Electronics
and
Communication Engineering

Aerotech 2023-24
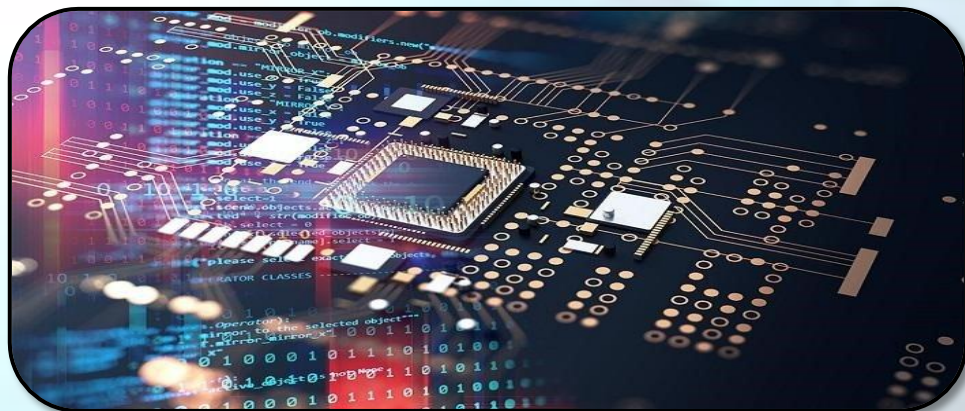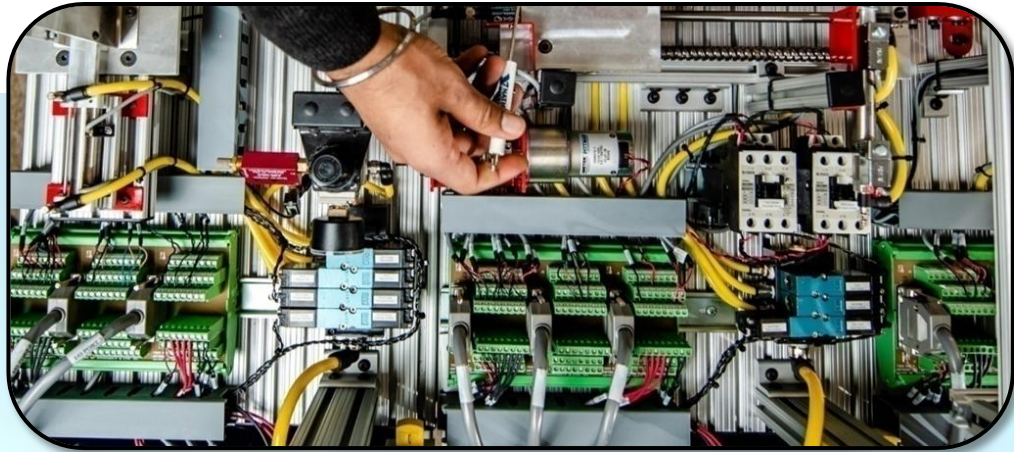
HON'BLE CHAIRMAN MESSAGE

Bhai Gurdas Institute of Engineering and Technology (BGIET), shines as a symbol of educational excellence in North India, devoted to catalyzing societal, scientific, and economic progress globally. Committed to academic brilliance and holistic growth, BGIET earns acclaim from both students and society. The institution prioritizes individual excellence, offering diverse scholastic, cultural, and professional activities to mold students into versatile achievers ready for the global stage. Faculty members impart rigorous training in placement, personality development, and communication skills, guiding students towards prosperous careers and futures.

As part of the BGGI community, students thrive in an environment where aspirations are nurtured under exceptional leadership and inspiring faculty. The institution's steadfast commitment to international-quality education ensures students access top-notch opportunities for personal and professional development. With a notable placement record and emphasis on practical skill-building, BGGI remains dedicated to excellence, ensuring students not only excel academically but also flourish in their chosen fields, armed with the tools and knowledge to navigate today's dynamic world.

Dr. Guninderjit Singh Jawandha
Chairman
Bhai Gurdas Group of Institutions, Sangrur

DIRECTOR MESSAGE

Bhai Gurdas Institute of Engineering and Technology (BGIET) stands as a prestigious engineering institution in Punjab and North India, renowned for its dedication to technical education excellence. With a rich history spanning over 22 years, BGIET has groomed skilled professionals who have made significant impacts across global industries, governmental sectors, and academic institutions. Rooted in its commitment to humanity, BGIET focuses on molding students into proficient professionals, managers, and responsible citizens, prioritizing research, industry collaborations, and streamlined access to quality education through an ERP system. The institute promotes holistic student development through sports, cultural, and extracurricular activities, fostering qualities like leadership, teamwork, and social responsibility to cultivate a technologically advanced workforce aligned with societal demands.

The institute's emphasis on nurturing socially responsible individuals underscores its commitment to providing a conducive environment for academic and personal growth, instilling values of integrity and leadership. Through its comprehensive educational approach, BGIET strives to achieve its broader goal of producing graduates who are not only technically proficient but also equipped with the skills and mindset to address the evolving challenges of the contemporary world.

Dr. Tanuja Srivastava
Director
Bhai Gurdas Institute of Engineering & Technology

HOD MESSAGE

The Department of Electronics & Communication Engineering (ECE) was established in the year 2002. The department's greatest asset is its highly motivated and learned faculty. We have an Undergraduate Program B. Tech. in Electronics and Communication Engineering and a Postgraduate Program M. Tech. in Electronics and Communication Engineering. Students in our department are trained with relevant practice through labs and projects to build problem-solving skills and keep industry requirements in view. The department conducts various workshops, expert talks, and additional training programs on recent trends in Electronics and Communication Engineering in collaboration with industries for the benefit of faculty and students. The significant infrastructural design, well-equipped laboratories & hi-tech computers with high-speed internet facilities with all qualified faculty members ensure our department's world-class education. These are exciting times for Electronics and Communication engineers as the discipline is now widely recognized as a vital source of tools and techniques for advancements in almost all spheres of human.

Dr. Deepinder Singh

HOD, ECE

VISION AND MISSION

VISION

To develop the department into a full-fledged centre of learning in various fields of Electronics & Communication Engineering keeping in view the latest developments.

MISSION

The mission of the course is to turn out full-fledged Engineers in the field of Electronics Communication Engineering with an overall back-ground suitable for making a successful career either in industry/research or higher education in India and abroad.

PROGRAM OUTCOME (PO)

PO Number	PO Statement
PO1	**Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design/Development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct Investigations of Complex Problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	**The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long Learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

11TH INTERNATIONAL CONFERENCE

The ISTE Section Faculty Convention-2023for Engineering Colleges and 11thInternational Conference on Advancements in Engineering and Technology (ICAET-2023) was hosted by BGIET Sangruron November 23rd and 24th 2023.

The event was inaugurated by Prof Buta Singh Sidhu, EC Member, ISTE, New Delhi &Former Vice-Chancellor, MRSPTU, Bathinda on 23rd November in the presence Prof. R. P. S. Suker-Chakia, Section Chairman, ISTE, Dr. S K Gandhi Secretary ISTE SMC, Prof. Gurinder Pal Singh, Registrar MRSPTU Bathinda, Dr. Guninderjit Singh Jawandha Chairman BGGI, Sangrur, Dr. Tanuja Srivastava, Director BGIET and Dr. Sushil Kakkar Convener of 11th International Conference on Advancements in Engineering and Technology (ICAET-2023).

The ISTE Faculty Convention-2023 and ICAET-2023 dignitaries, participants and delegates were welcomed by Prof. (Dr.) Tanuja Srivastava, Director, BGIET, Sangrur. She mentioned that BGIET, Sangrur feel privileged in hosting such an event and thanked the ISTE for giving an opportunity to organize such a mega event in the campus. She also narrated a detailed note on ISTE convention and International Conference, which includes; number of paper registered, different category of awards to be presented, schedule for the upcoming 2 days.

On the second valedictory day of the 11th International Conference on Advancements in Engineering and Technology (ICAET-2023), the esteemed gathering was graced by the presence of two distinguished personalities in the field of academia: Dr. Manjeet Singh Patterh, Dean Research at Punjabi University, Patiala, and Dr. Vikas Chawla, Dean Academics at I.K. Gujral Punjab Technical University, Jalandhar.

The day commenced with the Six Technical Sessions of ICAET-2023, a platform that showcased a myriad of cutting-edge research and technological advancements. Scholars and experts from across the country converged to present their oral presentations, fostering an environment of intellectual exchange and collaborative learning.

Dr. Manjeet Singh Patterh, Dean Research at Punjabi University, patiala, with his experience and scholarly   achievements, emphasized the pivotal role of research in shaping the future of engineering and technology.

Dr. Vikas Chawla, Dean Academics at I.K. Gujral Punjab Technical University, Jalandhar, shared his perspective on the evolving landscape of academic excellence in engineering and technology.

The highlight of the event was the recognition of outstanding contributions through the Best Paper Award for the technical Sessions. Dr. Manjeet Singh Patterh and Dr. Vikas Chawla jointly presented this prestigious accolade to deserving participants, acknowledging their exceptional research and impactful presentations. The conference not only celebrated the achievements of the present but also paved the way for a future where engineering and technology continue to push the boundaries of innovation.

CULTURAL ACTIVITIES

BGIET's Tech Fest was a cultural extravaganza! Students showcased their diverse talents with vibrant performances, including Giddha, Nepali dance, Bhangra, a fabulous fashion show, and energetic Haryanvi dance. The cultural mosaic continued as African students joined the celebration, thoroughly enjoying the lively performances. A true fusion of global cultures, the event highlighted the richness of diversity within our campus.


"WE ARE WHAT WE REPEATEDLY DO. EXCELLENCE, THEREFORE, IS NOT AN ACT BUT A HABIT."

Aristotle
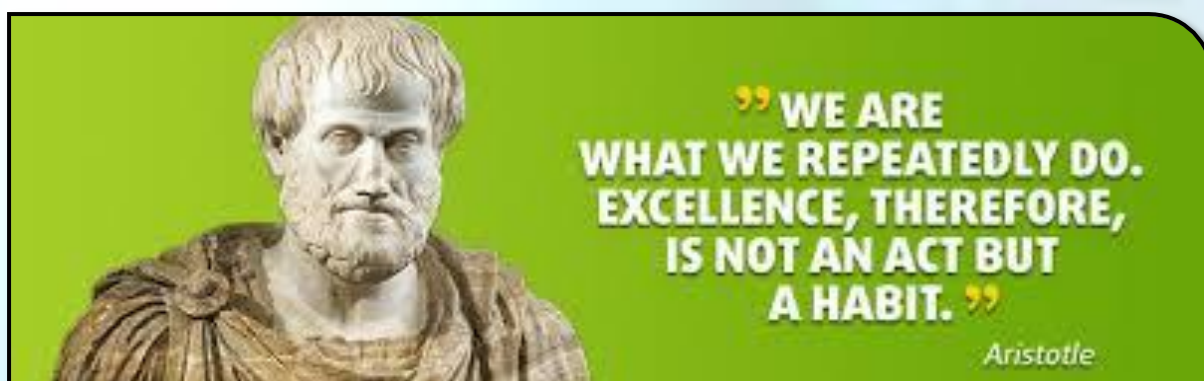
ARTICLES

MUTCOUPLING REDUCTION IN MIMO ANTENNA FOR UWB APPLICATIONS

In recent years, multiple-input-multiple-output (MIMO) antennas with the ability to radiate waves in more than one pattern and polarization play a great role in modern telecommunication systems. Now we see different mutual coupling reduction techniques in MIMO antenna systems. The increase in the mutual coupling can affect the antenna characteristics drastically, therefore, degrades the performance of the MIMO systems. It is possible to improve the performance partially by calibrating the mutual coupling in the digital domain. However, the simple and effective approach is to use the techniques, such as defected ground structure, parasitic or slot element, complementary split ring resonator and decoupling networks which can overcome the mutual coupling effects by means of physical implementation. An extensive discussion on the basis of different mutual coupling reduction techniques, their examples and comparative study is still rare in the literature. Mutual coupling defines as the energy absorbed by a proximate antenna when another antenna is radiating. Mutual coupling has a tendency to change the radiation pattern, reflection coefficient and input impedance of the MIMO antennas.
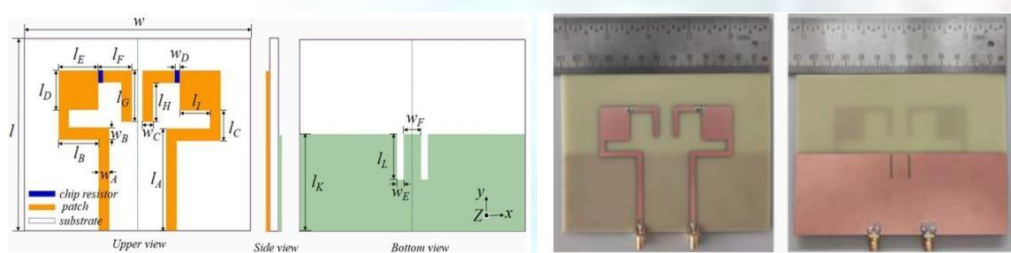
Antenna Simulation   Hardware Implementation

A monopole MIMO antenna with low mutual coupling is proposed in this article. This antenna is compact with the inter-element spacing of $0.075\lambda 0$. It has two elements, where each element is formed by a radiation patch with L-shaped stub. Therein, a chip resistor is embedded into the middle of patch and stub. The metal ground of the antenna is etched to form two slots as the DGS. Through utilizing these decoupling structures of subs, DGS and chip resistors, the designed array antenna obtains good isolation. Simulation and measurement results reveal that the antenna has the mutual coupling of − 36 dB and the ECC of 0.002 at resonance along with the peak gain of 4.03dBi. Such high-performance MIMO antenna could be applied in wireless routers, railway radio television network, offshore wireless communication and other fields with the need of multi-antenna.

Deepak Kumar

6th sem, 2101244

## WHOLE CLASS ATTENDANCE USING FACE DETECTION WITH RASPBERRY PI

Attendance is critical for both teachers and students in a learning environment. It is critical to maintain track of attendance since it reveals a student's consistency in attending classes and learning from the teachers in those subjects. In addition, the institute can keep track of students and notify parents on their children's behavior and punctuality. In some countries, students are not required to attend class, and the stipend is only awarded to pupils who passall of the previous year's examinations with no backlogs. Therefore, the students must studyon their own, or to simplify the learning process they must attend the classes. This type of approach is ideal for both students and educators. However, in most of the country's educational system, it is required to keep track of their attendance. When it comes to the traditional way of recording attendance in the classroom, we encounter some issues. Callingthe student's name or roll number for attendance is not only time-consuming but also needs a great deal of patience, with this manual process wasting at least 10 minutes. Furthermore, in a noisy environment, a child with hearing impairments may miss attendance, and as a result, parents are misinformed about their children. Various ways of attendance monitoringare now being used by some universities. One of these systems is the biometric technique. Despite being involuntary and a step ahead of the traditional method, it fails to meet the timeconstraint.

The method suggested can recognize faces from images as well as image frames from a video accurately. The used method can detect faces in unfavorable conditions like partially exposed regions of faces, crowded scenes and irrespective of the external factors such as haircut,bread, spectacles, etc.,

Methodology:

The proposed system meets the needs of accuracy, speed, and cost effectiveness. The used algorithms, CNN, used for locating faces, and k-NN, used for the facialfeatures classification is already proved to have an accuracy of 99.27%. and have low complexity in terms of computation.

Finally, in our method, we integrated the CNN object detection method for detecting faces in classrooms and deep residual learning for face recognition to overcome the problems faced with the current face recognition-based solutions. And we met our goal of faster execution time, less development time, simple data collection.
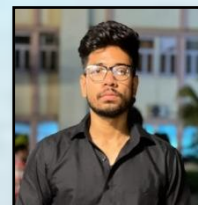
Sukhdev Singh,
6th sem, 2002023

"Never stop fighting until you arrive at your destined place — that is, the unique you. Have an aim in life, continuously acquire knowledge, work hard, and have perseverance to realize the great life."

- APJ Abdul Kalam

SMART CLASS

The classroom automation system is developed by the automatic switching of light and fan. The temperature will be above 40 degree Celsius in most regions during summer. It becomes very uncomfortable to live without a fan. In fact, a fan plays a major role in our households. For many people fan is the standard way of cooling down. Sometimes the individuals forget to turn off the light when they are out and this leads to wastage of electricity. Thus, we have decided to initiate a system that could save the electricity by automatic switching on and off the fan and light. Generally, our whole world depends on electricity which can be generated from the non-renewable resources like coal. But there exists a problem that we cannot store a huge amount of electricity. If these resources get extinct then there is no proper electricity for our future generations so we need to save it. So by doing this work, we can save some amount of electricity.

Methodology:
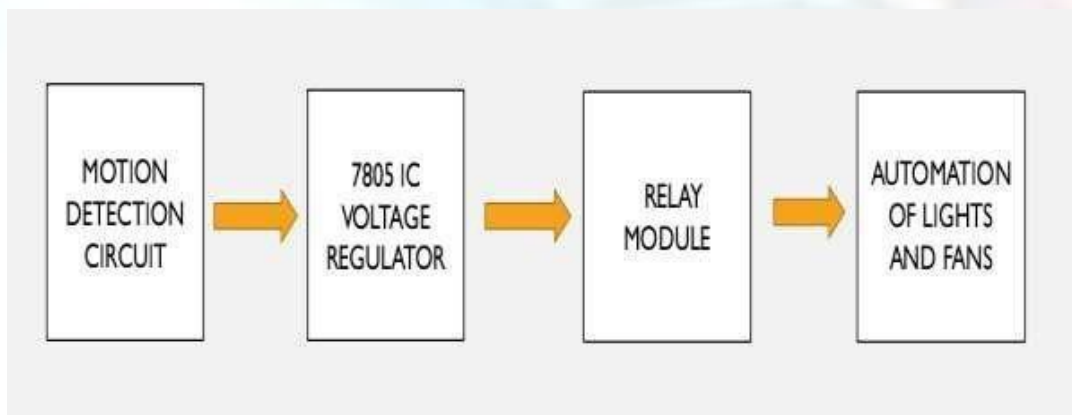
Block Diagram

The growing world is largely dependent on electricity. As there is usage there is also a lot of wastage. Conservation of Energy is important. A lot of electricity is also wasted in schools and colleges where students leave the class without turning of the lights and fans. Hence to deal with this problem a circuit is designed which works using a motion detector sensor (PIR SENSOR). With the help of this circuit lights and fans are turned on only when some student is under them and are turned off automatically when no person is near them, so that electricity consumption can be reduced and energy can be saved. Our proposed system mainly contains a Passive infrared sensor (PIR Sensor) which is an electronic device that measures infrared light radiations from objects in its field of view. PIR sensor is the most often used motion detector. Now when the person enters in to the PIR sensor region then it detects the motion of that person and it gives high voltage signal to the relay module.
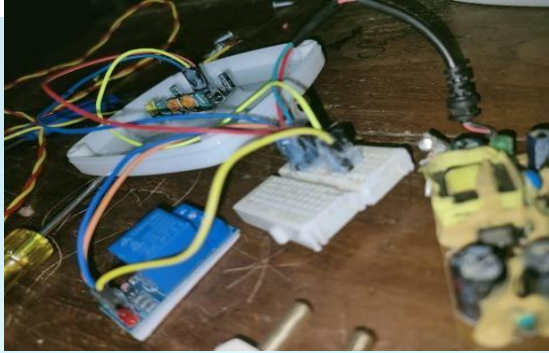
Hardware Connection   PIR Sensor testing
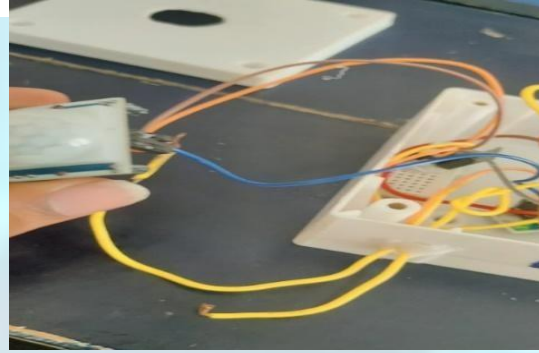
In the absence of person, the PIR sensor detects no motion and sends a low voltage signal to the relay module. When the relay module receives the high voltage signal from the PIR sensor then it turns on the lights and fans. When it receives the low voltage signal it turns off the lights and fans. Then the lights and fans are automatically turned on and off based on the signal received by the relay module from PIR sensor. So that a lot of power has been saved.

Imran Shabir,
4TH SEM, 2339452
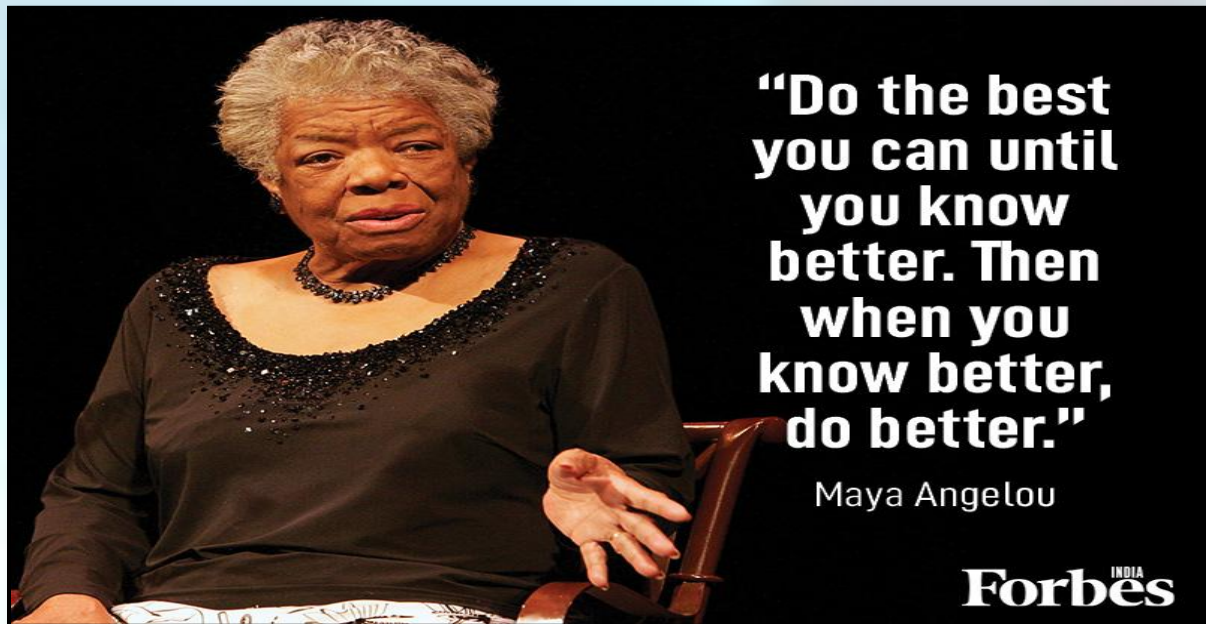
SCALABILITY ANALYSIS OF LORAWAN TECHNOLOGY

As there is continuous growth in the Internet of Things (IoT), the number of IoT application domains and deployments continues to increase. Market forecasts illustrating this growth estimate that the number of connected IoT devices will continue to grow at an annual rate of 32% and will reach 20.8 billion IoT end points by the end of this decade. Some of these novel IoT applications require low rate, long-range and delay-tolerant wireless communication at very low energy usage and cost. These types of requirements are hard to full fill using traditional machine to machine technologies such as cellular or WPAN. Low power wide area networks (LPWANs) are a new set of technologies that are designed to fill this gap in traditional technologies.

By combining low energy usage with long range communication, they promise to bring connectivity that suits large scale, low power, and low cost IoT deployments with battery lives up to ten years. LoRaWAN is an LPWAN technology that builds on top of the LoRa modulation scheme, which is developed by Sem-tech. The LoRa alliance has standardized LoRa radio usage in sub-GHz unlicensed spectrum for most areas in the world. By combining sub-GHz propagation and the LoRa modulation, LoRaWAN networks can cover large areas with only limited amounts of infrastructure. LoRaWAN networks are being deployed today.

Our modelling of LoRaWAN networks in ns-3 comprises a number of different elements. First, we will build an error model for the LoRa modulation for different code rates and spreading factors (SFs).

Second, we will develop a comprehensive implementation of the LoRaWAN standard in the ns-3 simulator with support for class A end-devices, multi-gateway networks and an elementary network server (NS). Third, we will conduct a scalability study focusing on the impact of confirmed versus unconfirmed messages and the impact of downstream traffic in large-scale LoRaWAN networks.

<div align="right">
Harpreet Singh,
6th sem, 2101245
</div>

GAS LEAKAGE & TEMPERATURE MONITORING SYSTEM

Rapid urban and economic development results in global warming, climate change, and energy imbalance ecosystem pollution and other forms of environmental contamination issues. The combustion of fuel creates carbon dioxide and both carbon monoxide and methane contribute to global warming. Sulphur dioxide and nitrogen oxide were also emitted. and particle matter are the most significant contributor's pollution in the air. The prototype's central concept is to save human lives from hazardous gas leakage accidents. We planned to build this prototype after reading several articles about the Bhopal gas tragedy and the Vishakhapatnam gas leakage incidents. The prototype relies heavily on GPS and GSM modules to track the location of the gas leak and send an alert message.

These two modules, along with the buzzer that alerts the surrounding area of the leakage-prone area, can be embedded in the Arduino UNO microcontroller. As a result, our prototype will be useful for both industrial and domestic purposes.

High population and urbanization growth rate raises the issue of air pollution in recent years. The
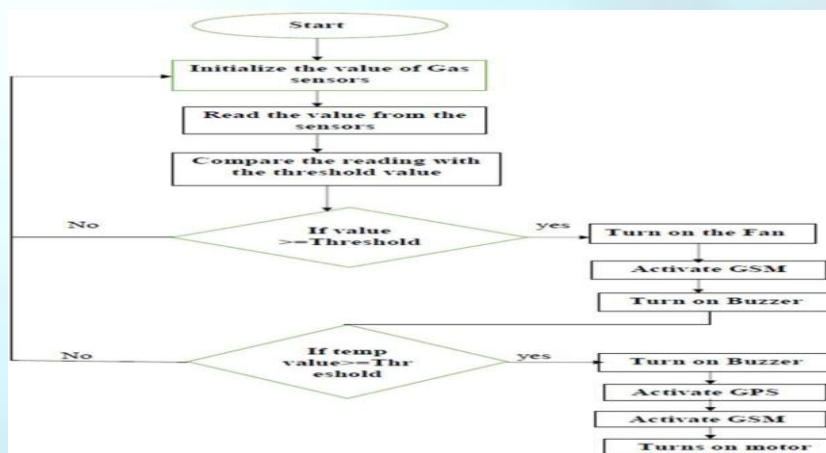
issue of air pollution has recently come to light due to rapid population and urbanization growth. Now that the project is being implemented, we are evaluating the air using gas, smoke, and flame sensors to see how the environment is. If poisonous gas is detected, the system detects it, activates the exhaust fan, sounds the bell, and then notifies the local authority and our neighbors. It aids in lowering the likelihood of accidents. In today's modern world, accidents are increasing on a day by day and fire- related mishaps are the most common, according to data. As we consider some of the previous fire accidents which are occurred due to the leakage of the gas.

Fig 3: Arduino Uno sample code

Fig 4: Exhaust Fan Prototype

So, in order to prevent accidents, we are developing a prototype that can be used to stop accidents by using a sensor that reads the value if the gas is detected then automatically the buzzer will ring and a message is sent to the concerned authority and if the fire catches up then it will turn on the motor that pumps the water and tries to reduce the fire and a message is sent to the concerned authority with the location tag.

Md Ajharul,
4TH SEM,
2201166

QUIZ

Questions

1. William Shakespeare is a scientist.

2. There are 200 bones in the Human Body.

3. Electrons are larger than molecules.

4. What causes the phases of the Moon?

5. What is the name of the closest star to Earth?

6. What is the launch date for Chandrayaan 3 mission?

7. What is the mission of Chandrayaan 3?

8. Which bank is called bankers Bank of India?

9. Which is largest animal on land?

10. Which is the largest flower in the world?

Answers

1. False (William Shakespeare was an English dramatist, poet, and actor).

2. False (206 bones are there in Human Body).

3. False

4. Sun's Light

5. Sun

6. July 14, 2023

7. To demonstrate a safe and soft landing on the lunar surface.

8. Reserve Bank of India

9. African Elephant

10. Rafflesia

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