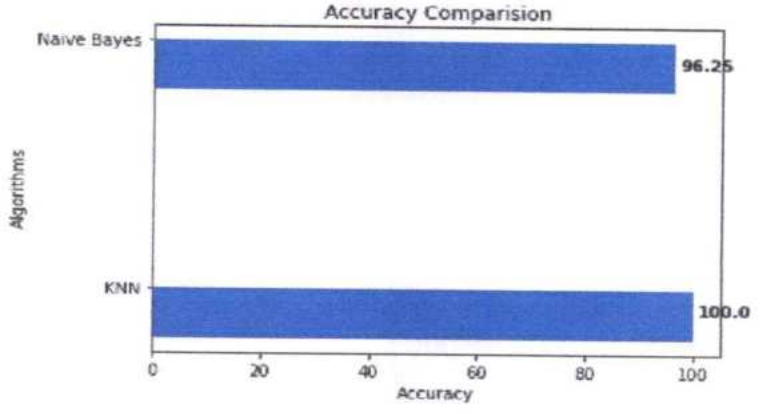

Figure 3. Graphical representation for accuracy comparison of KNN and Naïve bayes classification algorithm

Figure 3 is the graphical representation of both the prediction algorithms, KNN with 100% accuracy and Naïve Bayes with an accuracy of 96.25%. In the above figure x-axis represents the accuracy value and the y-axis represents the algorithm used. The above results highlight that accuracy of KNN algorithm is 3.75% higher than Naïve Bayes classification algorithm. The experimental results show that Chronic Kidney Disease can be better predicted by using K-Nearest Neigbour algorithm with 100% accuracy. The advantage of this research is that it will help Doctors to easily predict CKD with high accuracy and precision in less time period.

Conclusion

Various Researches have been made in the field of Chronic Kidney Disease prediction using Data Mining, Machine learning and different classification algorithms.This work is focused on predicting CKD status of a patient with high accuracy. Early and Accurate detection of CKD can helpful in preventing further deterioration of patient's health. In this research we have used 5 CKD related attributes from a total of 25 attributes and two classification algorithms KNN and Naïve Bayes for predicting CKD status of a patient. Same data set of 400 people was given to both the classification

algorithms and results were obtained. We have compared the results of both the algorithms on the basis of accuracy. KNN classifier predicted chronic kidney disease with an accuracy of 100%, whereas Naïve Bayes Classifier predicted with an accuracy of 96.25%.Thus KNN performing better than Naïve Bayes with high accuracy.In conclusion this study helps doctors to predict the disease more accurately and in no time and the patient's to undergo minimal test as compared to large number of test required for CKD prediction.

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Section C: Financial requirement (all figure must be INR)

S. No	Item Head	Total (in Lakh)
Capital Component		
1	Permanent Equipment (Located in lab/implementing organization) as per billing	55,000/-
2	Fabricated systems/demonstration models (located at beneficiary location)	1,35,000/-
A	Subtotal (Capital Items)	1,90,000/-
General Component		
1	Manpower and Contingencies	1,00,000/-
2	Consumables	60,000/-
3	Travel	10,000/-
4	Overhead	--------
5	PC	---------
6	Printer and Scanner	5,000/-
B	Subtotal (General)	1,75,000/-
C	**Total cost of the project (A+B)**	3,65,000/-

I. **Project Cost:3,65,000/-**
II. **Contribution of consortium (if any):**
III. **Total Budget (I+II):3,65,000/-**

PRINCIPAL
Avanthi Institute of Engg. & Tech
Gunthapally (V), Abdullapurmet (Mdl), R.R. Dist.

Section D: Applicant Details

Name of the Lead Organization	Avanthi Institute of Engineering and Technology	
Address, Please include phone numbers, fax, emails and website	Gunthapally (V), Abdullapurmet(M), RR Dist, Near Ramoji Film City, Hyderabad -501512. email: principal.avanthi@gmail.com Ph No:9849714307 www.aietg.ac.in	
Applicant Type Broad: Government/Non-Government Sub entity: Academic or research institution	ACADEMIC INSTITUTION	
Primary Point of Contact Lead Principal investigator (PI)	Name:	Dr.Hameeda shaik
	Designation	Associate Professor
	Email	Avanthicse2005@gmail.com
	Telephone	9858789546
	Mobile	9490407807
Secondary Point of Contact	Name:	Dr Ramachandra Reddy
	Designation	Associate Professor
	Email	principal.avanthi@gmail.com
	Telephone	9849714307
	Mobile	9849714234

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Avanthi Institute of Engg. & Tech
Gunthapally (V), Abdullapurmet (Mdl), R.R. Dist.

Information on Lead PI	Expertise available with the Principal Investigator
	Dr. Hameeda shaik, Associate Professor Dept. Of CSE, he would mentor the proposed research project from time to time. The Principal Investigator has gained good knowledge on Embedded systems design & Image Processing And Its Related Areas. 1.Guided two M.Tech project students based on his research area. Guided two B. Tech project students out of his research area. 2) During his research, PI has acquired knowledge of many simulations software& used them for the above said project works. The tools learned by PI are as follows: Computational skills: Simulation Software: C programming & JAVA Word Processing: MS Office

PRINCIPAL
Avanthi Institute of Engg. & Tech
Gunthapally (V), Abdullapurmet (Mdl), R.R. Dist.

1. Annexure 1:Monitoring & Evaluation approach

Time Schedule of Activities Giving milestones through BAR Diagram							
S.No	**WORKPLAN**	**1ST Month**	**2nd Month**	**3rd Month**	**4th Month**	**5th Month**	**6th Month**
1	Basic Study of the literature related for the project implementation consolidation of the available expertise. Planning of execution of the proposed project scheme						
2	Procurement of experimental equipment and installation						
3	Design of basic simulation of the project and control strategy using Embedded C & Embedded RTOS						
4	Implementation of research project and operational control of the test facility using Embedded C & Embedded RTOS						
5	Annual review of the progress of the project and effective guidance for implementation						
6	Commissioning of the project hardware						
7	Testing of the project and code						
8	Experimental validation of the project						
9	Report Writing						

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Gunthapally (V), Abdullapurmet (Mdl), R.R. Dist.

Avanthi Institute of Engineering and Technology, Gunthapally, Hyderabad

S No	Infrastructure Facility	Yes/No/Not required/Full or Sharing Bases
1	Workshop Facility	Yes
2	Water & Electricity	Yes
3	Laboratory Space/Furniture	Yes
4	Power Generator	Yes
5	AC Room or AC	Yes
6	Telecommunication including e-mail &fax	Yes
7	Transportation	Yes
8	Administrative/ Secretarial support	Yes
9	Information facilities like Internet Library	Yes
10	Computational facilities	Yes
11	Animal/Glass House	Not required
12	Any other special facility being provided	Dedicated Embedded C Lab

PRINCIPAL
Avanthi Institute of Engg. & Tech
Gunthapally (V), Abdullapurmet (Mdl), R.R. Dist.

AVANTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Approved by AICTE, Recg. By Govt. of T.S & Affiliated to JNTUH, Hyderabad)
NAAC "B++" Accredited Institute
Gunthapally (V), Abdullapurmet(M), RR Dist, Near Ramoji Film City, Hyderabad -501512.
www.aietg.ac.in email: principal.avanthi@gmail.com

AVIH/2022/R&D PROJECT

Dt: 11.01.2022,

TO

The Manager,

MANA Infotech (P) Limited,

Dilsukhnagar, Hyderabad.

Sub: Details of Project coordinator of **Detection Of Chronic Kidney Disease Using Machine Learning Algorithm**.

Respected Sir,

We are pleased to appoint faculty for coordination of **Detection Of Chronic Kidney Disease Using Machine Learning Algorithm,** We are happy to submit detailed proposal along with the milestones of Embedded Automation Design and Prototype.

Details of the Faculty:
Dr.Hameeda shaik, Associate Professor
Department of CSE
Phone Number: 8697025298
Thank you and looking forward for your collaboration.

Principal Investigator

PRINCIPAL
Avanthi Institute of Engg. & Tech
Gunthapally (V), Abdullapurmet (Mdl), R.R. Dist.

MANAC
Infotech (P) Limited

Date: 14.01.2022,

To,

The Principal,

Avanthi Institute of Engineering and Technology,

Gunthapally, Hyderabad.

Subject: **Detection Of Chronic Kidney Disease Using Machine Learning Algorithm** - Regarding

With reference to communication along with detailed submission of project milestones. We are pleased to invite for an internal discussion on execution of the project and other design and implementation regarding development of Toward Better Statistical Validation Of Machine Learning-Based Multimedia Quality Estimators. We are deputing Engineer for the above state of project.

Details of the Engineer:
Mr.Sk Saleem
Phone Number: 8576902121

Thank you and looking forward for your response.

Regards

MANAC INFOTECH PVT. LTD HYD

PRINCIPAL
Avanthi Institute of Engg. & Tech
Gunthapally (V), Abdullapurmet (Mdl), R.R. Dist.

MANAC
Infotech (P) Limited

WORK ORDER

Date: 18/01/2022,

HYDERABAD,

To
The Principal,
Avanthi Institute of Engineering& Technology,
Gunthapally, Abdullapurmet Mandal, Hyderabad.

Sub: Detection Of Chronic Kidney Disease Using Machine Learning Algorithm

Further to your offer for preparing of Portal/Control for face recognition as per the Telephone Discussion quotation, we are pleased to place the work order as below

S.NO	Description	Quantity in no	Unit Cost Rs.	Total Cost in Rs.
1	Detection Of Chronic Kidney Disease Using Machine Learning Algorithm	1	3,65,000	3,65,000

Work Oder Valid: One Year (18th January 2022 to 17th January 2023)

Terms& Conditions:

- Preparation of detailed drawings/Lay outs based on the reference design provided by the customer.
- Taking physical design for review and approval of our customer
- Submission of designs/lay outs for review and approval of our customer
- Incorporate any comments/feed back given by customer in the design/layouts
- Preparation of designs, lay outs, algorithms, part design, bill of materials for all designs.
- Preparation of built up designs, lay outs after completion of fabrication/Installation at site.

For MANA Infotech (P) Limited,

MANAGER

MANAC INFOTECH PVT. LTD.

PRINCIPAL
Avanthi Institute of Engg. & Tech
Gunthapally (V), Abdullapurmet (Mdl), R.R. Dist.

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www.aietg.ac.in email: principal.avanthi@gmail.com

Hyderabad,
Date: 01.11.2022,

From
The Principal,
Avanthi Institute of Engineering and Technology,
Hyderabad.

To
The Manager,
MANA Infotech (P) Limited,
Hyderabad.

Respected Sir,

Sub: Project Completion-reg.

The project has been completed on a given time bond. It has been a great achievement by us to complete the prestigious project on time. It has been a great privilege, working in association with you and looking forward to working with you in future projects. We request you to please come along with your team for collecting, retrieving of important and confidential data.

Looking forward to a quick response from your side

Thanking you,

Principal

PRINCIPAL
Avanthi Institute of Engg. & Tech
Gunthapally (V), Abdullapurmet (Mdl), R.R. Dist.

PRINCIPAL
Avanthi Institute of Engg. & Tech
Gunthapally (V), Abdullapurmet (Mdl), R.R. Dist.

SashakT
HR Services Pvt Ltd

Date: 07/02/2022,

To
The Principal,
Avanthi Institute of Engineering and Technology,
Gunthapally, Hyderabad.

Subject: Approval Letter for Financial Assistance for Project work entitled **"Unveiling In-app ads and Uncovering covert attacks via mobile app-web inter"**

I'm Mr. Swamy Rao Kulkarni, working as one of the Directors of SashakT HR Services Pvt Ltd. which is located at 102, Sharada Nagar, Vanastalipuram Hyderabad, Telangana ,India.

SashakT HR Services Pvt Ltd is very much pleased to see your application and is very much impressed with your faculty profile and research field. We are happy to inform you that the manager has approved your project proposal entitled **"Unveiling In-app ads and Uncovering covert attacks via mobile app-web inter"** We anticipate this project proposal may be of greater signifying concern to the people in this Complete details of corresponding project proposal are mentioned, check it and plan accordingly .the project proposal should complete in specified time and should submit the complete information on time.

Looking forward to a meaningful collaboration with AVIH, Gunthapally

Thanks& Regards

PRINCIPAL
Avanthi Institute of Engg. & Tech
Gunthapally (V), Abdullapurmet (Mdl), R.R. Dist.

Regd office : Vanastalipuram, Hyderabad, Telangana State - 500070.
Website : www.sashaktservices.com E-mail : info@sashaktservices.com
Cell : 9885197888, 9849714307

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(Approved by AICTE, Recg. By Govt. of T.S & Affiliated to JNTUH, Hyderabad)
NAAC "B++" Accredited Institute
Gunthapally (V), Abdullapurmet(M), RR Dist, Near Ramoji Film City, Hyderabad -501512.
www.aietg.ac.in email: principal.avanthi@gmail.com

Dr.G. RamaChandra Reddy, M.Tech, Ph.D
Principal

AVIH/2022/R&DPROJECT Dt: 10.02.2022,

TO
The Manager,
SashakT HR Services Pvt Ltd,
Hyderabad.

Sub: Submission of detailed proposal of Detection of suicide related posts in twitter data stream.

Respected Sir,

With reference to letter received from your end regarding **Unveiling In-app ads and Uncovering covert attacks via mobile app-web inter.** We are happy to submit detailed proposal along with the milestones of Design and hardware Control of Detection of suicide related posts in twitter data stream. We request you to discuss with your internal R&D team and communicate for further discussion.

Thank you and looking forward for your collaboration.

Principle Investigator

PRINCIPAL
Avanthi Institute of Engg. & Tech
Gunthapally (V), Abdullapurmet (Mdl), R.R. Dist.

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Section A: General Information:

Project Title	**Unveiling In-app ads and Uncovering covert attacks via mobile app-web inter**
Project Type Research Design &Control of Floor Cleaning Robot Research Other	Unveiling In-app ads and Uncovering covert attacks via mobile app-web inter
Project Location/s (District State)(Must be in India)	Avanthi Institute of Engineering and Technology, Gunthapally, Hyderabad
Stage of development (initial concept proof of demonstration/scale up)	Proof of Concept - Demonstration
Lead Implementing Organization	Avanthi Institute of Engineering and Technology, Gunthapally, Hyderabad
Any Partnering: Organization: In INDIA	NO
(1) Total Funding Request(INR In lakh)	75,000 Rs/-
(II) Contribution in Cash/kind from lead/partnering institution if any	NO
Total cost (I+II)=	75,000 Rs/-

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Section B: Project Information: Report submitted

Project Description:

Mobile users are increasingly becoming targets of malware infections and scams. In order to curb such attacks it is important to know how these attacks originate. We take a previously unexplored step in this direction. Numerous in-app advertisements work at this interface: when the user taps on the advertisement, she is led to a web page which may further redirect until the user reaches the final destination. Even though the original applications may not be malicious, the Web destinations that the user visits could play an important role in propagating attacks. We develop a systematic static analysis methodology to find ad libraries embed in applications and dynamic analysis methodology consisting of three components related to triggering web links, detecting malware and scam campaigns, and determining the provenance of such campaigns reaching the user. Our static analysis system identified 242 different ad libraries and dynamic analysis system was deployed for a two-month period and analyzed over 600,000 applications while triggering a total of about 1.5 million links in applications to the Web. We gain a general understanding of attacks through the app-web interface and make several interesting findings including a rogue antivirus scam, free iPad scams, and advertisements propagating SMS trojans.

INTRODUCTION

Android is the predominant mobile operating system with about 80% worldwide market share [1]. At the same time, Android also tops among mobile operating system in terms of malware infections [2]. Part of the reason for this is the open nature of the Android ecosystem, which permits users to install applications for unverified sources. This means that users can install applications from third-party app stores that go through no manual review or integrity violation. This leads to easy propagation of malware. In addition, industry researchers are reporting [3] that some scams which traditionally target desktop users, such as ransomware and phishing, are also gaining ground on mobile devices. In order to curb Android malware and scams, it is important to understand how attackers reach users. While a significant amount of research effort has been spent analyzing the malicious applications themselves, an important, yet unexplored vector of malware propagation is benign, legitimate applications that lead users to websites hosting malicious applications. We call this the app-web interface. In some cases this occurs through web links embedded directly in applications, but in other cases the malicious links arevisited via the landing pages of advertisements coming from ad networks.

A solution directed towards analyzing and understanding this malware propagation vector will have three components: triggering (or exploring) the application UI and following any reachable web links; detection of malicious content; and collecting provenance information, i.e., how malicious content was reached. There has been some related research in the context of Web to study so-called malvertising or malicious advertising [4], [5]. The context of the problem here is broader and the problem itself requires different solutions to triggering and detection to deal with aspects specific to mobile platforms (such as complicated UI and trojans being the primary kinds of malware).

In order to better analyze and understand attacks through app-web interfaces, we have developed an analysis framework to explore web links reachable from an application and detect any malicious activity. We dynamically analyze applications by exercising their UI automatically and visiting and recording any web links that are triggered. We have used this framework to analyze 600,000 applications, gathering about 1.5 million URLs, which we then further analyzed using established URL blacklists and anti-virus systems to identify malicious websites and applications that are downloadable from such websites. We need to mention that we could not trigger ads or links in about 5/6th of the applications. Note that many applications do not have any ad libraries (we can statically check for this) but still have to be run as there may be other kinds of links present. To give an example, for a run of 200K applications in China, we obtained 400K chains with 770K URLs. However, there are only 30K unique applications and 180K unique URLs. The other applications either do not have any ads or links or, in some cases, we may not have been able to trigger thoseads or links. Our methodology enables us to explore the Web that is reachable from within mobile applications, something that is not possible for traditional search engines and website blacklist systems such as Google Safebrowsing. We are not aware of any previous work that enables this.

We make the following contributions.

• We have developed a framework for analyzing the app-web interfaces in Android applications. We identify three features for a successful methodology: triggering of the app-web interfaces, detection of malicious content, and provenance to identify the responsible parties. We incorporate appropriate solutions for the above features and have implemented a robust system to automatically analyze app-web interfaces. The system is capable of continuous operation with little human intervention.

• As part of our triggering app-web interfaces, we developed a novel technique to interact with UI widgets whose internals do not appear in the GUI hierarchy. We develop a computer graphics-based algorithm to find clickable elements inside such widgets.

• We deployed our system for a period of two months in two locations, one in North America and another in China. We studied over 600,000 applications from Google Play and four Chinese stores for a period of two months and identified hundreds of malicious files and other scam campaigns. We present a number of interesting findings and case studies in an attempt to characterize the malware and scam landscape that can be found at the app-web interface. As some examples, we have found rogue ad networks propagating rogue applications; scams enticing users by claiming to give away free products propagating through both in-app advertisements and links embedded in applications; and dangerous SMS trojans propagating through wellknown ad networks.

• In order to assist with determining the provenance of the identified malicious links, we conducted a systematic study to associate ad networks with ad library packages in existing applications. We apply the MinHash [6] and LSH [7] teechniques to greatly improve the efficiency. The system is also incremental, allowing new apps to be analyzed on demand. Our study reveals 242 ad networks and their associated ad library packages. To the best of our knowledge, this is the largest number of ad libraries identified. We also analyze the popularity of the applications to help us understand the distribution of ad libraries in the markets. The manuscript extends our conference version [8] in the following important ways: (a)We apply the MinHash [6] and LSH [7] techniques to greatly improve the efficiency of finding ad libraries system. This demonstrates the scalability of the approach, even when applied to a large number of applications. We found 40 new ad libraries in 300,000 applications. The system is also incremental, allowing new apps to be analyzed on demand(Section 3). (b)We add the popularity part to help us know about the ad libraries distribution of markets.

In our findings, we have detected both applications embedding links leading to malicious content as well as advertisements that are malicious. We note that the two cases are different in terms of which party is to blame: the application developer, or others like the advertisement networks. Our results indicate that in both cases, the users can be offered better protection on the Android ecosystem by screening out offending applications that embed links leading to malicious content as well as making ad networks more accountable for their ad content.The rest of this paper is organized as follows. Section 2 presents the necessary

background. Our methodology is presented in Section 4 while Section 5 discusses implementation details. Section 6 and 6.6 presents our results and some interesting findings characterizing the studied malware and scam landscape. Related work is presented in Section 7. Finally, we conclude in Section 8.

BACKGROUND

In this section we provide the necessary context in which our system and study fits as well as some details which led to important decisions in our methodology.

Android Ecosystem

Android is a dominant mobile operating system. The core operating system is developed primarily by Google and is used by many device vendors as the platform for their devices. Apart from system applications, Android also allows running third-party applications, which serve to enrich the functionality of user's devices. Application stores serve as the primary venue for the users to find and install applications. Google maintains the official Android application store, called Google Play. However, there also exist other application stores. In some countries, such as China, Google services are not as popular and so the unofficial stores serve as the primary method of application distribution. Most devices and vendors allow application installation from unofficial sources, including third-party application stores and web links. Apart from the discovery mechanisms built into the application stores, users may also discover applications through advertisements in other applications. These advertisements may be served through ad networks or may be directly embedded by the application developers without the involvement of intermediary ad networks. Furthermore, in some cases applications may include direct web links (i.e., not affiliated with any application store).

Advertising

In-app advertisements are a significant source of revenue for application developers, and as such form a significant portion of app-web interaction on mobile devices. As an ad-supported application runs, it shows advertisements from various ad networks. Advertisements take a variety of forms ranging from banners at top or bottom area of the screen, whole-screen interstitials during switching of activities (roughly equivalent to windows) in the application, and as system notifications.

In the context of mobile advertising, the advertisers are parties who wish to advertise their products, the publishers are mobile applications (or their developers) that bring

advertisements to the users. Ad networks or aggregators link the publishers to the advertisers, being paid by the latter and paying the former. Ad networks themselves may have complex relationships with each other; Applications with advertisements em bed some code from ad networks. This code provides the glue between the ad network and the publisher. It is responsible for managing and serving advertisements and is called ad library. Each ad library may be attributed to an ad network. Clicking on advertisements may lead users to content on Google Play or to web links. This often happens through a chain of several web page redirections. We generally refer to all these URLs in these web page redirections as the redirection chain and the final web page as the landing page. Ad networks themselves may participate in complex relationships with each other. Certain parties, which may be ad networks themselves, run so-called ad exchanges where a given ad space is auctioned among several bidding ad networks so as to maximize profits for the publishers. Ad networks also have syndication relationships with each other: an ad network assigned to fill a given ad space may delegate that space to another network. Such delegation can happen multiple times through a chain of ad networks and is visible in the redirection chains. Applications with advertisements embed some code from ad networks. This code provides the glue between the ad network and the publisher. It is responsible for managing and serving advertisements and is called ad library.

Android Malware

Among the mobile operating systems, Android is particularly troubled by malware. Part of the reason for this is the openness in the ecosystem: applications can be downloaded from the Web and through unofficial application stores. The stores may be checking for malware with varying strictness while for Web links, there may be very little the user can do to know whether the downloaded applications are trusted. It is also noteworthy that most Android malware comes as trojans, i.e., applications that have a purported useful function as well as a hidden malicious function. Android implements a sandboxed application model, so that the compromise of one application does not directly mean compromise of the whole system. In the context of the Web and browsers, this means that drive-by-download attacks are difficult. Therefore, malware infections on Android happen not through drive-by-download attacks, which are fairly common on some other operating systems, but through trojans. In our methodology, therefore, we do not attempt to detect drive-by-download attacks but rather

scams that may entice users into downloading trojans or applications that charge users exorbitant amount of money.

AD NETWORK IDENTIFICATION

Applications that monetize with advertisements partner with ad networks and embed code called ad libraries from them to display and manage those advertisements. Our goal inthis section is to comprehensively identify ad networks that participate in the Android ecosystem. Some simple domain knowledge, such as which ad networks are in the market, may not provide a comprehensive list. We instead resorted to a systematic approach to do this by analyzing ad libraries found in a large number of actual Android applications. Our approach allows for comprehensive identification of ad libraries with very little manual effort. We begin by analyzing relationships among different entities in the application to identify independent code components, some of which could be ad libraries. We then map these components to robust feature sets derived from Android SDK APIs and then, based on these feature sets, cluster these components. The components can then be manually studied with little effort to identify if they correspond to some ad networks. In the following, we describe our approach in greater detail.

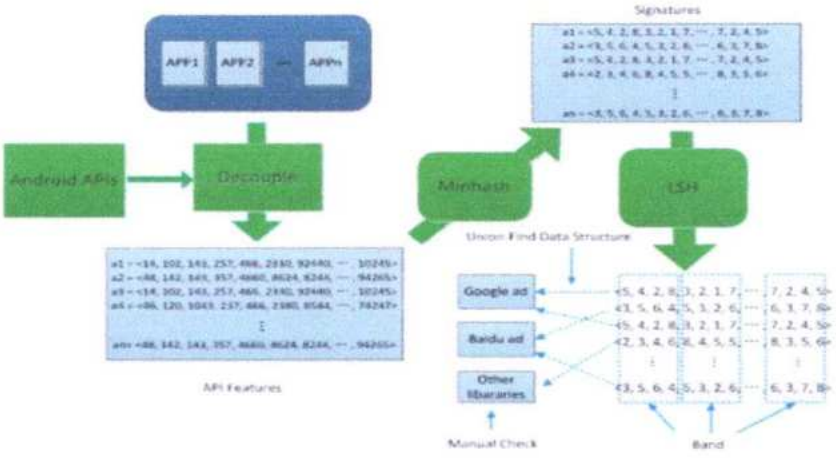
Component Decoupling

In general, the main application functionality is only loosely coupled with the functionality of ad libraries. The entire logic of fetching and displaying ads is implemented in the ad libraries while the other parts of the application may only occasionally make calls into the ad library code. Intuitively, in the application call graph and def-use graph, we would therefore see a densely connected region corresponding to the ad library which is only loosely connected to the other components of the application. Our goal here is to separate out these loosely connected components. Specifically, in order to decouple components, we implement the technique described by Zhou et al. [9]. They measure coupling in terms of of characteristics such as field references, method references, and class inheritances across classes. We build a dependency graph among Java classes: two classes are connected by an edge if code in one of them refers to that in the other through field references, method references, and class inheritances. Edges have weights and multiple edges between two vertices are collapsed and replaced by a single edge with the total of the weights of those edges. How closely a class is connected to another class is quantified by the total weight on the edges between the vertices.

Having built such a graph, we iteratively collapse any vertices that are connected by an edge whose weight exceeds a threshold. The final result is a reduced graph whose vertex set is the desired loosely coupled components. Each component contains a group of classes, which are usually succinctly identifiable with a few packages (Java packages are hierarchical namespaces in which class definitions are organized). Such succinct identifiers are useful when performing manual analysis later. Ideally, all the packages of one ad library will be grouped into one component while the non-related packages will be placed in other components. However, the errors are tolerable and can be manually analyzed.

Clustering Components

Once we have identified components in applications, we can make clusters of similar components over our entire application set. Ad libraries tend to be used by manyapplications at once and thus bigger clusters are more likely to correspond to ad libraries that smaller clusters. Our clustering should be robust against minor differences in code of components as well as renaming of classes and packages. This would, for example, enable us to cluster different ad library versions together. To do this, we first map our components to the Android APIs that the code in these components call. These APIs thus form our feature sets. Note that such features are representative of the functionality of the code: Different pieces of code performing similar functions are likely to call the same Android APIs.



Manual analysis

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Recall that ad libraries are embedded in multiple applications. Once separated into components by decoupling, the components belonging to the same ad libraries will likely be clustered together. We examine manually whether a cluster represents an ad library and if so, which one. Since ad libraries appear in a number of applications, we examine clusters with a size above a threshold, which we choose tobe 10. This screens numerous clusters that may represent application-specific code. Next, we choose the most common package names in a cluster and check if they belong to an ad library – this can be done by search for those package names on the Web.

Incremental analysis

Our technique easily supports incremental analysis to identify new ad libraries in newly published applications. To accomplish this, we provide two features. First, we can persist the clusters and features on storage and instantiate our runtime data structures, e.g., union-find, from these clusters. Handling new applications is simply a matter of decoupling components in them, creating clusters for them, and merging them with the previous clusters. Second, to aid manual analysis, we save a list of package names that we had confirmed earlier to be or to not be ad libraries. This saves redundant effort in examining package names.

Complexity comparison

Suppose that we get N modules and need to cluster them next. In the previous algorithm, we calculate the Jaccard coefficient between modules and cluster the modules based on the the value. The complexity is O(x 2). When applying MinHash and LSH, as described in 3.2. We consider the time of getting hash value is a constant because the input value of hash function is less than the number of Android SDK APIs. So the complexity of getting signatures of API feature is O(N). For the LSH part, the complexity is O(N) because the length of the signature is q = 80 and q = b * r. (b and r refers to the number of bands and the number of elements for each band). We also validated the reduction in time complexity empirically. The previous algorithm took about three days to cluster 10K applications modules, with quadratic increase in complexity. However, it took only about 15 hours to cluster 300K applications modules when using MinHash and LSH. Our new algorithm is obviously more efficient.

STUDYING MALVERTISING

Our methodology for analyzing app-web interfaces will involve the following three conceptual components:

• Triggering. This involves interacting with the application to launch web links, which may be statically embedded in the application code or may be dynamically generated (such as those in the case of advertisements).

• Detection. This includes the various processes to discriminate between malicious and benign activities that may occur as a result of triggering.

• Provenance. This is about understanding the cause or origin of a detected malicious activity, and attributing events to specific entities or parties. Once a malicious activity is detected, this component provides the information required in order to hold the responsible parties accountable.

Different processes and techniques may be plugged-in to these different components almost independently of what goes into the other components.The rest of this section elaborates on these three components, describing the various processes we incorporate into each of them. An overall schematic depiction of all the involved processes is presented in Figure 2.

Triggering App-Web interfaces

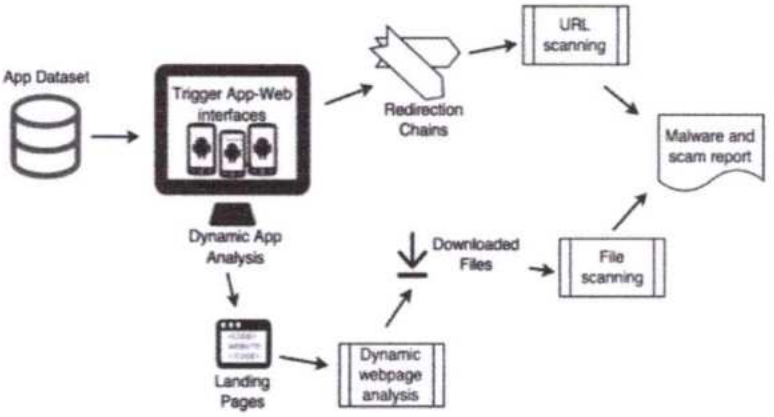
In order to trigger web links from within the application, we run the applications in a custom dynamic analysis environment. To enable scalability and continuous operation, running applications on real devices is not a feasible option. We deployed our system using multiple AVDs (20 in our test) in parallel for large-scale testing. If we use multiple real phones to run apps, it will increase the costs. Besides, with an application installed on a real phone, it may affect the results of other applications in spite of uninstalling it before installing another application. If we use emulators, we can kill the previous emulator and start a clean emulator to for a new application. Our system can easily support real phones for analyzing apps although we dont choose it. Therefore, each application is run in a virtual machine based on the Android emulator. The applications we are interested in are primarily GUI oriented and therefore we need to navigate through the GUI automatically to trigger app-web interfaces. The rest of this subsection describes the techniques that we leverage from past research in order to accomplish this, as well as some new techniques designed to overcome issues specific to the app-web interface.

Application UI Exploration

Application user interface (UI) exploration is necessary to trigger app-web interfaces. Researchers have come up with a number of systems for effective UI exploration catering to varied applications and incorporating different techniques (Section 7). An effective UI explorer will offer high coverage (of the UI, which may also translates to code coverage) while avoiding redundant exploration. For our work, we used the heuristics and algorithms developed in AppsPlayground [10]. We briefly describe these next. UI exploration generally involves extracting features (the widget hierarchy) from the displayed UI and iteratively constructing a model or a state machine of the application's UI organization, i.e., how different windows and widgets are connected together. A black-box (or grey-box) technique, such as AppsPlayground, may apply heuristics to identify which windows and widgets are identical to prevent redundant exploration of these elements. Window equivalence is determined by the activity class name (an activity is a code-level artifact in Android that describes one screen or window). Widget equivalence is determined by various features such as any associated text, the position of the widget on the screen, and the position in the UI hierarchy. In order to prevent long, redundant exploration, thresholds are used to prune the model search.

Handling Webviews

While studying advertisements, we faced a significant challenge: most of the in-app advertisements are implemented as customizations of Webviews (these are special widgets that render Web content, i.e., HTML, JavaScript, and CSS). Webviews and some custom widgets are opaque in the UIhierarchy obtained from the system, i.e., the UI rendered inside them cannot be observed in the native UI hierarchy and thus interaction with them will be limited. To the best of our knowledge, previous research has not proposed a satisfactory solution to this problem.



Detection

As the links are triggered, they may be saved for further analysis and detection of malicious activity such as spreading malware or scam. We would like to capture the links, their redirection chains, and their landing pages. The links, redirection chains, and the content of the landing pages may then be further analyzed using various methods.

Redirection chains

Advertisements redirect from one link to another until they finally arrive at the landing page. As discussed earlier, the redirection may be a result of ad syndication and auction or may even be performed within an ad network itself or by the advertisers themselves. An example redirection chain of length five is shown in Figure 3. Redirection chains may also be observed in non-ad links. Redirection may be performed using several techniques, including HTTP 301/302 status headers, HTML meta tags, and at the JavaScript level. Furthermore, we found that certain ad networks such as Google ads use time-based checks (preventing following the chain too quickly) in order to reduce possibility of click fraud. The result of this is that the links must be launched in real-time to obtain redirection messages.

Landing pages

Landing pages, or the final URLs in redirection chains, in Android may contain links that may lead to application downloads. Malicious landing pages may lure the users into downloading trojan applications. We load the landing pages in a browser configured with a

realistic user agent and window size corresponding to a mobile device, so that the browser appears to be the Chrome browser on Android. We then collect all links from the landing page and click each to see if any files are downloaded. Simulating clicks on pages loaded in a browser ensures that links are found and clicked properly in the presence of Javascript-based events. The downloaded files are analyzed further as below.

File and URL scanning

The collected URLs and files may be analyzed in various ways for maliciousness. In this paper, rather than developing our own analysis, we used results from URL blacklists and antiviruses from VirusTotal. VirusTotal aggregates results from over 50 blacklists and a similar number of antiviruses. Each URL collected, either the landing page or any other URL involved in the redirection chain, is scanned through URL blacklists provided by VirusTotal. This includes blacklists such as Google Safebrowsing, Websense Threatseeker, PhishTank, and others. Files that are collected as a result of downloads from the landing pages are scanned through the antiviruses provided on VirusTotal.

IMPLEMENTATION

We implemented most of our system in Python. For UI exploration, we make use of the source code of the AppsPlayground tool [12]. However, the existing version of the tool is unable to run on current versions of Android, and we therefore reimplemented the system to work on current Android versions with the same heuristics as are described in the AppsPlayground paper. Furthermore, instead of using HiearchyViewer for getting the current UI hierarchy of the application, we used UIAutomator, which is based on the accessibility service of Android. This had a significant and positive effect on the speed of execution. The graphics algorithms used for button detection were provided by the OpenCV library and appropriate thresholds were chosen after repeated testing. To improve speed of dynamic analysis, we take advantage of KVM-accelerated virtualization. To use this, we use Android images that can run on the x86 architecture. About 70% Android applications have no native code and so can run without problem on such targets. Other applications contain ARM native code and cannot run on x86 architecture without proprietary library support. We therefore excluded applications containing native code. Despite this we still believe the study results are generally representative.

Section C: Financial requirement (all figure must be INR)

S. No	Item Head	Total (in Lakh)
Capital Component		
1	Permanent Equipment (Located in lab/implementing organization) as per billing	30,000/-
2	Fabricated systems/demonstration models (located at beneficiary location)	25,000/-
A	Subtotal (Capital Items)	55,000/-
General Component		
1	Manpower and Contingencies	10,000/-
2	Consumables	5,000/-
3	Travel	3,000/-
4	Overhead	--------
5	PC	---------
6	Printer and Scanner	2,000/-
B	Subtotal (General)	20,000/-
C	**Total cost of the project (A+B)**	75000/-

I. **Project Cost:75,000/-**
II. **Contribution of consortium (if any):**
III. **Total Budget (I+II):75,000/-**

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Section D: Applicant Details

Name of the Lead Organization	Avanthi Institute of Engineering and Technology	
Address, Please include phone numbers, fax, emails and website	Gunthapally (V), Abdullapurmet(M), RR Dist, Near Ramoji Film City, Hyderabad -501512. email: principal.avanthi@gmail.com Ph No:9849714307 www.aietg.ac.in	
Applicant Type Broad: Government/Non-Government Sub entity: Academic or research institution	ACADEMIC INSTITUTION	
Primary Point of Contact Lead Principal investigator (PI)	Name:	Dr.Shaik Shakeer basha
	Designation	Associate Professor
	Email	csehod.avih@gmail.com
	Telephone	9868458787
	Mobile	7337145469
Secondary Point of Contact	Name:	Dr RamaChandra Reddy
	Designation	Associate Professor
	Email	principal.avanthi@gmail.com
	Telephone	9849714307
	Mobile	9849714234

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Information on Lead PI	Expertise available with the Principal Investigator
	Dr. Shaik Shakeer basha, Associate Professor Dept. Of Computer Science Engineering, he would mentor the proposed research project from time to time. The Principal Investigator has gained good knowledge on Robotic Controllers design and its related areas. 1.Guided four M.Tech project students based on his research area. Guided Five B. Tech project students out of his research area. 2) During his research, PI has acquired knowledge of many simulations software& used them for the above said project works. The tools learned by PI are as follows: The Aurdino, ultrasonic modules, Word Processing: MS Office

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1.Annexure 1:Monitoring & Evaluation approach

Time Schedule of Activities Giving milestones through BAR Diagram					
S.No	**WORKPLAN**	**1ST Month**	**2nd Month**	**3rd Month**	**4th Month**
1	Basic Study of the literature related for the project implementation consolidation of the available expertise. Planning of execution of the proposed project scheme				
2	Procurement of experimental equipment and installation				
3	Design of basic simulation of the project and control strategy using Arduino, Ultrasonic modules, motor drives				
4	Implementation of research project and operational control of the test facility using Arduino, Ultrasonic modules, motor drives				
5	Annual review of the progress of the project and effective guidance for implementation				
6	Commissioning of the project hardware				
7	Testing of the project and code				
8	Experimental validation of the project				
9	Report Writing				

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Avanthi Institute of Engineering and Technology, Gunthapally, Hyderabad

S No	Infrastructure Facility	Yes/No/Not required/Full or Sharing Bases
1	Workshop Facility	Yes
2	Water & Electricity	Yes
3	Laboratory Space/Furniture	Yes
4	Power Generator	Yes
5	AC Room or AC	Yes
6	Telecommunication including e-mail &fax	Yes
7	Transportation	Yes
8	Administrative/ Secretarial support	Yes
9	Information facilities like Internet Library	Yes
10	Computational facilities	Yes
11	Animal/Glass House	Not required
12	Any other special facility being provided	Dedicated Control systems Lab

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AVANTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Approved by AICTE, Recg. By Govt. of T.S & Affiliated to JNTUH, Hyderabad)
NAAC "B++" Accredited Institute
Gunthapally (V), Abdullapurmet(M), RR Dist, Near Ramoji Film City, Hyderabad -501512.
www.aietg.ac.in email: principal.avanthi@gmail.com

AVIH/2022/R&DPROJECT

Dt: 14.02.2022,

TO

The Manager,

SashakT HR Services Pvt Ltd,

Hyderabad.

Sub: Details of Project Unveiling In-app ads and Uncovering covert attacks via mobile app-web inter.

Respected Sir,

We are pleased to appoint faculty for coordination of Detection of suicide related posts in twitter data stream. We are happy to submit detailed proposal along with the milestones of Arduino & Ultra sonic modules Automation Design and Prototype.

Details of the Faculty:

Dr. Shaik Shakeer basha, Associate Professor

Department of CSE

Phone Number: 8968754896

Thank you and looking forward for your collaboration.

Principle Investigator

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SashakT
HR Services Pvt Ltd
HR Skilling Consulting

Date: 16.02.2022,

To,
The Principal,
Avanthi Institute of Engineering and Technology,
Gunthapally, Hyderabad.

Subject: Floor Cleaning Robot

We request you to periodically submit progress reports regarding the project. After discussion with our committee members the budget is finalized for the mentioned project proposal in attached. As per your communication the concerned faculty members are Principal Investigator Dr. Shaik Shakeer basha , Associate Professor& Department of CSE, AVIH, and Hyderabad. In this regard, we extend our facilities as well as sponsorship of Rs.75,000/-(Seventy Fifty Thousand Rupees only).

Details of the Engineer: Mr G.Sravan kumar

Phone Number: 8769685452
Thank you and looking forward for your response.
Regards
Ravi
Managing Partner
SashakT HR Services Pvt Ltd

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SashakT
HR Services Pvt Ltd

WORK ORDER

Date: 17/02/2022,

HYDERABAD,

To
The Principal,
Avanthi Institute of Engineering& Technology,
Gunthapally, Abdullapurmet Mandal, Hyderabad.

Sub: Unveiling In-app ads and Uncovering covert attacks via mobile app-web inter

Further to your of for preparing Detection of Unveiling In-app ads and Uncovering covert attacks via mobile app-web inter as per the Telephone Discussion quotation, we are pleased to place the work order as below.

S.NO	Description	Total Cost in Rs.
1	Unveiling In-app ads and Uncovering covert attacks via mobile app-web inter	75,000

Work Oder Valid: One Year (17th February 2022 to 16th February 2023)

Terms& Conditions:

- Preparation of detailed drawings/Lay outs based on the reference design provided by the customer.
- Taking physical design for review and approval of our customer
- Submission of designs/lay outs for review and approval of our customer
- Incorporate any comments/feed back given by customer in the design/layouts
- Preparation of designs, lay outs, algorithms, part design, bill of materials for all designs.
- Preparation of built up designs, lay outs after completion of fabrication/Installation at site.

For SashakT HR Services Pvt Ltd,

MANAGER

PRINCIPAL
Avanthi Institute of Engg. & Tech
Gunthapally (V), Abdullapurmet (Mdl), R.R. Dist.

AVANTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Approved by AICTE, Recg. By Govt. of T.S & Affiliated to JNTUH, Hyderabad)
NAAC "B++" Accredited Institute
Gunthapally (V), Abdullapurmet(M), RR Dist, Near Ramoji Film City, Hyderabad -501512.
www.aietg.ac.in email: principal.avanthi@gmail.com

UTILITY CERTIFICATE

We, the undersigned, Principal Investigator and Co-Investigators of the Al hased software development project being carried out at Avanthi Institute of Engineering and Technology Compatur Science Engineering Department, hereby certify that we have examined the financial details provided for the project follows:

S.no	Project Name	Project Cost
1	Automated irrigation system using a wireless sensor network & GPRS model	75,000/-

We assure you that the funds have been used diligently and in accordance with the guidelines provided by Fly Academy. Any remaining finds have been duly adjusted or will be returned as per the agreement.

Should you require any further supporting documentation or information, please do not hesitate to contact us. We appreciate your support and the opportunity to carry out this important project.

Thank you for your attention to this matter.

Principal

PRINCIPAL
Avanthi Institute of Engg. & Tech
Gunthapally (V), Abdullapurmet (Mdl), R.R. Dist.

AVANTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY
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Gunthapally (V), Abdullapurmet(M), RR Dist, Near Ramoji Film City, Hyderabad -501512.
www.aietg.ac.in email: principal.avanthi@gmail.com

Hyderabad,

Date: 22.07.2022,

From
The Principal,
Avanthi Institute of Engineering and Technology,
Hyderabad.

To
The Manager,
SHELLX Software solutions Pvt Ltd,
Hyderabad.

Respected Sir,

Sub: Project Completion-reg.

The project has been completed on a given time bond. It has been a great achievement by us to complete the prestigious project on time. It has been a great privilege, working in association with you and looking forward to working with you in future projects. We request you to please come along with your team for collecting, retrieving of important and confidential data.

Looking forward to a quick response from your side

Thanking you,

Principal

PRINCIPAL
Avanthi Institute of Engg. & Tech
Gunthapally (V), Abdullapurmet (Mdl), R.R. Dist.

MIND WAVE Informatics

Date: 04/01/2022,

To
The Principal,
Avanthi Institute of Engineering and Technology,
Gunthapally, Hyderabad.

Subject: Approval Letter for Financial Assistance for Project work entitled "Automated irrigation system using a wireless sensor network & GPRS model"

Dear Sir,

I'm Mr. Siva Bhaskaraiah, working as one of the Directors of MIND WAVE Informatics Ltd. which is located at 2nd Floor, SVR Towers, 8-2-1/A, Srinagar Colony Main Rd, , Venkateshwara Hills, Punjagutta, Hyderabad, Telangana, India.

Our nature of business is to design Humanoid Robots Manufacturing, Training & Development of 3DPrinting Technology, with experience in outcome based programmer's Workshops, Seminars, Guest Lectures, Virtual training for Government, Industries & Academic Institutions.

We are looking for team of professors at your college in Electronics and Communication Engineering who can work for our advance research project in developing critical software for Medical Robotics in processing of Contact less human health diagnostic system. If your college is interested to work in collaboration, we forward further documentation& NDA Le (Non Disclosure Agreement).

Looking forward to a meaningful collaboration with AVIH, Gunthapally

Thanks& Regards

MIND WAVE INFORMATICS HYDERABAD

PRINCIPAL
Avanthi Institute of Engg. & Tech
Gunthapally (V), Abdullapurmet (Mdl), R.R. Dist.

2nd Floor, SVR Towers, Opp. AXIS Bank, Srinagar Colony, Punjagutta, Hyderabad-16
Ph.No. 040-40041005 || Email: hr@mindwaveinformatics.com || www.mindwaveinformatics.com

AVANTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

(Approved by AICTE. Recg. By Govt. of T.S & Affiliated to JNTUH, Hyderabad)
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www.aietg.ac.in email: principal.avanthi@gmail.com

Dr.G. RamaChandra Reddy, M.Tech, Ph.D
Principal

AVIH/2022/R&DPROJECT Dt: 08.01.2022,

TO
The Manager,
MIND WAVE INFORMATICS,
Hyderabad.

Sub: Submission of detailed proposal of Automate d irrigation system using a wireless sensor network & GPRS model.

Respected Sir,

With reference to letter received from your end regarding Automated irrigation system using a wireless sensor network & GPRS model. We are happy to submit detailed proposal along with the milestones of Design and hardware Control of Automated irrigation system using a wireless sensor network & GPRS model. We request you to discuss with your internal R&D team and communicate for further discussion.

Thank you and looking forward for your collaboration.

Principle Investigator

PRINCIPAL
Avanthi Institute of Engg. & Tech
Gunthapally (V), Abdullapurmet (Mdl), R.R. Dist.

Section A: General Information:

Project Title	**Automated irrigation system using a wireless sensor network & GPRS model**
Project Type Research Design &Control of Floor Cleaning Robot Research Other	Automated irrigation system using a wireless sensor network & GPRS model
Project Location/s (District State)(Must be in India)	Avanthi Institute of Engineering and Technology, Gunthapally, Hyderabad
Stage of development (initial concept proof of demonstration/scale up)	Proof of Concept - Demonstration
Lead Implementing Organization	Avanthi Institute of Engineering and Technology, Gunthapally, Hyderabad
Any Partnering: Organization: In INDIA	NO
(1) Total Funding Request(INR In lakh)	75,000 Rs/-
(II) Contribution in Cash/kind from lead/partnering institution if any	NO
Total cost (I+II)=	75,000 Rs/-

PRINCIPAL
Avanthi Institute of Engg. & Tech
Gunthapally (V), Abdullapurmet (Mdl), R.R. Dist.

Section B: Project Information : Report submitted

Project Description:

Automated irrigation system using a wireless sensor network & GPRS model

Abstract—Nowadays, adopting an optimized irrigation system has become a necessity due to the lack of the world water resource. Moreover, many researchers have treated this issue to improve the irrigation system by coupling the novel technologies from the information and communication field with the agricultural practices. The Wireless Sensor and Actuators Networks (WSANs) present a great example of this fusion. In this paper, we present a model architecture for a drip irrigation system using the WSANs. Our model includes the soil moisture, temperature and pressure sensors to monitor the irrigation operations. Specifically, we take into account the case where a system malfunction occurs, as when the pipes burst or the emitters block. Also, we differentiate two main traffic levels for the information transmitted by the WSAN, and we use an adequate priority-based routing protocol to achieve high QoS performance. Simulations conducted over the NS-2 simulator show promising results in terms of delay and Packet Delivery Ratio (PDR), mainly for the priority traffic. Index Terms—WSANs, Drip irrigation, Priority-based Routing.

INTRODUCTION

During the last decade, the Precision Agriculture (PA) has emerged as novel trend to enhance the agricultural practices. The principal aim of the PA is to monitor the spatio-temporal characteristics of the agricultural parcel [1]. By this way, the crops yield can be optimized while the natural, financial and energetic resources can be preserved. However, since the monitored agricultural regions are generally scattered and suffer from a variable environmental condition, the need for accurate and real-time collected information is more pronounced. Also, the classical solution as the satellite imagery, aircraft or other systems based on the map cannot be supported by all farmers due to their heavy cost. To overcome this limitation, the Wireless sensor networks (WSNs) were introduced into the agricultural environment context [2]. Technically, the sensor nodes are deployed into the farmland. They start to collect environmental information and monitor soil characteristics. Then, they cooperate according to designed protocols to communicate the collected information to a central node. After that, this information is processed and treated to make an eventual decision. The WSN have been explored in different ways for the agriculture field. As example, in [3] the authors have used four nodes types: soil, environmental, water and

gateway to monitor the water content, temperature and soil salinity at farm located in Spain. Another work presented in [4] where authors have designed a node system for the collection of farmland information at different growth period of wheat, typically: seeding, jointing and heading. The study focuses in the optimal antenna height to use at the different growth period. Further examples presented in [5] and in [6] concern the greenhouse monitoring and the water saving irrigation using the WSN. The security aspect is another example of how can the WSN improve the agricultural yield. In fact, crops are negatively affected by human or animal intruders. Also, the production process is still insufficiently controlled which lead to a potential product loss. To overcome this point, the videosurveillance nodes can be used to detect and identify intruders as well as to better take care of the production process [7]. In addition, the video-surveillance system allows the farmers to protect their sensors and equipment being installed in the crops from theft or potential damage. One of the most important application of the WSNs in the PA is the irrigation system control. The interest comes naturally from saving water. For this aim, many researches were conducted to enhance the irrigation control system by coupling novel technologies with the agricultural practices. Among irrigation strategies, the drip irrigation system was considered as the most efficient policy to save water use. Moreover, combining this strategy with the WSNs leads us to have a great benefit from the farmlands. However, the irrigation system reliability need more attention, mainly in the case of general or partial dysfunction. For this aim, we present in this paper a model architecture for a drip irrigation system using the WSANs. Our model includes the soil moisture, temperature and pressure sensors to monitor the irrigation operations. Specially, we take into consideration the case when a system dysfunction occurs, as when the pipes are broken or the emitters are blocked. Also, we differentiate two main traffic levels for the information transmitted by the WSAN. Furthermore, based on our previous work [8], we can achieve a high QoS performance through an adequate priority-based routing protocol. The aim was to ensure an efficient and real-time communication between the different nodes type and the sink. The remainder of this paper is organized as follows: in section II, we review some related works designed for an efficient irrigation system. In section III, a description of our designed drip irrigation system is given. The priority-based protocol for DIS with simulation results are given in section IV. Finally, in section V, we draw the conclusion and give perspectives.

RELATED WORK

To the best of our knowledge, monitoring the dysfunction of the drip irrigation system using the WSNs with an adequate priority-based routing protocol was never suggested before in the specialized literature. Therefore, in this section we summarize some related works for the irrigation system control. In [9], authors propose an energy efficient method for the wireless sensor communication used in an automated irrigation system. This method is based on the Time Division Multiple Accesses (TDMA) scheduling that allows nodes to turn ON/OFF their radio according to scheduled slots. The main advantage of such scheme is saving the node's energy and reducing radio interference. Also, authors give a comparison between two methods to transmit the collected data to the sink node; namely the direct communication method and the data fusion method. For each method, the energy consumed and the data throughput are studied over the NS2 simulator. To optimize water use in agricultural context, authors propose in [10] an automated irrigation system based in the WSNs technology. The developed system is composed of two kinds of sensors to collect soil-moisture and temperature information. The sensors are placed in the root zone of the plants. Also, a gateway was used to gather sensor information, triggers actuators, and transmits data to a web application. To control the water quantity, authors had programmed into a microcontroller an algorithm with threshold values of temperature and soil moisture. Concerning the energy, photo-voltaic panels are used to power the system.

The entire system can be controlled through a web page which help to program an irrigation schedule and performs a data inspection In [11], authors present practical irrigation management system using a deployed WSN. This system includes a remote monitoring mechanism through a GPRS module to send SMS message containing land characteristic such as soil temperature and soil moisture, or the network performances such as packet delivery ratio, RSSI or the nodes energy level. The main contribution of this paper is to design and implement a lowcost efficient irrigation management system that combines sensors and actuators in a wireless sensor/actuator network. Authors conclude through this study that the deployment of the sensor nodes in the agricultural field is a critical issue. Furthermore, they suggest that the distance between sensor nodes has to be as short as possible in order to enhance the effectiveness of the system. However, the main weakness of this study is that authors employ only five sensors for the experiment. We conclude for all referred works, that authors don't take into consideration the case of irrigation system dysfunction. Also they don't use the pressure sensor to monitor the irrigation flow rate. In

addition, no priority-based protocol is designed to distinguish the importance of the communicated information. In the following section we present our proposed drip irrigation system that can overtake the dysfunction case.

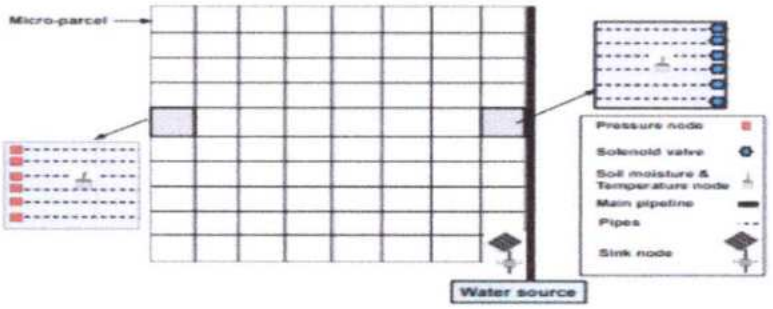

Fig. 1: Drip Irrigation System layout

PROPOSED DRIP IRRIGATION SYSTEM MODEL

Recent practices in precision agriculture include two main micro irrigation methods which promote interesting water efficiency. The first method is the drip irrigation. It allows water to be dripped to the plants roots through pipes containing several emitters. This irrigation system is composed of the following components: water source (generally is a tank) which is connected with a main tube called main pipeline. To this line, several pipes are connected using manual or electrical valves that control the water flow. The pipes go through the field and distribute water for each plant. The second method is the sprinkler irrigation which delivers water through a pressurized pipe network to the nozzles of sprinkler which spray the water into the air [12]. However, this method is less efficient than the drip one, since more water is losing due to evaporation and runoff. Therefore we choose the drip strategy for our design. Our proposed model is a closed-loop model. As defined in [13], a system can be categorized as a closed-loop model if the response of the system is monitored and used to adjust the control. We note also that our proposed model is designed for a site-specific irrigation where the crops are characterized by a spatio-temporal variation of the irrigation requirements. The variability comes from the soil type, crop type, crop and meteorological conditions [13].

The main purpose of our design is to handle the dysfunctional situation of the drip installation. As discussed in [7], the crops are negatively affected by human or animals intruders. This is more critical in the case of drip irrigation installation. In fact, the pipes can be broken by rangers or by accident which can cause water waste and plants damage. Also the pipe emitters can be blocked due to environmental condition (sludge, sand) which can cause plant stress. To overtake these shortcoming the water flow rate into the drip installation must be monitored.

For this aim, our proposed system include the following sensors and actuators:

Soil moisture sensor: It is used to optimize irrigation and to warn of plant stress by controlling some parameters such as the electrical conductivity of soil or the underground volumetric water content (VWC). Measuring the soil moisture can help the farmers to manage their irrigation systems more efficiently by using less water to grow a crop and increasing quality and yields.

Temperature sensor: It is used to monitor the ambient temperature. It can be analog or digital and help farmer to adjust their irrigation schedule according the temperature measured to avoid risk of evaporation.

Pressure sensor: It is used to measure a pressure of gases or liquids and change it into a quantity that can be processed electronically. It generates a signal as a function of the pressure imposed. In irrigation application, this kind of sensor helps to monitor the abnormal pressure of pipe installation. In such case, by means of communication module (Zigbee/802.15.4), a message can be transmitted to the corresponding solenoid valve or the master valve (which control the main pipe) to shut down the system. A very low pressure value can be synonymous of a broken pipe or failure to open valves. Having a high pressure value can indicate that a valve is not closed correctly or some emitters are blocked.

Solenoid valve: It is an electromechanical valve for use with liquid or gas controlled by running or stopping an electrical current through a solenoid, which is a coil of wire, thus changing the state of the valve [14]. Combined with a Zigbee module, the valve can be controlled trough wireless communication. Concerning the energy issue, the valve can have an external energy sources as solar panel

Sink node: It corresponds to the gateway of the system. All sensor nodes in the topology need to forward their gathered information to the sink node to be processed. Also, through this node, a request commands are generated to corresponding actuators or sensors.

Deployment strategy

Deploying the sensor nodes to monitor a farmland is crucial issue. In fact, many parameters must be considered to choose the most beneficial deployment, as the crops characteristics, the micro meteorological parameters, the sensors and nodes specification and obviously the farmer's budget. According to a generic guide proposed in [15] the coverage of the sensor nodes in agricultural WSN must be dense. By this way, all the required measurements can be gathered to have reliable knowledge of the monitored area. Authors in this guide argue that for a field with 100 m2 size, at least 80- 90 nodes are needed. They consider roughly 1 sensor node per 1 m2 . Of course, with such density we can reduce the sensors transmission power to the lowest level to save energy. In addition to have an adequate number of nodes, the topology formation must be determined. Among start, tree, or grid topology, the right choice depends to field's size and the plants formation. However, for middle or high surface, the grid topology remains the most suitable. Based on the above discussion, we choose the grid topology for our drip irrigation design. We divide the field area into several equal micro parcel as suggested in [16]. The size of the parcel must be a trade-off between monitoring quality required, the communication coverage and the deployment cost. In the middle of each parcel we fix a soil moisture and temperature node. We make the assumption that the soil moisture and the temperature remain the same inside the parcel.

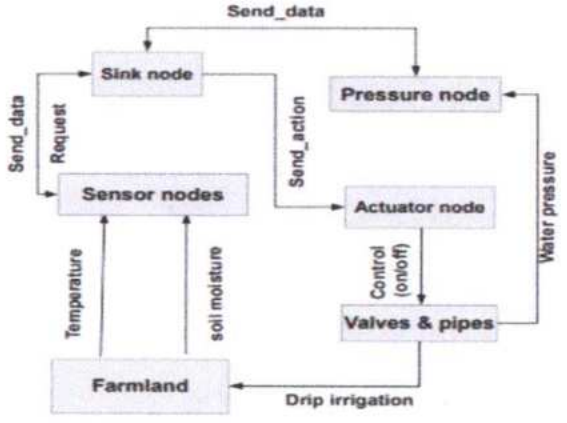

Fig. 2: Drip Irrigation System communication

In Fig. 2 we present a flowchart of the communication between all actors in the designed drip irrigation system. The sensor nodes gather the temperature and the soil moisture from the farmland periodically. According the value obtained, the sensor nodes decide to send the information to the sink or not. At the sink node, the abnormal information is processed and an eventual decision is taken to adjust the irrigation schedule according to the plant requirement. The same irrigation schedule is transmitted to the pressure nodes to be awakened at the same time of irrigation process. Once the actuators receive an action from the sink, they control their corresponding valves to be opened or closed. If the valves are opened, the water flow goes through the pipes and the pressure nodes start sensing. If any abnormal pressure value is gathered, an alert message is transmitted to the sink node to shut down the irrigation process and request an external human verification of the pipe installation. We make the assumption that the sensor nodes communicate only with the sink node through a multi-hop protocol. Also, the actuators receive only actions from the sink. We assume also that the sink node can request some information from the sensor nodes at any time.

Priority-based protocol

As discussed in section III, we have two main traffic type gathered from sensors. The first one related to information gathered from temperature and the soil moisture sensors. We classify this traffic type as normal traffic since no need for an urgent intervention is required. The second traffic type is related to information gathered from pressure sensors. We classify this traffic type as priority traffic due to the need for an emergency resolution of the detected problem (shut off the main valve, require human intervention ... etc). Now, in the case when both traffics are active simultaneously, it is clear that the reliability and the timeliness of the priority traffic is more requested than those of the normal traffic.

However, in the wireless context, there are many troubles that can occur due to the sharing of the same communication medium. Among these problems we cite the interference problem, the exposed and the hidden problem [17]. Another problem that must be considered is the effect of the carrier sense range on communication performances. As discussed in our previous work [8], the carrier sense range is usually more larger than the transmission and the interference range. So carefully routing process must be applied to avoid any trouble between multiple sources and to satisfy the requested QoS for each traffic.Let us take the example presented in Fig. 3. Two source nodes need to send their data to the sink. The first source node A sends a priority traffic and the source node B sends a normal traffic.

We make the assumption that only one path is constructed from each source node. The circle presented around each node represents the transmission range. We avoid adding the carrier sense range in the figure to not overload it. As shown in Fig. 3, the black path refers to the path constructed from the node A to the sink node. After that, the node B needs to find out a valid path to reach the sink. If the red path is chosen, then all the nodes from the black path and the red one will be in concurrence to access to the communication medium which will degrade the final performance. The green lines represent relation between these nodes. To avoid such situation, the node A must construct the blue path. Thus, even if the number of hops is higher the performances at the sink node are better. In what follow we will describe how the two paths can be constructed.

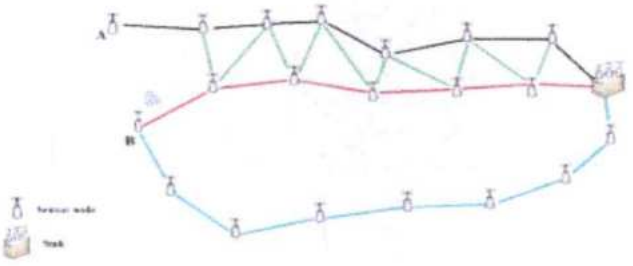

Fig. 3: Carrier sense effect in the case of multi-sources

Protocol description

Based on our previous work [8], we design a routing protocol that can allow the priority source node (namely the pressure node) to construct an efficient routing path while avoiding the carrier sense range effect. In this work we make the assumption that nodes are aware of their positions and the position of the sink node. In the following, we give a short description of how the paths are constructed according to our approach. When a priority source node seeks to communicate with the destination, it sets up a route discovery process by sending a priority forward agent (P-FAGT) to construct a short multihop path. The choice of the next hop node is based on the geographic information available at each node. For each selected node i, the node state is changed from free to busy, and a Hello message is broadcasted to all neighbors in the communication range to notify the new state of the node i. Every neighbor node j of the node i becomes a banish node, that means it cannot be selected for any communication. After that, each node j broadcasts in its turn a hello message in their

neighborhood. Now, if a normal source node needs to send some information, it constructs the routing path by sending a normal forward agent (N-FAGT) which must respect the following rules: the next hop must not be blocked, and must not be a banish node or having a banish node in its neighborhood. A node is in a blocked state when the destination is unreachable through this node. To avoid a blocking situation when a node cannot reach the destination, we use the same principle as in [18], called the step-back method. The same method is used by the agent when the selected next hop has a banish node in its neighborhood.

Once the destination is reached, the forward agent (either P-FAGT or N-FAGT) becomes a backward agent and an optimized reverse path is travelled. At each intermediate node, the agent records the valid next hop into the routing table, after that, it chooses from the reverse path the nearest neighbor to the current node. The same procedure is repeated until reaching the source node. In the case where the P-FAGT finds an already constructed path (used by a normal source), it follows this path and changes the state information of all nodes involved in it. After that, the normal source is informed by a special agent to start another discovery phase to take into consideration the current priority source communication. When the communication is ended, all the nodes altered by the communication process reset their state and become ready for further transmissions. In the remaining of this paper, we denote our approach by Carrier Sense Aware (CSA).

Simulation & result analysis

Working environment

Our simulation scenario is based on the topology presented in Fig.1. The topology area is 200*200 m2 , and the total number of nodes is 280 (including pressure, temperature/soil moisture and valve nodes). We make the assumption that the micro parcel size is 20 m2 . Two random source nodes (pressure and temperature/soil moisture) are selected and start transmission at different instance but in the same interval time. To distinguish the two traffic in the simulation in the NS2 simulator [19], we choose for the temperature/soil moisture source node a constant bit rate (CBR) traffic with X packets per second For the pressure source node, we choose an exponential traffic (Exp) with a data rate equals to 20 Kbytes. The duration of communication is 30 s, and no mobility is supported in this scenario. For every value of X, 20 scenarios are generated and the average value of results is computed. We present the results with a confidence interval of 95%. According to the characteristic of the

MicaZ node [20] and the two-ray-ground propagation model equation, we define the reception and the carrier sense threshold (RXThreshold and CSThreshold). Their respective value was 3.981∗10−13 Watt and 3.981∗10−14 Watt which represent nearly 20 m for the transmission range and 35 m for the carrier sense range. We compare our work with the Two Phase geographical Greedy Forwarding (TPGF) protocol [18] since it adopts also a geographical approach.

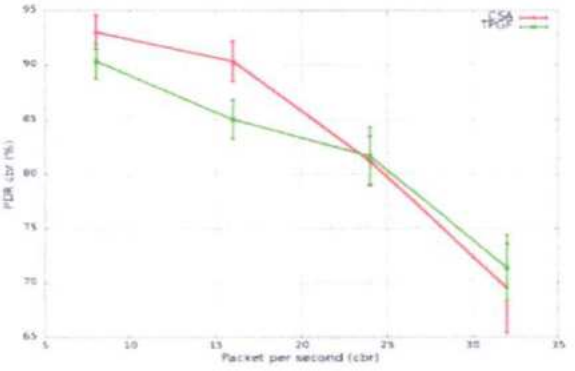

Fig. 4: Average PDR of normal traffic vs packet per second

CONCLUSION AND FUTURE WORK

In this paper, we have presented a model architecture for a drip irrigation system using the WSANs. Our model includes the soil moisture, temperature and pressure sensors to monitor the irrigation operations. Specially, we take into account the case where a system malfunction occurs, as when the pipes are broken or the emitters are blocked. Also, we differentiate two main traffic levels for the information transmitted by the WSAN, and based on our previous work, we achieve a high QoS performance through an adequate priority-based routing protocol. We have performed extensive simulations. The results prove that our solution gives better performances in terms of delay, PDR for the priority traffic. As a future work, we intend to realize a real test-bed to investigate the effectiveness of our approach.

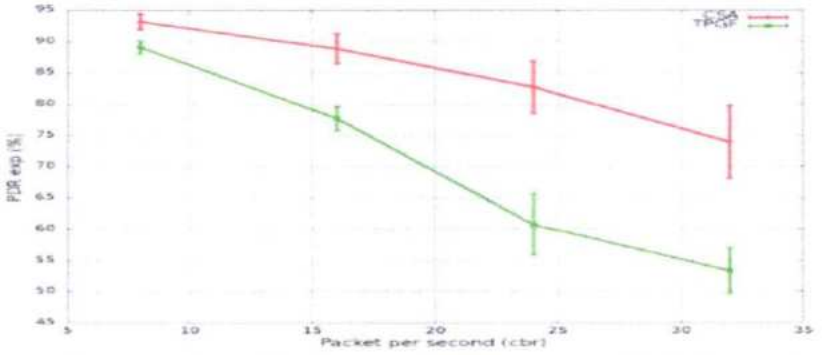

Fig. 5: Average PDR of priority traffic vs packet per second

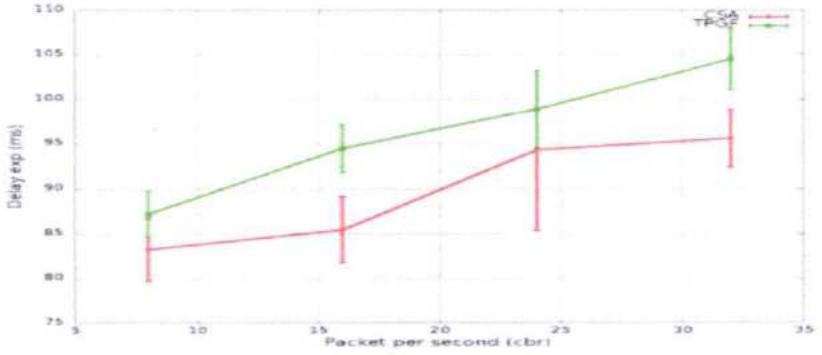

Fig. 6: Average delay of priority traffic vs packet per second

ACKNOWLEDGMENT

This work is partially supported by "Projet de cooperation ´ Maroco-Franc¸aise : Contribution a l'optimisation de la qualit ´ e´ de service dans les reseaux de capteurs sans fil: Application ´ a` la supervision agricole 2013-2014"

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[17] Lu Wang, Kaishun Wu, and M. Hamdi. Combating hidden and exposed terminal problems in wireless networks. Wireless Communications, IEEE Transactions on, 11(11):4204–4213, November 2012.

Section C: Financial requirement (all figure must be INR)

S. No	Item Head	Total (in Lakh)
Capital Component		
1	Permanent Equipment (Located in lab/implementing organization) as per billing	30,000/-
2	Fabricated systems/demonstration models (located at beneficiary location)	25,000/-
A	Subtotal (Capital Items)	55,000/-
General Component		
1	Manpower and Contingencies	10,000/-
2	Consumables	5,000/-
3	Travel	3,000/-
4	Overhead	--------
5	PC	---------
6	Printer and Scanner	2,000/-
B	Subtotal (General)	20,000/-
C	**Total cost of the project (A+B)**	75000/-

I. **Project Cost:75,000/-**
II. **Contribution of consortium (if any):**
III. **Total Budget (I+II):75,000/-**

PRINCIPAL
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Gunthapally (V), Abdullapurmet (Mdl), R.R. Dist.

Section D: Applicant Details

Name of the Lead Organization	Avanthi Institute of Engineering and Technology	
Address, Please include phone numbers, fax, emails and website	Gunthapally (V), Abdullapurmet(M), RR Dist, Near Ramoji Film City, Hyderabad -501512. email: principal.avanthi@gmail.com Ph No:9849714307 www.aietg.ac.in	
Applicant Type Broad: Government/Non-Government Sub entity: Academic or research institution	ACADEMIC INSTITUTION	
Primary Point of Contact Lead Principal investigator (PI)	Name:	Mr G.Srinivas
	Designation	Assistant Professor
	Email	Avanthiece2005@gmail.com
	Telephone	9492492031
	Mobile	7337038221
Secondary Point of Contact	Name:	Dr RamaChandra Reddy
	Designation	Associate Professor
	Email	principal.avanthi@gmail.com
	Telephone	9849714307
	Mobile	9849714234

Information on Lead PI	**Expertise available with the Principal Investigator**
	Mr G.Srinivas, Assistant Professor Dept. Of ECE, he would mentor the proposed research project from time to time. The Principal Investigator has gained good knowledge on Robotic Controllers design and its related areas. 1.Guided Two M. Tech project students based on his research area. Guided Five B. Tech project students out of his research area. 2) During his research, PI has acquired knowledge of to words GPRS model & used them for the above said project works. The tools learned by PI are as follows: The Arduino, ultrasonic modules, motor driver, and motors work on 5 volts Word Processing: MS Office

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1.Annexure 1:Monitoring & Evaluation approach

Time Schedule of Activities Giving milestones through BAR Diagram					
S.No	**WORKPLAN**	**1ST Month**	**2nd Month**	**3rd Month**	**4th Month**
1	Basic Study of the literature related for the project implementation consolidation of the available expertise. Planning of execution of the proposed project scheme				
2	Procurement of experimental equipment and installation				
3	Design of basic simulation of the project and control strategy using Arduino, Ultrasonic modules, motor drives				
4	Implementation of research project and operational control of the test facility using Arduino, Ultrasonic modules, motor drives				
5	Annual review of the progress of the project and effective guidance for implementation				
6	Commissioning of the project hardware				
7	Testing of the project and code				
8	Experimental validation of the project				
9	Report Writing				

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Avanthi Institute of Engineering and Technology, Gunthapally, Hyderabad

S No	Infrastructure Facility	Yes/No/Not required/Full or Sharing Bases
1	Workshop Facility	Yes
2	Water & Electricity	Yes
3	Laboratory Space/Furniture	Yes
4	Power Generator	Yes
5	AC Room or AC	Yes
6	Telecommunication including e-mail &fax	Yes
7	Transportation	Yes
8	Administrative/ Secretarial support	Yes
9	Information facilities like Internet Library	Yes
10	Computational facilities	Yes
11	Animal/Glass House	Not required
12	Any other special facility being provided	R&d Lab

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Gunthapally (V), Abdullapurmet(M), RR Dist, Near Ramoji Film City, Hyderabad -501512.
www.aietg.ac.in email: principal.avanthi@gmail.com

AVIH/2022/R&D PROJECT Dt:10 .01.2022,

TO
The Manager,
MIND WAVE INFORMATICS,
Hyderabad.

Sub: Details of Project Automated irrigation system using a wireless sensor network & GPRS model.

Respected Sir,

We are pleased to appoint faculty for coordination of automated irrigation system using a wireless sensor network & GPRS model. We are happy to submit detailed proposal along with the milestones of Arduino& Ultra sonic modules Automation Design and Prototype.

Details of the Faculty:

Mr G .Srinivas, Assistant Professor
Department of ECE
Phone Number: 9492492031

Thank you and looking forward for your collaboration.

Principle Investigator

PRINCIPAL
Avanthi Institute of Engg. & Tech
Gunthapally (V), Abdullapurmet (Mdl), R.R. Dist.

MIND WAVE
Informatics

Date: 21.12.2022,

To,
The Principal,
Avanthi Institute of Engineering and Technology,
Gunthapally, Hyderabad.

Subject: Automated irrigation system using a wireless sensor network & GPRS model

We request you to periodically submit progress reports regarding the project. After discussion with our committee members the budget is finalized for the mentioned project proposal in attached. As per your communication the concerned faculty members are Principal Investigator Mr. G Srinivas, Assistant Professor and Department of ECE, AVIH, and Hyderabad. In this regard, we extend our facilities as well as sponsorship of Rs.75,000/-(Seventy Fifty Thousand Rupees only).

Details of the Engineer: Mr. Amaranth

Phone Number: 9505379414
Thank you and looking forward for your response.
Regards
Ravi
Managing Partner
MIND WAVE INFORMATICS

MIND WAVE INFORMATICS HYDERABAD

PRINCIPAL
Avanthi Institute of Engg. & Tech
Gunthapally (V), Abdullapurmet (Mdl), R.R. Dist.

MIND WAVE Informatics

WORK ORDER

Date: 20/01/2022,

HYDERABAD,

To
The Principal,
Avanthi Institute of Engineering& Technology,
Gunthapally, Abdullapurmet Mandal, Hyderabad.

Sub: Automated irrigation system using a wireless sensor network & GPRS model

Further to your of for preparing of wireless sensor network & GPRS model as per the Telephone Discussion quotation, we are pleased to place the work order as below

S.NO	Description	Total Cost in Rs.
1	Automated irrigation system using a wireless sensor network & GPRS model	75,000

Work Oder Valid: One Year (20th January 2022 to 20th January 2023)

Terms& Conditions:

- Preparation of detailed drawings/Lay outs based on the reference design provided by the customer.
- Taking physical design for review and approval of our customer
- Submission of designs/lay outs for review and approval of our customer
- Incorporate any comments/feed back given by customer in the design/layouts
- Preparation of designs, lay outs, algorithms, part design, bill of materials for all designs.
- Preparation of built up designs, lay outs after completion of fabrication/Installation at site.

For MIND WAVE INFORMATICS,

MANAGER

MIND WAVE INFORMATICS PVT. HYDERABAD

PRINCIPAL
Avanthi Institute of Engg. & Tech
Gunthapally (V), Abdullapurmet (Mdl), R.R. Dist.

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www.aietg.ac.in email: principal.avanthi@gmail.com

Date:07/03/2022,

TO
The Manager,
MIND WAVE INFORMATICS,
Hyderabad.

Dear sir

The college does not have sufficient working capital to complete the next half of proposed project which we have been discussed. We are therefore requesting for advance funds to the staff and other expenses required to work on this project. Therefore we urge you to consider our request for approval to receive funding in advance for this project. Thank you for your consideration of this request. Sincerely,

Thanking you,

Principal
Avanthi Institute of Engg. & Tech
Gunthapally (V), Abdullapurmet (Mdl), R.R. Dist.

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UTILITY CERTIFICATE

We, the undersigned, Principal Investigator and Co-Investigators of the Al hased software development project being carried out at Avanthi Institute of Engineering and Technology Compatur Science Engineering Department, hereby certify that we have examined the financial details provided for the project follows:

S.no	Project Name	Project Cost
1	Automated irrigation system using a wireless sensor network & GPRS model	75,000/-

We assure you that the funds have been used diligently and in accordance with the guidelines provided by Fly Academy. Any remaining finds have been duly adjusted or will be returned as per the agreement.

Should you require any further supporting documentation or information, please do not hesitate to contact us. We appreciate your support and the opportunity to carry out this important project.

Thank you for your attention to this matter.

Principal

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Avanthi Institute of Engg. & Tech
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Gunthapally (V), Abdullapurmet(M), RR Dist, Near Ramoji Film City, Hyderabad -501512.
www.aietg.ac.in email: principal.avanthi@gmail.com

Hyderabad,

Date: 29.05.2022,

From
The Principal,
Avanthi Institute of Engineering and Technology,
Hyderabad.

To
The Manager,
MIND WAVE INFORMATICS,
Hyderabad.

Respected Sir,

Sub: Project Completion-reg.

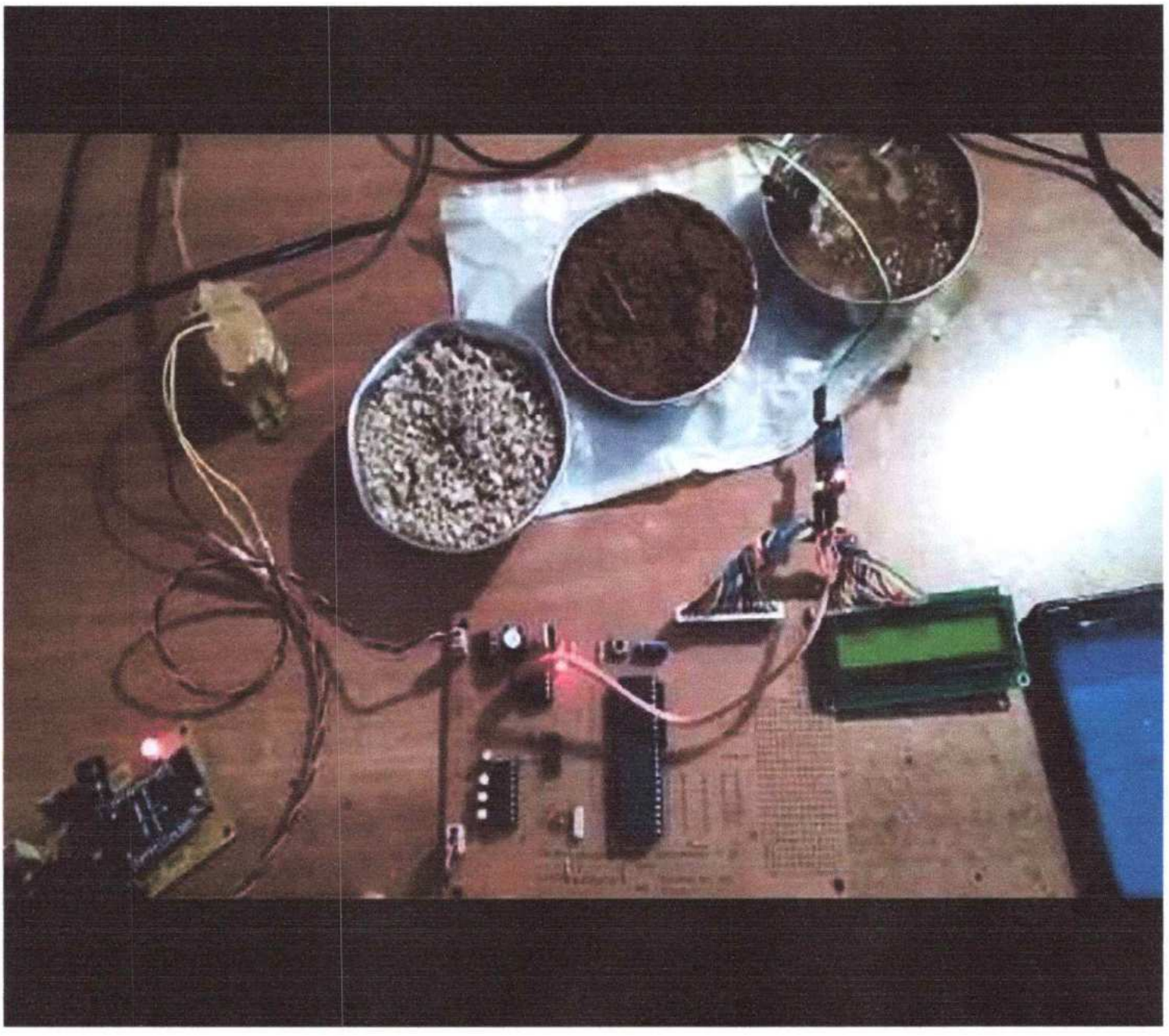
The project has been completed on a given time bond. It has been a great achievement by us to complete the prestigious project on time. It has been a great privilege, working in association with you and looking forward to working with you in future projects. We request you to please come along with your team for collecting, retrieving of important and confidential data.

Looking forward to a quick response from your side

Thanking you,

Principal

PRINCIPAL
Avanthi Institute of Engg. & Tech
Gunthapally (V), Abdullapurmet (Mdl), R.R. Dist.



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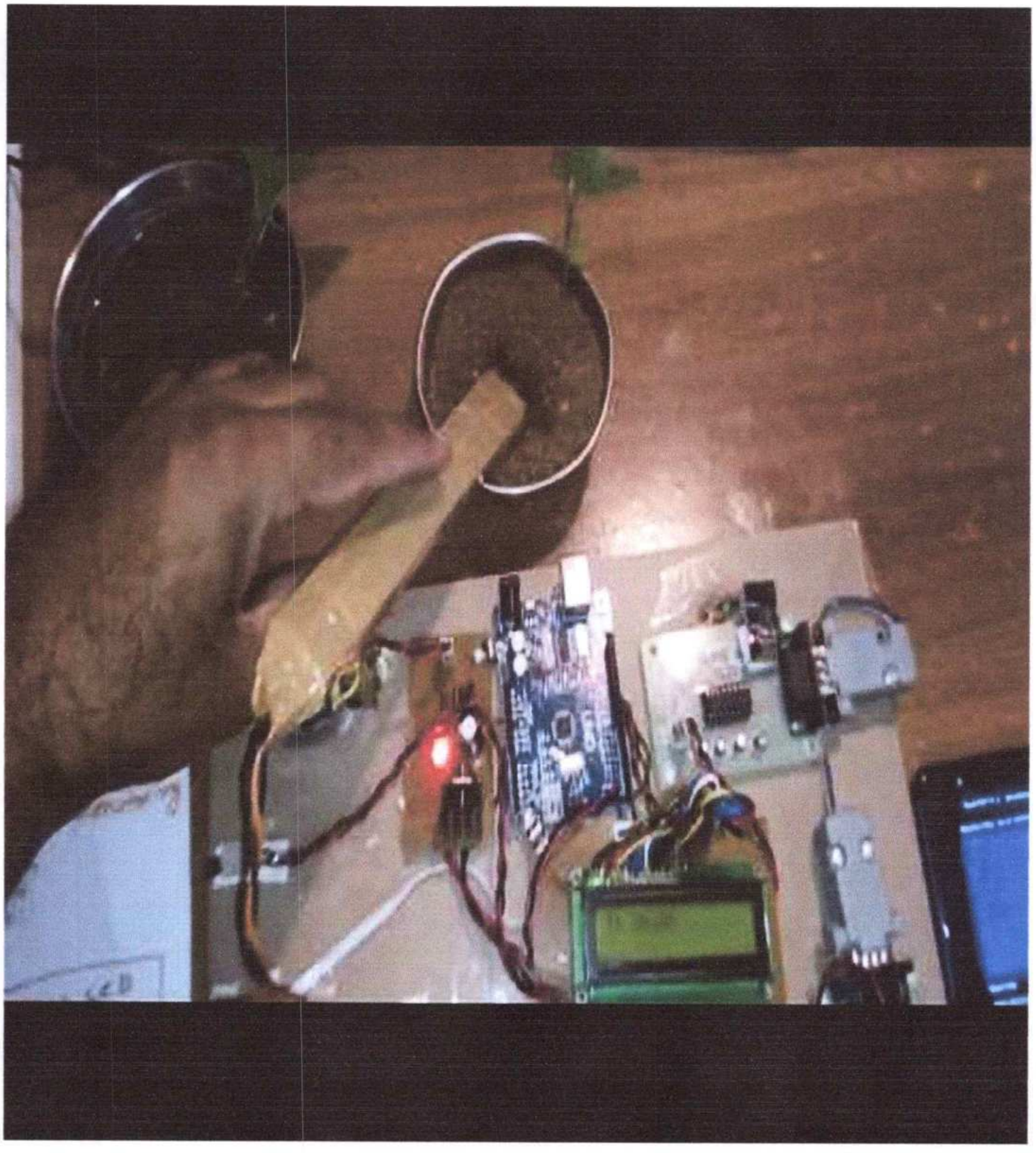

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K.V.Reddy

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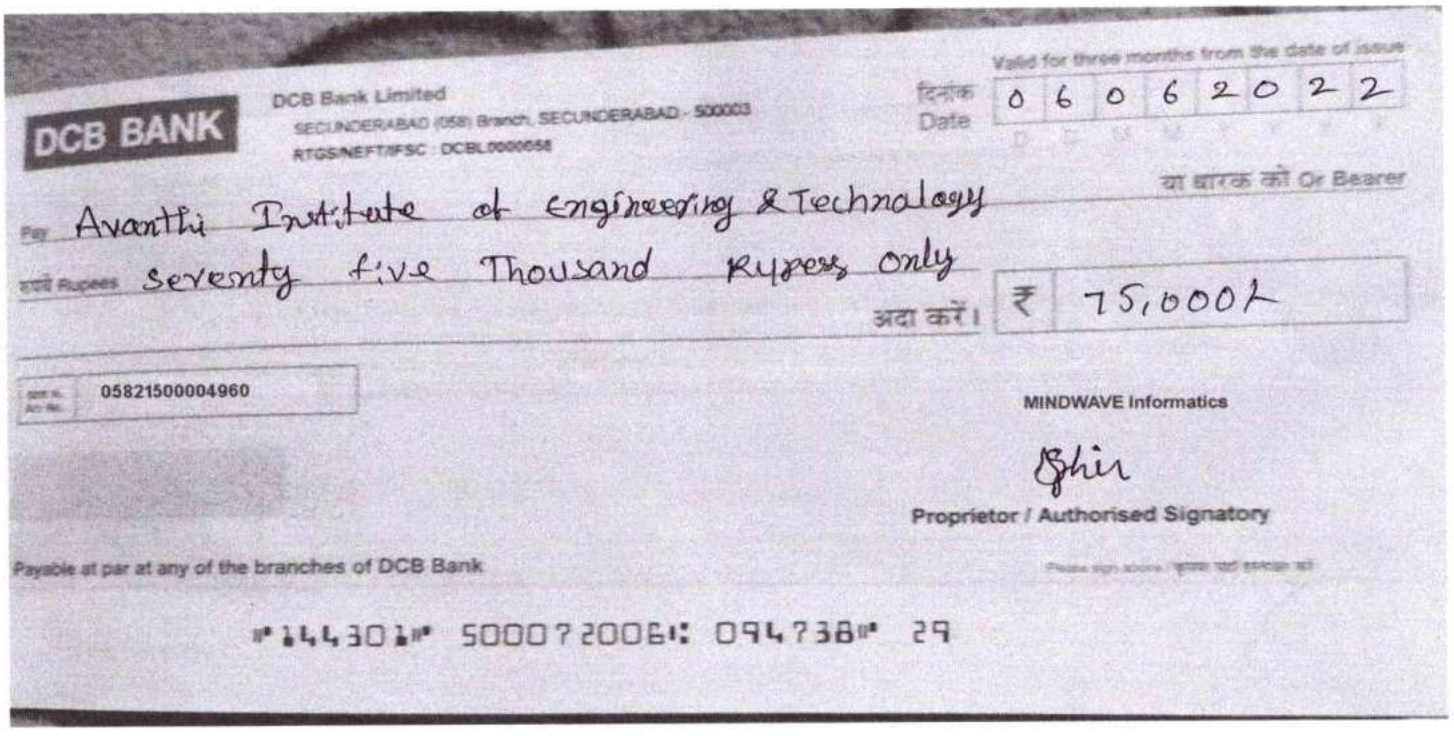

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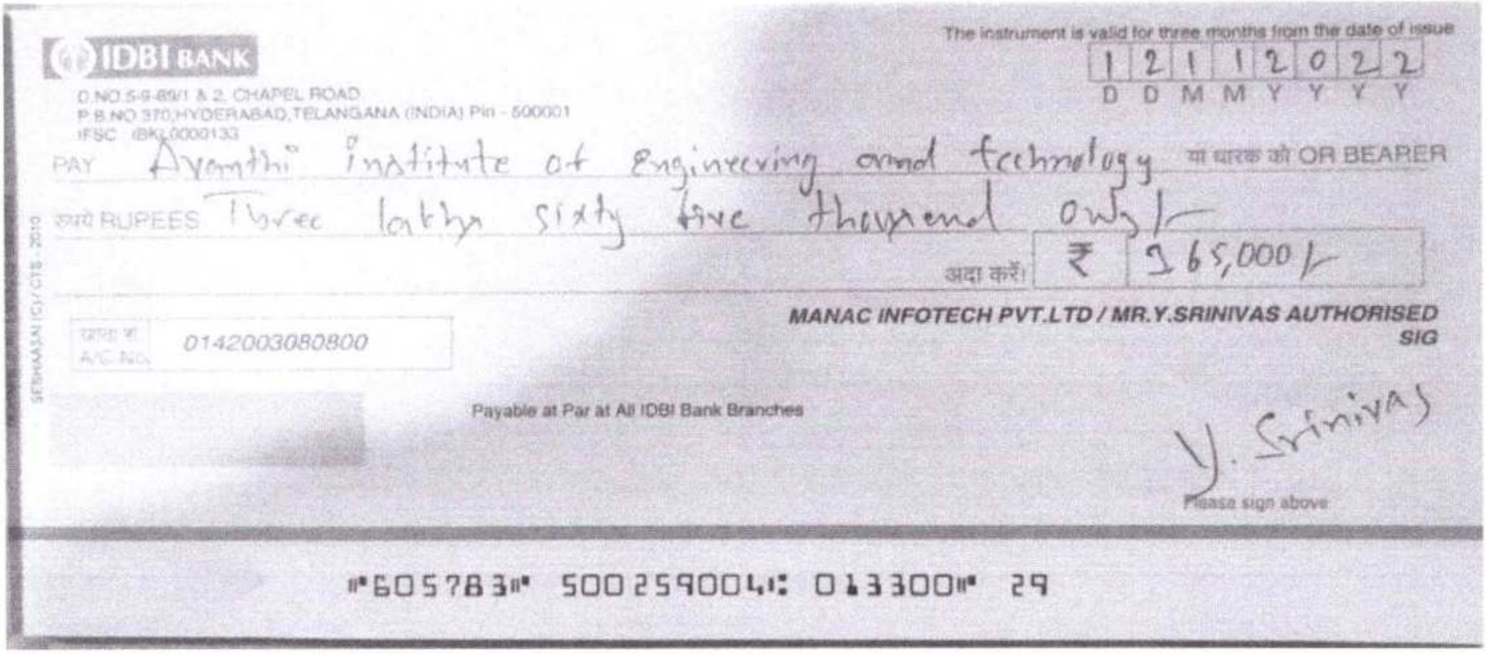
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MANDAL RANGA REDDY DIST
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501512

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IFSC Code :UTIB0002738
MICR Code :500211055
Nominee Registered : N

Registered Mobile No :XXXXXX5659
Registered Email ID:
Scheme :SB-TRUST/SOCIETY/NGO/GOVT

PAN :AAATA3530B

Statement of Axis Account No :918010018620123 for the period (From : 06-01-2022 To : 07-01-2022)

Tran Date	Chq No	Particulars	Debit	Credit	Balance	Init. Br
		OPENING BALANCE			**19723194.32**	
06-01-2022		BY CASH DEPOSIT-BNA/BPRH273801/811/060122/KVRANGA		100000.00	19823194.32	2738
06-01-2022		BY CASH DEPOSIT-BNA/BPRH273801/813/060122/KVRANGA		100000.00	19923194.32	2738
06-01-2022		BY CASH DEPOSIT-BNA/BPRH273801/815/060122/KVRANGA		100000.00	20023194.32	2738
06-01-2022		BY CASH DEPOSIT-BNA/BPRH273801/817/060122/KVRANGA		100000.00	20123194.32	2738
06-01-2022		BY CASH DEPOSIT-BNA/BPRH273801/819/060122/KVRANGA		100000.00	20223194.32	2738
06-01-2022		BY CASH DEPOSIT-BNA/BPRH273801/823/060122/KVRANGA		100000.00	20323194.32	2738
06-01-2022		BY CASH DEPOSIT-BNA/BPRH273801/825/060122/KVRANGA		100000.00	20423194.32	2738
06-01-2022		BY CASH DEPOSIT-BNA/BPRH273801/836/060122/KVRANGA		98500.00	20521694.32	2738
06-01-2022		BY CASH DEPOSIT-BNA/BPRH273801/846/060122/KVRANGA		60800.00	20582494.32	2738
06-01-2022		BY CASH DEPOSIT-BNA/BPRH273801/848/060122/KVRANGA		39500.00	20621994.32	2738
06-01-2022		AVANTHI INST OF ENG & TECH - 05 05.01.2022		226330.00	20848324.32	274
07-01-2022		TRF/CONSCIENCE TECHNOLOGIES/		386000.00	21234324.32	1456
07-01-2022		AVANTHI INST OF ENG & TECH - 05 06.01.2022		1583280.00	22817604.32	274
		TRANSACTION TOTAL	**.00**	**3094410.00**		
		CLOSING BALANCE			**22817604.32**	

Unless the constituent notifies the bank immediately of any discrepancy found by him/her in this statement of Account, it will be taken that he/she has found the account correct.

The closing balance as shown/displayed includes not only the credit balance and / or overdraft limit, but also funds which are under clearing. It excludes the amount marked as lien, if any. Hence the closing balance displayed may not be the effective available balance. For any further clarifications, please contact the Branch.

We would like to reiterate that, as a policy, Axis Bank does not ask you to part with/disclose/revalidate of your iConnect passord,login id and debit card number through emails OR phone call Further,we would like to reiterate that Axis Bank shall not be liable for any losses arising from you sharing/disclosing of your login id, password and debit card number to anyone. Please co-operate by forwarding all such suspicious/spam emails, if received by you, to customer.service@axisbank.com

With effect from 1st August 2016, the replacement charges for Debit card and ATM card applicable on Current accounts have been revised. To know more about the applicable charges,please visit www.axisbank.com

Deposit Insurance and Credit Guarantee Corporation (DICGC) insurance cover is applicable in all Banks' deposits, such as savings, current, fixed, recurring etc* up to maximum amount of Rs 5 Lakh including principal & interest both* (* or exceptions and details please refer www.dicgc.org.in)

In compliance with regulatory guidelines, the non-CTS cheque books attached to the accounts would be destroyed in banks core banking System. Thus, Non CTS cheques will not be valid for CASH, Clearing and Transfer transactions

PRINCIPAL
Avanthi Institute of Engg. & Tech
Guntihapally (V), Abdullapurmet (Mdl) R.R.Dist

REGISTERED OFFICE - AXIS BANK LTD,TRISHUL,Opp. Samartheswar Temple, Near Law Garden, Ellisbridge, Ahmedabad . 380006.This is a system generated output and requires no signature.

BRANCH ADDRESS - AXIS BANK LTD, VANASTHALIPURAM HYD TG, DOOR NO 5-5-1189, SY NO.15(P), PLOT NO 2/A & 3/B, SAHEB NAGAR, KURD,HAYATHNAGAR(M), LB NAGAR CIRCLE III, 500070, HYDERABAD, TELANGANA, INDIA, TEL:040-24113411 FAX:

Legends :

ICONN	-	Transaction trough Internet Banking
VMT-ICON	-	Visa Money Transfer through Internet Banking
AUTOSWEEP	-	Transfer to linked fixed deposit
REV SWEEP	-	Interest on Linked fixed Deposit
SWEEP TRF	-	Transfer from Linked Fixed Deposit / Account
VMT	-	Visa Money Transfer through ATM
CWDR	-	Cash Withdrawal through ATM
PUR	-	POS purchase
TIP/ SCG	-	Surcharge on usage of debit card at pumps/railway ticket purchase or hotel tips
RATE.DIFF	-	Difference in rates on usage of card internationally
CLG	-	Cheque Clearing Transaction
EDC	-	Credit transaction through EDC Machine
SETU	-	Seamless electronic fund transfer through AXIS Bank
Int.pd	-	Interest paid to customer
Int.Coll	-	Interest collected from the customer

++++ End of Statement ++++

PRINCIPAL
Avanthi Institute of Engg. & Tech
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AXIS BANK

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Nominee Registered : N

Registered Mobile No :XXXXXX5659
Registered Email ID:
Scheme :SB-TRUST/SOCIETY/NGO/GOVT

PAN :AAATA3530B

Statement of Axis Account No :918010018620123 for the period (From : 07-06-2022 To : 10-06-2022)

Tran Date	Chq No	Particulars	Debit	Credit	Balance	Init. Br
		OPENING BALANCE			**590928.32**	
07-06-2022		AVANTHI INST OF ENG & TECH - 05 06.06.2022		15000.00	605928.32	274
08-06-2022		AVANTHI INST OF ENG & TECH - 05 07.06.2022		97790.00	703718.32	274
09-06-2022		NEFT/010906225555/1	1000.00		702718.32	2738
09-06-2022		IFT/010906225555/3	17000.00		685718.32	2738
10-06-2022		AVANTHI INST OF ENG & TECH - 05 09.06.2022		15000.00	700718.32	274
10-06-2022		TRF/MINDWAVE INFORMATICS/		75000.00	775718.32	58
		TRANSACTION TOTAL	**18000.00**	**202790.00**		
		CLOSING BALANCE			**775718.32**	

Unless the constituent notifies the bank immediately of any discrepancy found by him/her in this statement of Account, it will be taken that he/she has found the account correct.

The closing balance as shown/displayed includes not only the credit balance and / or overdraft limit, but also funds which are under clearing. It excludes the amount marked as lien, if any. Hence the closing balance displayed may not be the effective available balance. For any further clarifications, please contact the Branch.

We would like to reiterate that, as a policy, Axis Bank does not ask you to part with/disclose/revalidate of your iConnect passord,login id and debit card number through emails OR phone call Further,we would like to reiterate that Axis Bank shall not be liable for any losses arising from you sharing/disclosing of your login id, password and debit card number to anyone. Please co-operate by forwarding all such suspicious/spam emails, if received by you, to customer.service@axisbank.com

With effect from 1st August 2016, the replacement charges for Debit card and ATM card applicable on Current accounts have been revised. To know more about the applicable charges,please visit www.axisbank.com

Deposit Insurance and Credit Guarantee Corporation (DICGC) insurance cover is applicable in all Banks' deposits, such as savings, current, fixed, recurring etc* up to maximum amount of Rs 5 Lakh including principal & interest both* (* or exceptions and details please refer www.dicgc.org.in)

In compliance with regulatory guidelines, the non-CTS cheque books attached to the accounts would be destroyed in banks core banking System. Thus, Non CTS cheques will not be valid for CASH, Clearing and Transfer transactions

REGISTERED OFFICE - AXIS BANK LTD,TRISHUL,Opp. Samartheswar Temple, Near Law Garden, Ellisbridge, Ahmedabad . 380006.This is a system generated output and requires no signature.

BRANCH ADDRESS - AXIS BANK LTD, VANASTHALIPURAM HYD TG, DOOR NO 5-5-1189, SY NO.15(P), PLOT NO 2/A & 3/B, SAHEB NAGAR, KURD,HAYATHNAGAR(M), LB NAGAR CIRCLE III, 500070, HYDERABAD, TELANGANA, INDIA, TEL:040-24113411 FAX:

Legends :

ICONN - Transaction trough Internet Banking
VMT-ICON - Visa Money Transfer through Internet Banking
AUTOSWEEP - Transfer to linked fixed deposit
REV SWEEP - Interest on Linked fixed Deposit
SWEEP TRF - Transfer from Linked Fixed Deposit / Account
VMT - Visa Money Transfer through ATM
CWDR - Cash Withdrawal through ATM

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Avanthi Institute of Engg. & Tech.
Guntihapally (V), Abdullapurmet (Mdl) R.R.Dist

PUR	-	POS purchase
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SETU	-	Seamless electronic fund transfer through AXIS Bank
Int.pd	-	Interest paid to customer
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++++ End of Statement ++++

PRINCIPAL
Avanthi Institute of Engg. & Tech
Guntihapally (V). Abdullapurmet (Mdl) R.R.Dist

AXIS BANK

AVANTHI INSTITUTE OF ENGINEERING & TECHNOLOGY
Joint Holder :- -
GUNTHAPALLY VILLAGE, HAYATH NAGAR
MANDAL RANGA REDDY DIST
HYDERABAD
TELANGANA-INDIA
501512

Customer ID :879983002
IFSC Code :UTIB0002738
MICR Code :500211055
Nominee Registered : N

Registered Mobile No :XXXXXX5659
Registered Email ID:
Scheme :SB-TRUST/SOCIETY/NGO/GOVT

PAN :AAATA3530B

Statement of Axis Account No :918010018620123 for the period (From : 25-02-2022 To : 28-02-2022)

Tran Date	Chq No	Particulars	Debit	Credit	Balance	Init. Br
		OPENING BALANCE			**9949942.32**	
25-02-2022		NEFT/012402222997/33	558673.00		9391269.32	2738
25-02-2022		IFT/0125022212098/6	1000300.00		8390969.32	2738
25-02-2022		AVANTHI INST OF ENG & TECH - 05 24.02.22		8000.00	8398969.32	274
28-02-2022		IFT/01280222159l6/11	2500000.00		5898969.32	2738
28-02-2022		BY CASH DEPOSIT-BNA/DPRH317301/3697/280222/KVRANGA		100000.00	5998969.32	2738
28-02-2022		TRF/SASHAKT HR SERVICE PVT.LTD. /		75000.00	6073969.32	3315
28-02-2022		BY CASH DEPOSIT-BNA/DPRH317301/3699/280222/KVRANGA		14500.00	6088469.32	2738
		TRANSACTION TOTAL	**4058973.00**	**197500.00**		
		CLOSING BALANCE			**6088469.32**	

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The closing balance as shown/displayed includes not only the credit balance and / or overdraft limit, but also funds which are under clearing. It excludes the amount marked as lien, if any. Hence the closing balance displayed may not be the effective available balance. For any further clarifications, please contact the Branch.

We would like to reiterate that, as a policy, Axis Bank does not ask you to part with/disclose/revalidate of your iConnect passord,login id and debit card number through emails OR phone call Further,we would like to reiterate that Axis Bank shall not be liable for any losses arising from you sharing/disclosing of your login id, password and debit card number to anyone. Please co-operate by forwarding all such suspicious/spam emails, if received by you, to customer.service@axisbank.com

With effect from 1st August 2016, the replacement charges for Debit card and ATM card applicable on Current accounts have been revised. To know more about the applicable charges,please visit www.axisbank.com

Deposit Insurance and Credit Guarantee Corporation (DICGC) insurance cover is applicable in all Banks' deposits, such as savings, current, fixed, recurring etc* up to maximum amount of Rs 5 Lakh including principal & interest both* (* or exceptions and details please refer www.dicgc.org.in)

In compliance with regulatory guidelines, the non-CTS cheque books attached to the accounts would be destroyed in banks core banking System. Thus, Non CTS cheques will not be valid for CASH, Clearing and Transfer transactions

REGISTERED OFFICE - AXIS BANK LTD,TRISHUL,Opp. Samartheswar Temple, Near Law Garden, Ellisbridge, Ahmedabad . 380006.This is a system generated output and requires no signature.

BRANCH ADDRESS - AXIS BANK LTD, VANASTHALIPURAM HYD TG, DOOR NO 5-5-1189, SY NO.15(P), PLOT NO 2/A & 3/B, SAHEB NAGAR, KURD,HAYATHNAGAR(M), LB NAGAR CIRCLE III, 500070, HYDERABAD, TELANGANA, INDIA, TEL:040-24113411 FAX:

Legends :

ICONN - Transaction trough Internet Banking
VMT-ICON - Visa Money Transfer through Internet Banking
AUTOSWEEP - Transfer to linked fixed deposit
REV SWEEP - Interest on Linked fixed Deposit
SWEEP TRF - Transfer from Linked Fixed Deposit / Account
VMT - Visa Money Transfer through ATM

PRINCIPAL
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CWDR	-	Cash Withdrawal through ATM
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AXIS BANK

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Nominee Registered : N

Registered Mobile No :XXXXXX5659
Registered Email ID:
Scheme :SB-TRUST/SOCIETY/NGO/GOVT

PAN :AAATA3530B

Statement of Axis Account No :918010018620123 for the period (From : 14-11-2022 To : 15-11-2022)

Tran Date	Chq No	Particulars	Debit	Credit	Balance	Init. Br
		OPENING BALANCE			**7408524.24**	
14-11-2022		NEFT/0114112210451/3	1048470.00		6360054.24	2738
14-11-2022		NEFT/0114112221373/2	64800.00		6295254.24	2738
14-11-2022		NEFT/0114112219320/30	356464.00		5938790.24	2738
14-11-2022		IFT/0114112219320/41	641970.00		5296820.24	2738
14-11-2022		AVANTHI INST OF ENG & TECH - 05 11.11 to 13.11.22		577000.00	5873820.24	274
15-11-2022		AVANTHI INST OF ENG & TECH - 05 14.11.22		362500.00	6236320.24	274
15-11-2022		TRF/MANAC INFOTECH PVT. LTD /SRINIVAS/		365000.00	6601320.24	133
		TRANSACTION TOTAL	**2111704.00**	**1304500.00**		
		CLOSING BALANCE			**6601320.24**	

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