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SENSEOTRONICS

The E-Technical Magazine..

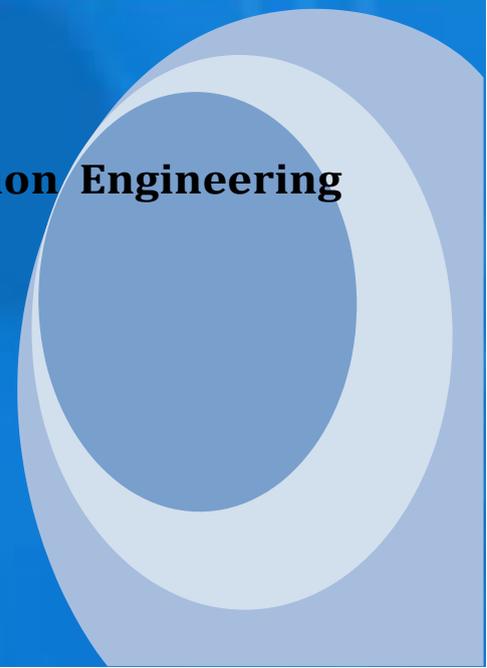


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Department of Electronics and Communication Engineering



Aditya College of Engineering
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Affiliated to JNTUK, Kakinada
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To be a center of excellence and renowned for Electronics & Communication Engineering education and research

MISSION

M1: Enlighten the graduates in the basic concepts underlying the principles of analog and digital electronics, communication systems and advanced technologies..

M2: Provide state of the art infrastructure and research facilities.

M3: Organizing industrial programs and social activities in collaboration with industries, NSS to disseminate knowledge.

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1. User cum eco-friendly smart parking lot

User cum eco-friendly smart parking lot is a project that helps to enhance the functionality of smart cities. Smart parking lots are mainly used for private parking spaces, hospitals, shopping complexes, public parking lots, offices, etc., to make the parking confusion free and less time taking. The smart parking system gives the privilege for the drivers to book the parking slots in advance and also in a conventional way, where we directly go to the lot without booking a slot. The aim is to automate and reduce time spent in search for proper and empty parking slot, spot and even lot. We can make smart parking lot even smarter by using energy in an efficient way. This model keeps check on the lights that glow in the underground parking only in the necessary paths and critical spots. Smart parking makes use of sensing devices which are the basic requirement for making the lot automatic. Strong sensing systems are deployed to examine analyze the data in real time. The system increases the efficiency of the parking lots with the use of sensors. The sensors placed in the slot sense if parking slot is occupied or vacant. This way we automate the parking lot.

The main challenges that the urban cities are facing are the traffic and parking problems. If we put a check to these problems that's it, half battle won. And this traffic and parking problems are inter-related like people not able to find a slot to park their vehicles is also the reason for traffic in the cities. Due to increase in vehicles day by day the demand for parking lots has also raised. This issue of finding the parking slot for our vehicle is at each and every place whether it is the shopping mall or companies or at the airport or in hospitals. It is said that on an average people spend about 20 minutes to find a parking for their vehicles, which leads to people parking their vehicles in the places where they are not supposed to and places which are not for parking. These results in some adverse situations disabling other vehicles to move freely and sometimes can cause large traffic jams further which would lead to many other vulnerable situations. There are valid reasons for people parking in places which are not designated for parking like no availability of slots, no proper utilization of spaces, poor planning and most importantly poor infrastructure and functionality of existing parking lots. According to a survey, drives looking out for empty parking space are the prime cause of traffic congestion and it accounts for about 30% of traffic in the city.

User cum eco-friendly smart parking lot is a project that helps to enhance the functionality of smart cities. Smart parking lots are mainly utilized in private parking lots, hospitals, shopping malls, public parking garages, offices, etc., to make the parking lots hassle free and less time consuming.

The smart parking system enables drivers to book the parking slots online (in advance) and also in a conventional way, where we directly go to the lot without booking a slot. Smart parking includes the use of real time data, low-cost sensors and applications that enables the users to find the parking slots easily. The aim is to automate the lot and reduce time spent in manually searching for the parking slot and even lot. We can make smart parking lot even smarter by using energy in an efficient way. This proposed model keep check on the lights that glow in the underground parking only in the necessary paths and critical point. Smart parking makes use of sensing devices which are the basic requirement for making the lot automatic. The use of sensors makes the lot function in an efficient manner. The sensors placed in the slots recognize if parking slot is occupied or vacant. Another efficient module is added to this project which works great for shopping malls, where we can collect the emails of the users and when the parking lot is about to fill we send a message bearing "The lot is filling fast", by this it will be even more easy for the users to know the status of the lot. This way we automate the parking lot.

- Precisely, the features that we have proposed in this methodology are: The parking lot is accessible to both the online users and normal conventional users as well.
- The lot is automated in such a way that it allots the slots to the users (offline and online) instinctively by getting the data from the sensors which are deployed at each slot to record the status of the slots.
- The functioning of the slot allotment is, for example: there are 4 slots in a lot and slot 1 is already filled and one of the users have booked slot-2 then if another user has entered the lot for a slot, then he will be allotted with slot-3 automatically.
- To authenticate whether the online booked user is the one who have booked or not, this model has used the field called passkey where the online user will be asked to give any random passkey while booking and while entering the lot he will as be asked to enter the passkey that he have given while booking, if entered correct access will be given otherwise the user will not be able to enter the lot.
- This parking lot have also been designed in such a way that if the vehicle has been parked in any other slot which has not been assigned to him then there will be error message thrown that the vehicle is parked in wrong slot.
- This parking lot has also been designed in an energy efficient way. Coming to underground parking there is the necessity to glow the lights 24×7, but there is no necessity to glow all the lights all the time. The lights can glow in the main passage and in the critical points only and in the other sub-passages the lights glow only when the vehicle enters that passage, this feature has been implemented using ultrasonic sensor.

➤ To make the users even more comfortable in knowing the status of the parking lot, we have implemented a feature like when the slots are almost filled like only one is left then we send a message to the user's mails that Parking lot is almost full.

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2. Advanced tracking system for alive human detection

Disasters cause social imbalance like unexpected deaths and injuries to humans and other living beings and also cause economic imbalance like property loss and food scarcity and can also cancel the progress of poverty reduction. This has a devastating impact on development and on our society. The disasters may be natural like floods, earthquakes or manmade like transportation and industrial accidents. However, we cannot stop any of the disasters from happening, but we can make them less damaging by saving more lives as much as possible.

People may get trapped in some places during disasters where they cannot jump out of that situation by themselves and need others to help them. Proper rescue and medication on time can save their lives. But manual detection of trapped people in those areas is a rigorous and time-consuming process. However, it is possible to detect those cornered people by using latest technologies. This approach may save plenty of lives by detecting the trapped people as soon as possible. At the same time, the rescue team can treat the detected people. This can save a lot of time since the detection and treatment of the injured persons takes place at the same time. We came up with an implementation called “Advanced tracking system for alive human detection” which is an automatic robotic vehicle that acts a transmitter. we implemented this robot using an Arduino uno micro-controller, a contactless IR temperature sensor, dc motors and quadruple half H-drivers and an LCD display.

Need for the tracking system:

In certain circumstances, it's anything but workable for the salvage group to face the challenge for looking of alive individuals to be available or not at the hour of fiascos. Thus, we chose this venture to make valuable for the poor people. A few times it is unsafe for entering the spots without knowing the presence of poor people. The gadget will permit one to recognize the alive human and the relating area will be shared to the salvage group through IOT.

- This task will notice the alive people during fiascos by utilizing Arduino.
- Contactless temperature sensor will recognize the alive human by the distinction between encompassing temperature and item temperature.
- With the assistance of contactless temperature sensor if temperature is close encompassing it is considered as an item if temperature is close to human temperature, it is considered as alive human.

- Once the alive human is recognized, the area is sent through IOT.
- Here GPS module is utilized to send location of the detected person.

It's anything but an incredible assistance to rescuers in location of living souls focused in unfortunate regions. Every one of the parts that are utilized in the equipment configuration are effectively accessible and the entire framework is cost productive. Here we are sending the temperature and area yet we can likewise send some other medical issue like heartbeat, beat pace of the recognized human to the beneficiary, so it will be not difficult to the rescuers to treat the patients on schedule. IoT frameworks permit clients to accomplish further computerization, examination, and joining inside a framework. They work on the range of these spaces and their precision. IoT uses existing and arising innovation for detecting, systems administration, and advanced mechanics.

KEY FEATURES OF IOT:

The main highlights of IoT incorporate man-made reasoning, network, sensors, dynamic commitment, and little gadget use. A concise audit of these highlights is given beneath:

Artificial intelligence - IoT makes essentially anything "keen", which is improving each part of existence with the force of information assortment, man-made calculations, and organizations. This means something as important as improving your cooler and cupboards to distinguish when drain and your number one cereal come up short, and then submit a request with your favored merchant.

Availability - New empowering advancements for systems administration, and explicitly IoT organizing, mean organizations are not, at this point only attached to significant suppliers. Organizations can exist on a lot more modest and less expensive scale while as yet being useful. IoT makes these little organizations between its framework gadgets.

Sensors IoT loses its differentiation without sensors. They go about as characterizing instruments - which change IoT from a standard latent organization of gadgets into a functioning framework able to do true combination.

Dynamic Engagement - Much of the present cooperation with associated innovation occurs through uninvolved commitment. IoT presents another worldview for dynamic substance, item, or administration commitment.

Little Devices - Devices, as anticipated, have decreased, less expensive, and all the more remarkable over the long run. IoT misuses reason assembled little gadgets to convey its exactness, adaptability, and flexibility.

LIMITATIONS

- The exact body temperature of humans can't be detected.
- The system can only take a straight path.
- Detecting humans is difficult in case of fire accidents.
- Can trace humans only for limited distance from sensor.

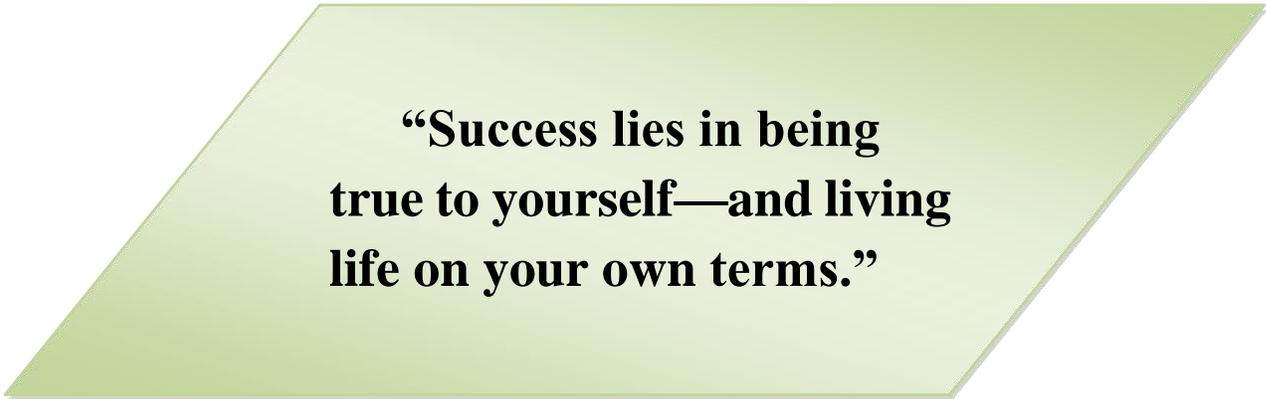
ADVANTAGES

- Finds most accurate location.
- Cost effective.
- Easy to build.
- Location is shared to mobile directly.
- Alerts rescue team about alive humans present.

APPLICATIONS

- It is used to detect whether any people are there in prohibited areas.
- Used to find locations of any person.
- Used to find if the body is alive or not.

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**“Success lies in being
true to yourself—and living
life on your own terms.”**

3.Introduction to antennas

An antenna or aerial is a metal device made to send or receive radio waves. An Antenna is a transducer, which converts electrical power into electromagnetic waves and vice versa. In the field of communication systems, whenever the need for wireless communication arises, there occurs the necessity of an antenna. Antenna has the capability of sending or receiving the electromagnetic waves for the sake of communication, where you cannot expect to lay down a wiring system. The following scenario explains this. In order to contact a remote area, the wiring has to be laid down throughout the whole route along the valleys, the mountains, the tedious paths, the tunnels etc., to reach the remote location. The evolution of wireless technology has made this whole process very simple. Antenna is the key element of this wireless technology.

An Antenna can be used either as a transmitting antenna or a receiving antenna.

- A transmitting antenna is one, which converts electrical signals into electromagnetic waves and radiates them.
- A receiving antenna is one, which converts electromagnetic waves from the received beam into electrical signals.
- In two-way communication, the same antenna can be used for both transmission and reception.

Many electronic devices like radio, television, radar, wireless LAN, cell phone, and GPS need antennas to do their job. Antennas work both in air and outer space. The word 'antenna' is from Marconi's test with wireless equipment in 1895. Antenna can also be termed as an Aerial. Plural of it is antennae or antennas. Now-a-days, antennas have undergone many changes, in accordance with their size and shape. There are many types of antennas depending upon their wide variety of applications.

Types of antennas

Antennas may be divided into various types depending upon –

- The physical structure of the antenna.
- The frequency ranges of operation.
- The mode of applications etc.

Physical structure

- Wire antennas
- Aperture antennas
- Reflector antennas
- Lens antennas
- Micro strip antennas
- Array antennas

Frequency of operation

Following are the types of antennas according to the frequency of operation.

- Very Low Frequency (VLF)
- Low Frequency (LF)
- Medium Frequency (MF)
- High Frequency (HF)
- Very High Frequency (VHF)
- Ultra High Frequency (UHF)
- Super High Frequency (SHF)
- Micro wave
- Radio wave

Mode of Applications

Following are the types of antennas according to the modes of applications

- Point-to-point communications
- Broadcasting applications
- Radar communications
- Satellite communications

Micro strip patch antenna

In telecommunication, a micro strip antenna (also known as a printed antenna) usually means an antenna fabricated using photolithographic techniques on a printed circuit board (PCB).^[1] It is a kind of internal antenna.

They are mostly used at microwave frequencies. An individual microstrip antenna consists of a patch of metal foil of various shapes (a patch antenna) on the surface of a PCB (printed circuit board), with a metal foil ground plane on the other side of the board. Most micro strip antennas consist of multiple patches in a two-dimensional array. The antenna is usually connected to the transmitter or receiver through foil micro strip transmission lines. The radio frequency current is applied (or in receiving antennas the received signal is produced) between the antenna and ground plane. Micro strip antennas have become very popular in recent decades due to their thin planar profile which can be incorporated into the surfaces of consumer products, aircraft and missiles; their ease of fabrication using printed circuit techniques; the ease of integrating the antenna on the same board with the rest of the circuit, and the possibility of adding active devices such as microwave integrated circuits to the antenna itself to make active antennas.

Patch antenna

The most common type of microstrip antenna is commonly known as patch antenna. Antennas using patches as constitutive elements in an array are also possible. A patch antenna is a narrowband, wide-beam antenna fabricated by etching the antenna element pattern in metal trace bonded to an insulating dielectric substrate, such as a printed circuit board, with a continuous metal layer bonded to the opposite side of the substrate which forms a ground plane. Common microstrip antenna shapes are square, rectangular, circular and elliptical, but any continuous shape is possible. Some patch antennas do not use a dielectric substrate and instead are made of a metal patch mounted above a ground plane using dielectric spacers; the resulting structure is less rugged but has a wider bandwidth. Because such antennas have a very low profile, are mechanically rugged and can be shaped to conform to the curving skin of a vehicle, they are often mounted on the exterior of aircraft and spacecraft, or are incorporated into mobile radio communications devices.

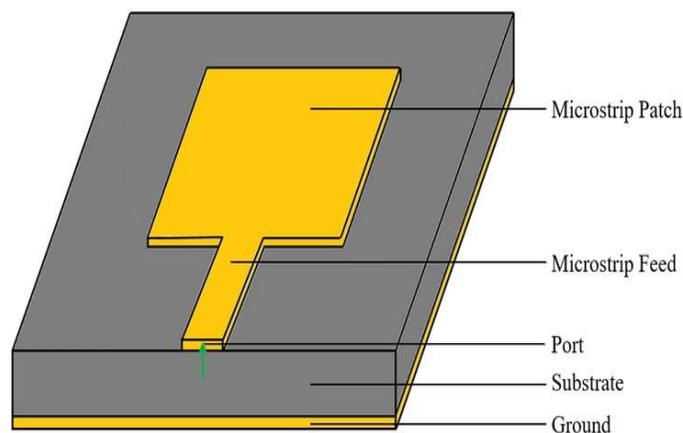


Fig 1. Structure of micro strip patch antenna

Substrates

Various substrates like foam, duroid, benzocyclobutane, roger 4350, epoxy, FR4, Duroid 6010 are in use to achieve better gain and bandwidth. A dielectric substrate is a insulator which is a main constituent of the micro strip structure, where a thicker substrate is considered because it has direct proportionality with bandwidth whereas dielectric constant is inversely proportional to bandwidth as lower the relative permittivity better the fringing is achieved. Another factor that impacts directly are loss tangent it shows inverse relation with efficiency the dilemma is here is that substrate with lower loss tangent is costlier. A clear pros and cons are discussed here of different substrates for judicious selection. A substrate gives mechanical strength to the antenna.

Substrates	ϵ_r	Loss tangent	Resonance frequency	Return Loss	Gain
Benzocyclobutane	2.6	0	2.04GHz	-18.124	5.5
Duroid 6010	10.7	.0060	2.455	-9.449	4.02
Nylon fabric	3.6	.0083	989MHz	-35.42	6.11
Roger 4350	3.48	.004	2.586GHz	-25.29	4.62
RT-Duroid	2.2	.0009	10GHz		12.03
Foam	1.05	0	454MHz	-16.732	2.73
FR-4	4.4	.018	5.8GHz	-14.73	9.8

Table 1: Comparison on Various Substrates of Antenna

Fabrication methods

Antennas can be fabricated using two methods. They are

- Photolithography process
- PCB prototype machine

Photolithography process

The format is made utilizing CAD devices and print out of the negative veil of the plan is made on a straightforward or a semi-transparent sheet. To expel impurities from the metallization of the substrate, it is cleaned with acetone. A blend of photo resist and slenderer in the proportion 1:1 is made and covered over the substrate. In the wake of drying, the veil is put over the substrate and is presented to the UV light. The uncovered substrate is then plunged in the developer solution for solidifying the photo resist in the uncovered part. The covered segment must be expelled. The substrate is plunged in the dye in order to show signs of improvement perceivability of the uncovered photo resist and washed utilizing water. The undesirable copper portions are evacuated utilizing the etching procedure utilizing Ferric chloride. FeCl_3 disintegrates the unexposed copper covering. Photolithography process is shown.

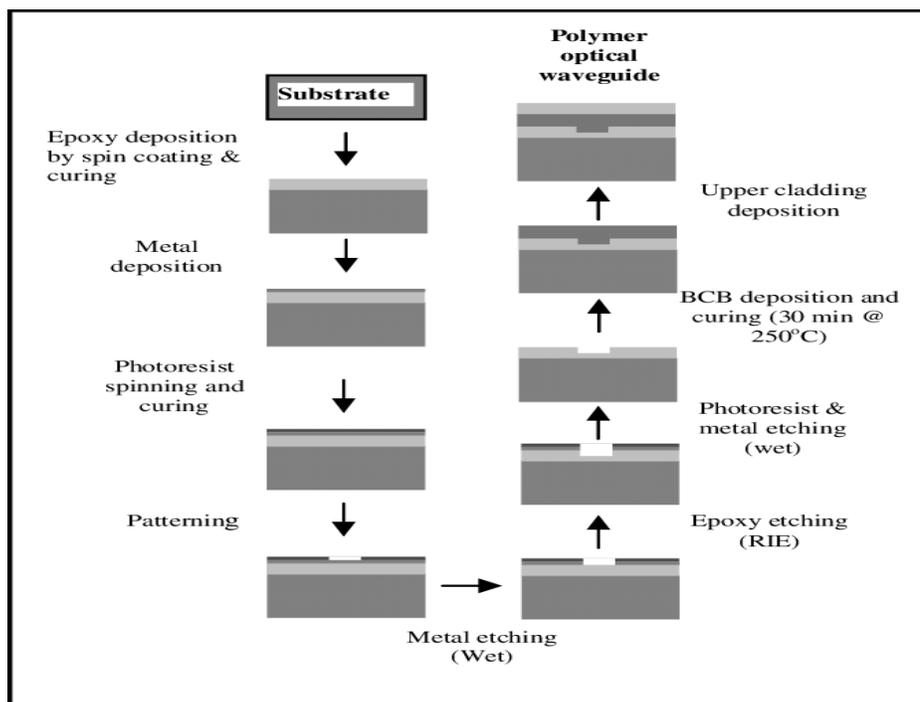


Fig 2. Photolithography process

Hardware implementation of designed antenna is done using PCB Prototype machine which is the process of removing the areas of copper from a sheet of substrate material i.e., printed circuit board to recreate the structures according to the designed antenna from HFSS simulation software. PCB milling is a non-chemical process and it can be done in a lab environment without exposure to hazardous chemicals.



Fig 3. PCB prototype machine

Simulation tool used

HFSS is the industry-standard software for S-parameter and full-wave SPICE extraction and for the electromagnetic simulation of high- frequency and high-speed components. HFSS is widely used for the design of on-chip embedded passives, PCB interconnects, antennas, RF/microwave components, and high-frequency IC packages.

Applications of HFSS

HFSS is utilized in different field to mimic and get required examples. Some of them

- Antennas
- Microwave advances
- Waveguide segments
- RF channels
- Three-dimensional discontinuities

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4. Real-time face mask detection and thermal screening

COVID-19 is an illness caused by the SARS-CoV-2 corona virus, which is a novel corona virus. Following a report of a cluster of cases of 'viral pneumonia' in Wuhan, People's Republic of China, WHO first heard of this new virus on December 31, 2019. The majority of persons who have symptoms (about 80%) recover without the need for hospital care. About 15% become very unwell, requiring oxygen, and 5% become critically ill, requiring intensive care. Respiratory failure, acute respiratory distress syndrome (ARDS), sepsis and septic shock, thromboembolism, and/or multi organ failure are some of the complications that can lead to mortality. People over the age of 60, as well as those with underlying medical conditions such as high blood pressure, heart and lung disease, diabetes, obesity, or cancer, are more likely to develop serious illnesses. COVID-19, on the other hand, can affect anyone at any age, causing significant illness or death. Whether or not they need hospitalization, some persons who have had COVID-19 continue to have symptoms such as tiredness, respiratory, and neurological issues. WHO is collaborating with our Global Technical Network for COVID-19 Clinical Management, researchers, and patient groups throughout the world to plan and conduct studies of patients who have progressed beyond the acute phase of their illness. Simple precautions such as physical separation, wearing a mask when separation is impossible, keeping rooms well aired, avoiding crowds and close contact, frequently wiping your hands, and coughing into a bent elbow or tissue will help you stay safe. Inquire about local guidance in the area where you live and work. Complete all of the tasks. The most prevalent COVID-19 symptoms are:

- Fever
- Coughing that is dry
- Fatigue

Other less prevalent symptoms that may affect some patients include:

- Taste or olfactory loss
- Congestion in the nose
- Conjunctivitis is a condition that affects the eyes (also known as red eyes)
- A scratchy throat
- Headache
- Pain in the muscles or joints
- Various types of skin rashes

- Vomiting or nausea are both symptoms of nausea
- Diarrhea
- Dizziness or chills

Whenever feasible, anyone with symptoms should be checked. People who have had close contact with someone who is, or may be, sick but do not have symptoms should also consider testing – call your local health guidelines and follow their advice. While waiting for test results, a person should isolate themselves from others. When testing capacity is limited, tests should be performed first on those who are at higher risk of infection, such as health care workers, and those who are at higher risk of serious sickness, such as the elderly, particularly those who live in senior residences or long-term care facilities. In the majority of cases, a molecular test is performed to detect and confirm SARS-CoV-2 infection. The most common molecular test is polymerase chain reaction (PCR). A swab is used to collect samples from the nose and/or throat. By multiplying viral genetic material to detectable quantities, molecular assays detect virus in a sample. As a result, a molecular test is utilised to establish the presence of an active infection, usually within a few days of exposure and around the time symptoms appear.

Rapid antigen tests (also known as rapid diagnostic tests or RDTs) are used to identify viral proteins (known as antigens). A swab is used to collect samples from the nose and/or throat. These tests are less expensive than PCR and provide findings faster, but they are often less reliable. When there is more virus circulating in the population and when a sample is taken from an individual when they are most infectious, these tests function best. If you think you might have COVID-19, call your doctor or the COVID-19 hotline for information on when and where to receive a test, how to stay at home for 14 days away from people, and how to keep track of your health. If you experience shortness of breath, chest pain, or pressure, seek medical attention at a health facility right away. For directions to the appropriate health facility, call your health care provider or a hotline ahead of time.

PREVENTIONS TO PROTECT FROM COVID-19

- A. Face mask
- B. Temperature check
- C. Sanitization

Face mask:

In the case of a virus transmitted by sputtering (spraying), it appears that wearing a face mask is necessary to protect people and restrict illness spread. The corona virus pandemic of 2019-20 is presently underway. COVID-19 (corona virus disease 2019) is an infectious disease with flu-like symptoms at first.

COVID-19 originally appeared in China, then soon spread over the rest of the world. When compared to the flu, COVID-19 is considered to be very contagious. We offer a face mask recognition model in this research that detects whether or not a person is wearing a face mask in real time.

Temperature check:

The infrared radiation generated by all materials at temperatures above absolute zero, (0° Kelvin), is detected by an infrared in temperature probe, which measures temperature. A lens focuses infrared (IR) radiation on to a detector, which transforms the energy to an electrical signal that can be shown in temperature units after being corrected for ambient temperature change. This setup allows for temperature measurement from a distance without having to touch the thing being monitored. As a result, the infrared temperature sensor can be used to measure temperature in situations where thermocouples or other probe-type sensors are unavailable or, for a variety of reasons, do not produce accurate data. The object to be monitored is moving; the object is surrounded by an EM field, as in induction heating; the object is enclosed in a vacuum or other controlled atmosphere; or the object is used in applications that need a quick reaction.

Designs for an infrared thermometer (IRT) have been around since at least the late 1800s, and Charles A. Darling (1) incorporated some of Fry's notions in his 1911 book "Pyrometry." However, the technology to transform these notions into practical measurement equipment did not exist until the 1930s. Since then, the design has evolved significantly, and a significant amount of measurement and application expertise has been accumulated. The approach is currently well-accepted and widely employed in both industry and research. The Fahrenheit ($^{\circ}$ F) scale, the Celsius ($^{\circ}$ C) scale, and the Kelvin (K) scale is the three most widely used temperature scales in the world today. The thermocouples, resistive temperature devices (RTDs, thermistors), infrared radiators, bimetallic devices, liquid expansion devices, molecular change-of-state, and silicon diodes are the seven primary types of temperature measurement sensors, Thermocouples, Resistive temperature measuring devices, Infrared Sensors, Bi metallic Devices, Thermometers, Silicon Diode, and Change-of-state Sensors.

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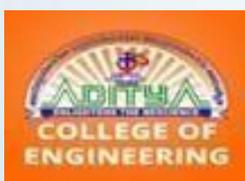
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Editorial

Predicting whether a big wave is small is coming or small wave in a ocean is very difficult to predict. Even whatever wave comes cannot stay over longer time. In our life, that is like ocean often we encounter situations that worry us lot. Mere knowledge in the mind that nothing is forever, can bypass the all odds like a passing cloud. A wise and stabilized man will experience the difficulty and plan for the same for the future. This is needed for over selves, for people who brought up and finally who rely on us. So get all the arms in hand, be confident and stand straight to fight the war, to surf in the roaring ocean. Be like a full stack developer who can handle all types of databases, servers, clients and system engineering.

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