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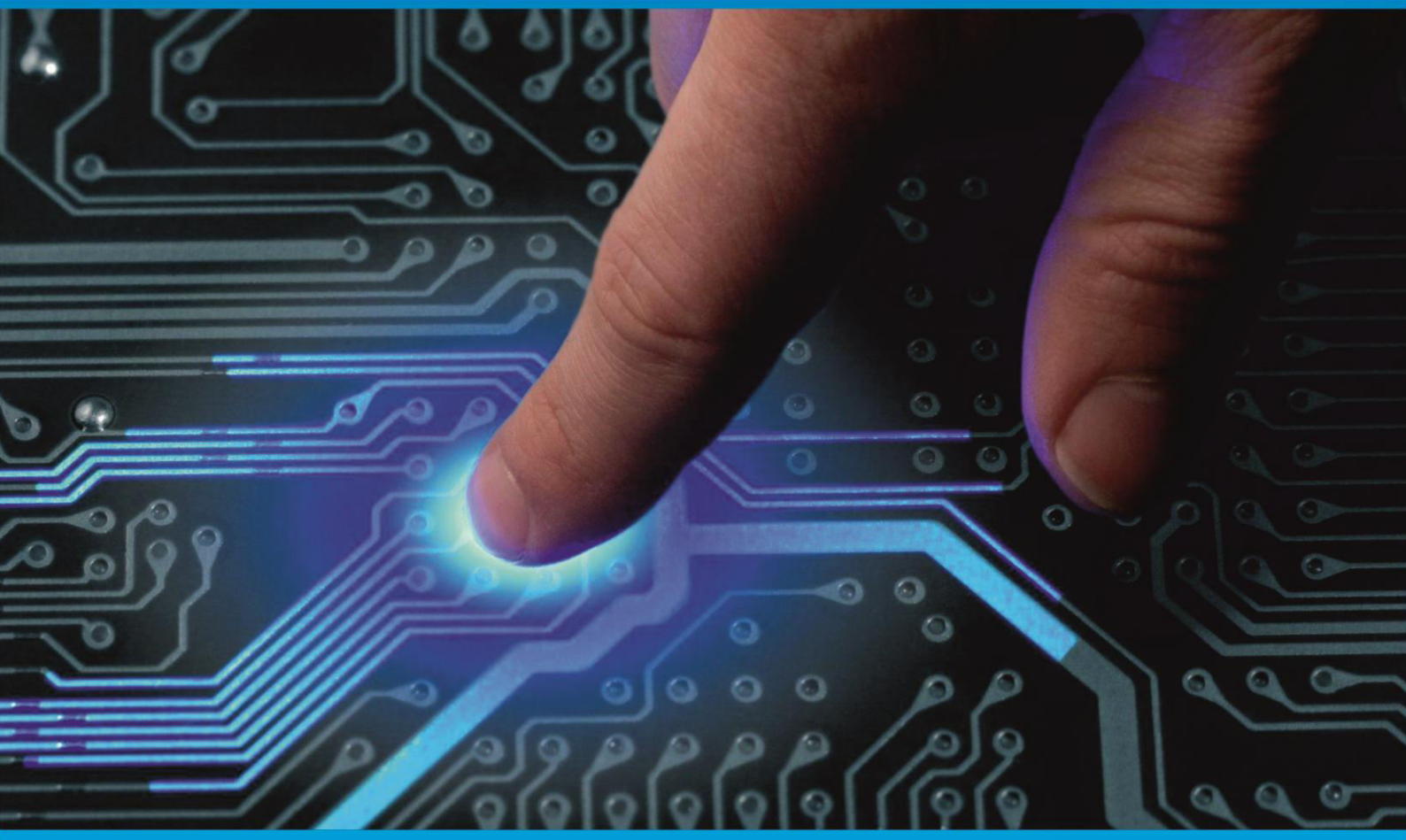

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Intelligent IV Fluid Bottle for Healthcare Using Robotic Arm

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ABSTRACT: In this paper, we recommend an intelligent way to control the saline flow rate and monitoring of oxygen level for the quick recovery of patients. Almost in all hospitals, a nurse is responsible for monitoring the saline fluid level and the oxygen level continuously. But unfortunately, during most of the time the nurse may forgets to change the saline bottle at the correct time. It may lead to several problems to the patients such as backflow of blood, blood loss, drop oxygen level etc.The design and execution of saline and oxygen flow controlling method employs a liquid IR sensor, SpO2 sensor, temperature sensor and pressure sensor. The Arduino Mega (2560) platform has been used as controlling units for essential control along with a 3x4 matrix keypad which helps in setting the saline flow rate. The LCD display is used to indicate the saline flow rate and oxygen rate. Android phone is employed to control and monitor the saline flow rate through the mobile application; it also monitors the heart beat rate and body temperature as well as there is an option to eject the venflon using robotic arm. Also, we are using a push switches. These switches can be used in either increasing or decreasing the saline flow and also pressure. Relay also used. If any process goes down, it will indicate through an alarm. Here, using IOT technology, the status of the patient will send to the android application with the help of Wi-Fi connection. The main advantage of our project is a single nurse can monitor more than ten patients at a time.

KEYWORDS:Intravenous, robotic arm, controlling method, saline.

I. INTRODUCTION

Saline or intravenous fluid is a term refers to sterile solution of sodium chloride (nacl) or a substance which is given through vein to improve the patients' health. In medical fields the intravenous fluid is used to desiccation, hypovolemia or in nasal irrigation. The number of saline bottle is based on the condition of the patient health. Thus it is prime thing to measure the flow rate of fluid. This has been done manually by the nurses. During day or night time the few number of caretakers makes this task quite complicate. Thus it becomes mandatory to invent remote health monitoring systems which will measure the required patient data accurately and transmit a doctor or caretaker through fizzy logic algorithm. Many systems have been developed in last few years for measurement of parameters like blood pressure, dextrose, pulse rate, body temperature and so on. This has been possible because of advancement in the field of sensors, microcontrollers and telemetry [2]. The development of such a system introduces a drastic change in medical field for monitoring the patient's parameters like heart beat rate, detection of heart attack symptoms and much more automatically with interdisciplinary nature. Even though many advanced remote monitoring devices or system are used, ensuring the safety of the patients during iv period is still a challenging issue. Intravenous fluid is a process which the liquid directly into the patient's hands. Therapies manage intravenously are often called specialty drips. The number of technology is involved to take care of health sectors and also involved in their improvement process. Still there have been many research and development of iv flow monitoring and controlling device or system for betterment of people's health care. The main objective of this is to provide reliable, convenient, effortless and cost effective system for flow and pressure monitoring. The saline is injected into blood by considering certain parameters like heart rate, blood pressure, body temperature, and pulse rate of patient. If the fluid crosses the certain limit it is required to change the iv bottle on time. Similarly, if the oxygen goes below the critical level, the nurse should check the level. An automatic monitoring system determines the flow and pressure rate. Normally when a saline is fitted to a patient, he/she is in a desiccation condition. it is major important thing when the fluid crosses the certain limit and also here to note that the saline is needed only when the patient is dehydrated. in most cases caretaker lethargically when monitored the patient, then it causes fatal consequences. if due to some other unavoidable situation, the saline bottle is completely cater of to the patient and the venflon is not at once removed from the veins then the pressure difference between the patient blood pressure and the empty fluid bottle causes an outward rush of blood into the saline. Normally this may be think of as a natural event.

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II. LITERATURE SURVEY

Normally, as the population growth increases, the need for health care also increases. Hence it is a compulsory thing for everyone in this world to take care of their health properly. So, maintaining patient's safety is the first priority to be given in all hospitals. Many systems have been rapidly developed in last few years for measurement and transmission of parameters such as blood pressure, glucose, pulse rate, temperature and so on. Saline is a word referring to sterile solution of sodium chloride (NaCl) used in hospitals where it is commonly said as glucose bottle. In medical field, saline is often used for intravenous infusion in dehydration, hypervolemia or in nasal irrigation. Probably the doctor or the nurse measure the saline flow rate manually and then adjust it accordingly. But it is very difficult for a nurse to be present at the patient's bedside every moment. This system will help the nurses in remote monitoring the saline to the large extent. The use of RF ZigBee module helps in reducing the power consumption and cutting down the cost of messages as is not the case of GSM module[2] The lack of careful persons with sufficient skill in hospitals and their heavy duty time become a social problem in this modern world. We have to develop low cost health monitoring systems which is available to every hospital in the days to come. A number of health monitoring sensors for humans in bed have been developed also monitoring heart rate by an air pressure with an air tube in mattress in bed is developed. System of systems using non- contact sensors is known by Yutaka. Heart attack symptoms can be detected using mobile phone and wearable sensors. The automatic saline monitoring system provides more flexibility to the doctors; thereby the patient's caring enhanced. The automatic injection system includes the patient's physiological conditions like heart rate, body temperature, rate of respiration, blood pressure are automatically checked and the saline flow rate is controlled and hence it saves lot of time for the doctor or nurse who is on duty [3] So to assure the safety of the patient during IV period there is a need to develop an efficient health monitoring system in the medical industry. This can be achieved with the help of RF based IV fluid level indicating system where IR sensor, RF transmitter, receiver and buzzer are used to provide information to control either to change the intravenous or to switch off it. This will reduces the stress in continuous monitoring of the patient by the doctor or nurse at an affordable cost.[9] The requirements for health care are rapidly rising with the continuous growing of the world. Numerous technological innovation designs are evolved and taken for the advantages of medical improvements. There have been research and development of saline monitoring and controlling device for upgradement of people's health care. The intension of this is to give the regular life to a affected person through developing an automated and also price efficient saline tracking and controlling method because it is necessary to control the saline flow rate for different age patient as circulation flow depending on physical conditions like heart rate as well as pulse rate, heat range of patient's body, body mass, and blood pressure level of the patient [10]. Due to evolution in science and development of the technology, the growth in the medical field is rapid. This is due to the combine of the engineering and medical field. Now days, many automatic health monitoring devices are developed to ensure patients safety and to reduce the stress of the doctors and nurse. Bluetooth module and WI-FI module act as trans-receiver, due to which the notification can be sent to the nurse on her mobile as well as computer. The CC2500 is a low cost true single chip 2.4GHZ transceiver designed for low power wireless applications. The system is reliable, low cost and convenient for nurses and doctors and also it can be reused for the next saline bottle. So it is beneficial for nurses as well as doctors at rural hospitals, they can easily monitor the saline level from distance also. It is mainly useful at night timing as there is no need for nurses to go to patient's bed to check the level of saline in the bottle every time[6] The technologies are transforming further than one's visualization. The solution of sodium chloride sterile is utilized to get rinsing out contact lenses, nasal irritability, into the vein infusion and to cleanse a fresh piercing. Regular Saline is frequently used in intravenous drips or the patients who are not able to have liquids by mouth as well as tend to be in threat of leading to dehydration or hypovolemia. The device can be used in the medical application as well as in chemical lab where the very accurate flow of fluid is required. Once the command is given to the device regardless of the level of water from the patient, it keeps the flow rate constant. This low-cost medical device may have potential use for patient health care, especially in developing countries like Bangladesh.[8] However, in today's busy world there is increase in sudden death events which motivates for a monitoring system that continuously monitors remotely located patient effectively. Depending on this factor many researchers have developed patient monitoring system[4] Growth of technology is at its peak. The main aim of this paper is to propose a system which can measure the saline flow rate and develop an automated infusion rate system remotely. It can also monitor the saline level. When it is below the critical level, immediately an alert is sent to the concerned authority and relatives of the patient through the use of internet. We also propose using speech recognition technique and depending on the frequency the concerned message is either sent to relatives or the nurse/doctor. To detect and control the flow rate accurately, a flow sensor made up of two metal wires is used, which is more sensitive than the one available in the market. The primary goal of this system is to offer dependable, hassle-free, simple and easy as well as a cost efficient method of saline level controlling. It will be advantageous at night as there will be no such requirement for the nurses to visit patient's bed every time to check the level of saline in the bottle since an alert

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notification will be sent to the nurses, doctors, caretakers when saline reaches the critical level[1] Internet of Things (IoT) is the network of physical objects comprising of all the devices, vehicles, buildings and the other items embedded with electronics, software and sensors which enables these objects to collect and exchange data amongst each other. Using this technology, objects are sensed and controlled remotely across existing network infrastructure. IoT is advantageous in many ways as it leads to automation of daily tasks leading to better quality of life and saves money as well as time. Applications of IoT include a vast number of systems, amongst them, a few are Smart homes, automated car, automated doors, Automated Escalators, Automated Hand Dryer[5] The main highlight of the device is its cost-effectiveness without compromising with performance. As a end we get guaranteed patient safety and also minimum human interference, with the large magnitude of research and development carried out in the embedded system market it's concluded that the ever growing medical sector gets a technology boost rapidly. This device aims to bring about a revolution in the common medical sector which is sadly very primitive and risky[7]

III. PROPOSED SYSTEM

The main objective of this is to provide a reliable, convenient, effortless and cost-effective system for flow and pressure monitoring. The saline is injected into blood by considering certain parameters like heart rate, blood pressure, body temperature, and pulse rate of a patient. Similarly, if the oxygen goes below the critical level, the nurse should check the level. An automatic monitoring system determines the flow and pressure rate. After examining a few papers based on the improvement of the automated saline monitoring system, it was seen that many complex circuit and modules were used which increase the cost of manufacturing but the oxygen pressure mechanism is not involved here. In some systems, Bluetooth system were used to monitoring the system. In all the previous systems it was seen that there is no automatic control of flow rate.

The proposed system is to detect and control the flow rate of saline and oxygen label correctly and give the signal to the doctor or nurse so that the amount of flow and pressure can be controlled using a smartphone and guide control. The system will be able to control the flow rate automatically allowing to the command given to the device by the user. Sensors will be developed to determine the rate. A water drop IR sensor will detect the water drop accurately.

Using Arduino AT mega our proposed system is designed. Let an IR sensor is fitted in the saline bottle at a certain limit which will continuously monitor the saline flow. if the fluid crosses a certain limit an alert message will send to the nurse mobile application with the connection to the Wi-Fi module. Through that message nurse or caretaker can increase, decrease or even stop the flow rate.

The controlling process of fluid done in two cases.

1. In Case 1: an alert message received in nurse mobile application. if that patient needs 2 saline bottles, the nurse decreases the fluid flow using the app and she will visit the patient and take care of it.
2. In case 2: similarly a message received in the mobile app but here the patient doesn't need 2 saline bottle .now nurse stop the fluid flow using stop option in the mobile app. After stopping the process ejection of venflon will be done.

Similarly, during an accident or operation, oxygen level in the brain may decrease so aviod that here we measuring the oxygen level in the brain. And finally, there is a fault identification process to avoid human error.

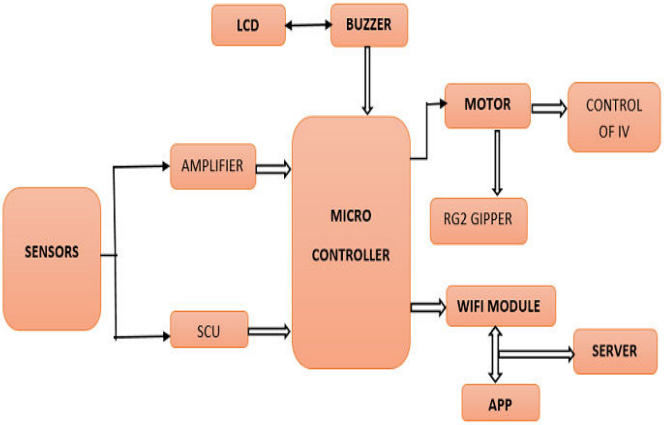

Fig 1. Block Diagram

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IV. RESULTS AND DISCUSSION

The thing which has been executed in our project is mainly based on the sensors. Depending upon the voltage and weight quantity of the sensor, the flow rate and the oxygen rate can be controlled and the temperature value can be seen and displayed in the LCD through Arduino AT mega. IR sensor is used to see how much of flow rate is present. Temperature of the patient is detected using the temperature sensor. Heart beat sensor is used to count the heart beat count at every 2 seconds. Pressure sensor is used to generate the oxygen. The above process can be done through an application. With the help of this application, the nurse can automatically control the flow rate if wants to either increase or decrease.

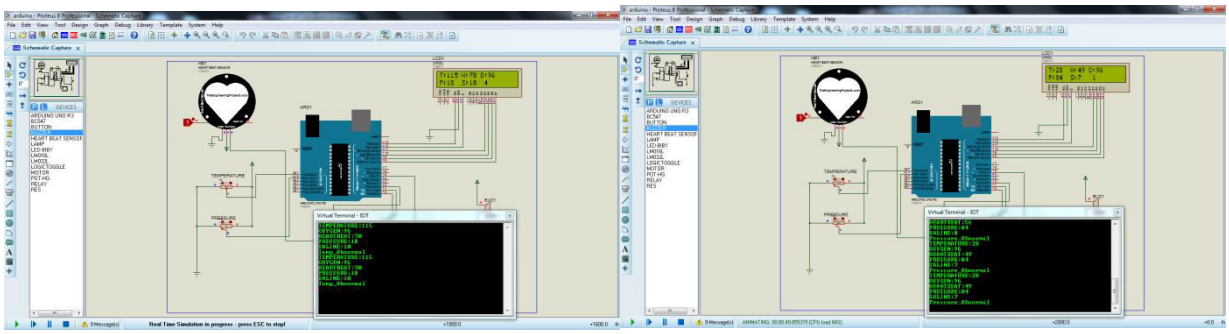

Fig 2. Simulation Output

V. CONCLUSION AND FUTURE WORK

This paper analysis of automatic monitoring and controlling of fluid flow to reduce the burden of nurse and to improve the patients' healthcare. By this system we can build smart hospital. Feature process of this system is to avoid air bubbles in the saline bottle.

REFERENCES

1. Bhadgale.M,AnkitaRani,AkshayKarnawat,NitinLimhan,SudhanshiSalke"Intelligent Saline Control Mechanism" International Journal of Computer Engineering and Applications, Volume XII, Special Issue, March 18
2. Chaudhari.H.P, Tawade.I.S, Pendse.M.S, "Design and Development of Saline Flow Rate Monitoring System Using Flow Sensor, Microcontroller and RF Zigbee Module", International Journal of Engineering Research and General Science, vol.3,Feb 18
3. Gavimath.C.C, Krishnamurthy Bhat, Chayalakshmi.C.L., Hooli.R.S and Ravishankera B.E, "Design And Development Of Versatile Saline Flow Rate Measuring System And Gsm Based Remote Monitoring Device",.International Journal of Pharmaceutical Applications, vol. 3, June 18.
4. Kalaivani.P,Thamaraiselvi.S, Sindhuja.P "Real Time ECG and Saline Level Monitoring System Using Arduino UNO Processor" Asian Journal of Applied Science and Technology (AJAST) Volume 1, Issue 2, March 2017.
5. KhushbooVaishnav, NehaSwamy, NargeesBanoHaidarali"IoT Based Saline Level Monitoring System"International Journal of Innovations & Advancement in Computer Science IJIACS ISSN 2347 – 8616 Volume 6, Issue 10 October 2017.
6. Mansi.G, Chidgopka, ArunaPhatale, "Automatic and Low Cost Saline Level Monitoring System Using Wireless Bluetooth Module And Cc2500 Transreceiver", International Journal of Research in Engineering and Technology, vol. 04,Nov 16.
7. Manoj Kumar Swain, Santosh Kumar Mallick, RatiRanjanSabat, "Smart Saline Level Indicatorcum Controller", International Journal of Application or Innovation in Engineering & Management (IJAIEM) May 17.
8. Muthupandiyan.S, Priyanka.M, Gomathi.M, Manju.M, Monisha.R "A Low Cost Automated Fluid Control Device Using Smart Phone for Medical Application" International Journal of Emerging Technology in Computer Science & Electronics (IJETCSE) ISSN: 0976-1353 Volume 25 Issue 5 – Apirl 2018.
9. Priyadharshini.R, Mithuna.S, VasanthKumar.U, KalpanaDevi.S, SuthanthiraVanitha.N, "Automatic Intravenous Fluid Level Indication System for Hospitals", International Journal for Research in Applied Science & Engineering Technology (IJRASET), vol. 3,May 18.
10. SaranyaD.R, Jemimal.S, Meena.S, Sindhuja, "Fluid Control and Alert Device Using Smart Phone", International Journal of Trendy research in Engineering and Technology (IJ TR ET) Volume 2 Issue 3 April 2018

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 7.488 |

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BIOGRAPHY

N. Nishais currently pursuing her undergraduates in the department of Electronics and Communication Engineering at Paavai Engineering College (Autonomous). She is an active member in IFERP. She is the Internshala Student Partner in the program ISP 15&16. She is runner-up in Smart India Hackathon in the year of 2020 for the project titled "Smart IV Bottle for Health Care using Robotic Arm". She has made her patent in the field of Healthcare and Robotics. . She has worked in 5 projects in the field of Internet of Things and Health Care till now.

C.Sandhiyais currently pursuing her undergraduates in the department of Electronics and Communication Engineering at Paavai Engineering College (Autonomous). She is runner-up in Smart India Hackathon in the year of 2020 for the project titled "Smart IV Bottle for Health Care using Robotic Arm". She has made her patent in the field of Healthcare and Robotics. She has completed the course of Business English Certification preliminary level certified by University of Cambridge, ESOL Examinations. She has worked in 5 projects in the field of Internet of Things, Robotics, and Health Care till now.

Dr.M. Sudha, is currently working as Professor and Head of Electronics and Communication Engineering Department, Paavai Engineering College (Autonomous), Namakkal. She has been working in the institution since 2005. She has a rich experience of 15 years in the field of technical education. She has completed her B.E., degree in Electronics and Communication Engineering from ThanthaiPeriyar Government Institute of Technology (TPGIT), Vellore under Madras University and obtained her M.B.A., degree in Finance under Alagappa University, Karaikkudi. Then, she obtained her M.E degree in Applied Electronics under Anna University, Coimbatore. She completed her Research in the area of Wireless Sensor Networks under Information and Communication Engineering at Anna University, Chennai. She published 20 publications in International Journals and 15 publications in National and International Conferences. She was awarded and rewarded with more than 12 merit certificates and gold coins for her achievement in the field of Education. She is acting as a Journal Reviewer for Springer – Wireless Networks and IEEE Access, Technical committee member in IFERP, Question paper setter for 3 Autonomous colleges. She has received 6 renowned Awards namely, Best Outstanding Faculty form TESFA, Best Faculty from IARA, Best Researcher from IJRULA, Young Women Educator & Researcher Award from (NFED), Best Woman Scientist Award from Novel Research Academy, Puducherry and Young Engineers Award from IEI (Kolkata) for her continuous efforts in Teaching and Research. She has completed the course of Business English Certification preliminary level certified by University of Cambridge, ESOL Examinations. More than 8 course materials were prepared by her to the betterment of student community. She has guided 42 UG projects and 14 PG projects till now. She has received various funds from TNSCST, AICTE and PMKVY-TI. She has made more than 6 patents in the field of Wireless sensor networks, Internet of things, embedded systems, VLSI Design and Machine learning. She is a striving contributor in the field of Science and Technology by being an active member of many Professional Bodies like ISTE, IEI, IETE, IARA, IJRULA, IFERP and IAENG.

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