

CENTRE FOR INTERNET OF THINGS

About the Centre

Centre for Internet of Things was established during the academic year 2017-18. Centre for Internet of things (CIoT) enables students to acquire knowledge in IoT domain. Students are motivated to implement their innovative ideas into a prototype IoT solutions using embedded development platform.

Objectives of the Centre

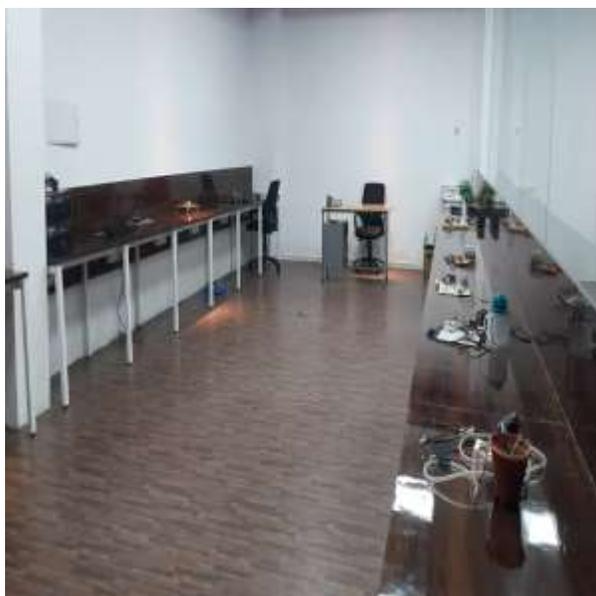
- To impart working knowledge in Internet of Things to all our students to train them at par with the requirement of the nation to become technocrats as well as entrepreneurs in IoT technology
- To identify research opportunities in IOT domain.
- To develop expertise in the field of IoT and transfer technologies to industries.
- To conduct and organize various Technical seminars/workshops in the field of embedded systems and IoT.

Facilities Available

The Centre for IoT (CIoT) is equipped with the following boards

- Aurdino Uno
- Aurdino Nano
- Nodmcu
- STM 32
- ARM freescale boards
- Texas Instruments Launch pad CC3200 LAUNCHXL
- Texas Instruments Launch Pad Tiva C Series
- Texas Instruments Robotics Car
- Intel Galileo
- Sensors

The above facilities are used to design and develop IoT systems for various applications such as agriculture, health monitoring systems, autonomous vehicles, connected cars and home automation.



Faculty Members

S. No	Name of the Faculty	Specialization
1.	Dr.S.Manjula, (Centre Incharge)	VLSI and Embedded Systems
2.	Ms. Nami Susan Kurian, (Centre Incharge)	IoT and Wireless Sensor Networks
3.	Dr.H.Sivaram	Antenna and Embedded Systems
4.	Ms.A.Vanathi	Antenna and Embedded Systems
5.	Ms.V.Chinnammal	Antenna and IoT
6.	Ms.V.Subashini	IoT and Wireless Sensor Networks
7.	Mr.A.Balaji	Antenna and Embedded Systems
8.	Ms.Malarvizhi	Antenna and Embedded Systems

Enrolled Students list

S. No.	Roll no.	Name of the student
1	202006035	SARANYA V
2	202006024	T PARKAVI
3	202006027	E.S.RAMAPRIYA
4	202006037	SHARMILA.D
5	202006023	MUGILAN.E
6	202006043	VARSHA.M
7	202006039	SNEHA M
8	202001096	NITESH KUMAR L
9	202001115	RANJIT J
10	202001112	RAMANATHAN R
11	202002069	M.VIDYASAGAR
12	202002026	KISHORE C D
13	202006006	CYNTHIYA S HERMALIN
14	202002053	G.S.SANTHOSH RAGHAV
15	202002051	SANJAI
16	202002063	SURYATEJA.P
17	201902003	AMIRTHAVALLI M
18	202002066	VAMSI.R
19	201902006	BALA SONA B
20	201902002	ADITHYAN P

S. No.	Roll no.	Name of the student
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22	201902099	YOGESH SAI. J
23	202002069	VIDYASAGAR M
24	202002080	M.LOKESHRAJA
25	202002033	NAVEEN D
26	202002030	MONISH V
27	202002026	KISHORE C D
28	202002008	BRINDHA S
29	202002004	ARAVIND GOSH S
30	202002076	YUVARAJ SABARI R
31	202002011	DEEPAK KUMAR D
32	202002015	DHIVYADHARSHINI P
33	202002025	KESHNI M R
34	202002015	DHIVYADHARSHINI P
35	202002018	GAYATHRI N R
36	202002016	DIVYA R
37	202002007	BHARATH K
38	2002002012	DEEPAK.L
39	202002035	PARUCHURI PAVAN
40	202002043	ROUSHITH M

S. No.	Roll no.	Name of the student
41	202002023	KAMALESH M
42	202002013	D.S.DEETYA
43	202002024	KARTHIKEYAN S
44	202002030	MONISH V
45	202002014	DHANUSHPRAKASH V C
46	202002003	ARAVIND B
47	202002019	GOKUL KRISHNA. M
48	202002064	THARUN .J.L
49	202002047	SAKTHIVELAN
50	202002010	DEEKAN S
51	202002027	KISHOREKUMAR R
52	202001028	BHARAT RAJ K
53	202002046	SAKTHIVEL S
54	202002031	S MUGULSUNDAR
55	202002001	R AKSHARAA
56	202002044	THATHAMCHETTY SAI SUSHANTH
57	202002022	JANARDHANAN S
58	202001162	S.VIGNESH KUMAR
59	202001162	S.VIGNESH KUMAR
60	202002028	KRITHIKA K

S. No.	Roll no.	Name of the student
61	202002037	POOJA.E
62	202001096	NITESH KUMAR L
63	202002071	VIJAYAN A
64	202001163	VIGNESH U
65	202006017	MANOJ J
66	201902031	JANANI N
67	201902004	ASHIKA R J
68	202001112	RAMANATHAN R
69	202002073	VISHNUVARDHAN D
70	202002075	YUVAN SAI P S
71	201902034	KAMALESH D
72	201902010	BUVANESWARI M
73	201902017	GANESH KUMAR K
74	202002065	M.THIRUNETHRA
75	202002086	G.KAVIYA
76	201902079	SINGAREDDY MANEESH
77	201902090	THARUN KUMAR S
78	201902072	SANJAY KUMAR V
79	201902095	R.VENKATESHAN
80	201902099	YOGESH SAI. J

S. No.	Roll no.	Name of the student
81	201902025	HARISH V
82	201902057	NITIN J
83	201902058	POLAKI SANDEEP KUMAR
84	201902055	NITHARSHAN N
85	201904006	G.ARUNKUMAR
86	201902041	LAVANYA S
87	201902073	SANTHIYA B
88	201902047	MANASA PADHY
89	201904018	NARASIMHAN K S
90	201904008	HARI KRISHNAN M
91	201904018	NARASIMHAN K S
92	201902030	JANAKIRAMAN S
93	201902059	PRANITA R
94	201902068	SAI ANANTHA LAKSHMI.K
95	201902086	SUSHMITHAA S
96	201902092	VANISHREE.P
97	201902051	MOHANA PRIYA K
98	201904028	THAMEEZUDEEN T

Publication Details

15 articles have been published in reputed Journals.

Name of Faculty	Title	Name of the Journal	Impact Factor	SCI/ Scopus
Mr. A.Balaji	Smart Kitchen Wardrobe System Based on IoT	IEEE Proceedings of the International Conference on Smart Electronics and Communication (ICOSEC 2020)	-	Scopus
Mr.Senthil Kumar K	A Portable Real Time Cardiac Health Care Supporting System Using Iot	International Journal of Mechanical and Production Engineering Research and Development	-	Scopus
Mr. L. Saravanan	Detection of software intrusion based on machine learning techniques for IOT systems	Materials Today: Proceedings	-	Scopus
Dr.I.Chandra	Optimization Techniques for Detection and Recognition of Plant Leaf Diseases Using IOT and Image Segmentation	GEINTEC	-	Scopus
Dr.I.Chandra	A Survey on Plant Leaf Disease Identification Techniques	Annals of R.S.C.B	-	Scopus
Ms.A.Vanati	An IOT based Rail Track Condition Monitoring and Derailment Prevention System	International Journal of RF Technologies	-	Scopus

Ms.C.Malarvizi	IoT Based Farm Housing Using NPK Sensors	Annals of R.S.C.B.	-	Scopus
Ms.Nami Susan Kurian	IoT based Wireless Notice Board Using Raspberry Pi	International Conference on Artificial Intelligence for IOT and Sustainable Electrical Networks	-	Scopus
Ms.R.Aruna Jayashree	Smart Agronomy Using LoRaWAN Technology For Porosity Analysis	International Conference on Artificial Intelligence for IOT and Sustainable Electrical Networks	-	Scopus
Mr.Franklin Telfer	Design and Analysis of sickle shape patch antenna with flexible non-woven material for IoT applications	International Conference on Advanced Computing Technologies and Applications	-	Scopus
Ms.K.Jayamani	Design of Wearable Reconfigurable Antenna for IoT Applications	IEEE International Conference on Advancements in Electrical, Electronics, Communication, Computing and Automation	-	Scopus
Dr.S.Manjula	GPS Tracking Traffic Management System Using Priority Based Algorithm	IFIP Advances in Information and Communication Technology Lecture series	-	Scopus
Mr.Rahul Krishnan	IoT for Precision in Agricultural System	AIP Conference Proceedings	-	Scopus
Dr.G.Shanthi	Metaheuristics Based Node Localization Approach for Real-Time Clustered Wireless Networks	Computer Systems Science & Engineering	1.486	SCI

Dr.S.Manjula	Design of low-power CMOS transceiver front end for 2.4-GHz WPAN applications	Sādhanā	1.214	SCI
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Patents Details

S.No.	Title	Application Number	Status
1.	A System and A Method For Real Time Dynamic Traffic Management By The Utilization Of GPS and IOT	202141061430 A	Published
2	Smart Vehicle Locking and Theft Identification System	202041054167 A	Published
3	An IoT Based Pollution Control and Safety for Compressed Natural Gas Fuel Based Vehicles	202041044694 A	Published
4	Smart Cost Sanitizer Spray Machine	202041022832 A	Published

Details of Industry/Academic Mentors

S.No.	Industry/Academic Mentors	Name of the Industry/Institution	Expertise
1.	Mr.M.E.Senthil	Kone Elevator India Private Limited 	Embedded Systems
2.	Mr.Hareesh	Texas Instruments 	Microcontrollers and Embedded Systems
3	Dr.M.D.Selvaraj	IITDM Kancheepuram	Wireless Communication

Details of MoUs

S.No.	Name of the Industry	Date of MoU	Linkages
1.	Kone Elevator India Private Limited	02.09.2022	Student Internship in Embedded Systems
2.	Tesla Minds	01.12.2017	Consultancy Projects

Details of Completed/Ongoing Projects

1.Healthcare

Health Monitoring System and Supervised Anomaly Detection Using Advanced Smart IoT Based Technology

This project is used to monitor the health of the person routinely and based on the data, the person is advised medically and thereby we can prevent serious health issues before it reaches critical state. The person is monitored by checking Temperature, Oxygen saturation (Spo2) and Pulse rate periodically. These sensors take the reading from the person and the measured data is given to our embedded system for further process. Then based on the range of values given for each parameters, if the data is below or above the given range, then message will be sent to the Patient guardian and Personal doctor through SMS. The Data will be also sent to Health care professional through cloud/wireless platform for further Health proposal. If the person is normal means the values will be stored to the cloud for future purpose. This advanced Health monitoring system is useful for many old age persons and during the pandemic situations like COVID.

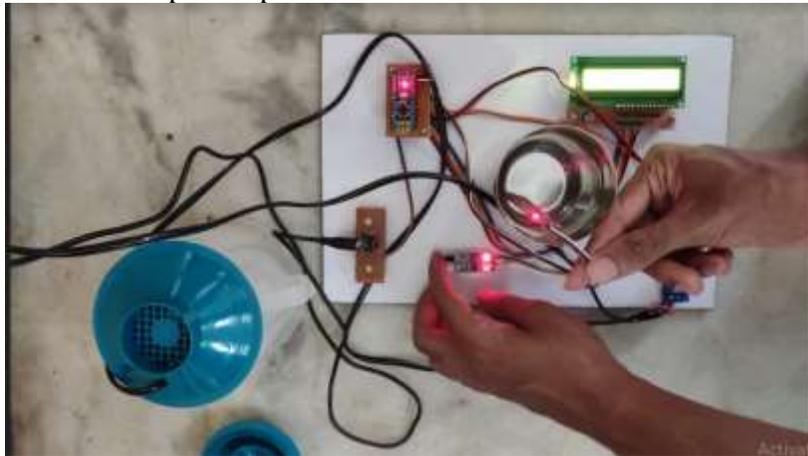


IOT based OCR for visually impaired/elderly people in a smart trolley

To date numerous methods had been proposed to enhance the life style of visually impaired and blind people. Still purchasing products in the supermarket without others support is tricky one for them. In this project we are looking into integrating an application specific implementation of OCR (Optical Character Recognition) along with a Tesseract Algorithm (open source machine learning algorithm) that can help visually challenged people / elderly people shopping in a supermarket .Also this system does automated billing when the product is selected for purchase.

Automatic Vaporizer for Steam Inhalation

Steam inhalation is one of the most recommended age-old home remedies used extensively to calm and open the nasal passages and get respite from the common cold or a sinus infection. It is also called steam therapy in which we inhale water vapor. The existing electric steam inhaler also called a vaporizer is readily available, which is simple and handy to use. But, many users using this vaporizer for more than 10-15 minutes per session and they are not monitoring the water level. If the vaporizer is used for more than 10 – 15 minutes, it is not safe for the user as well as the water getting dried which in turn damages the vaporizer. In order to overcome these drawbacks, we proposed a low-cost automatic vaporizer steam inhaler for public places.



2. Home Automation

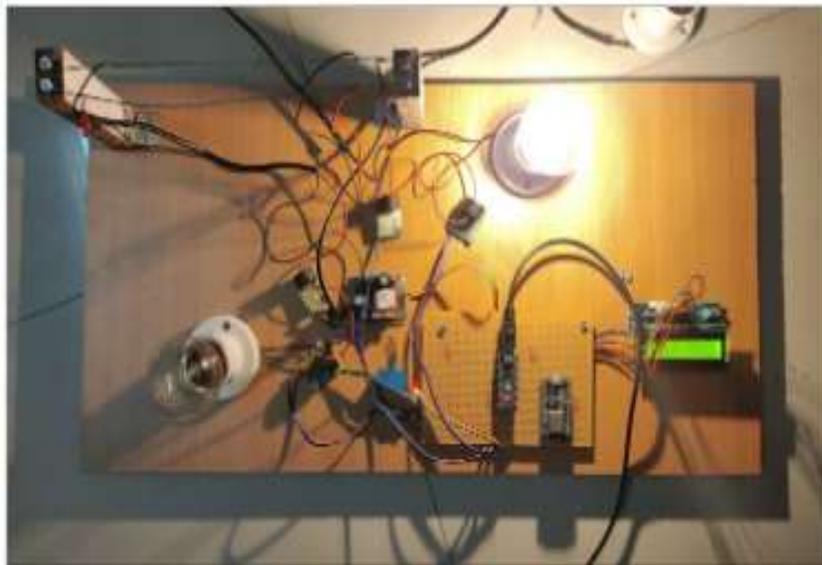
Intruder alert system using IOT

The security is a scenario in which objects, animals or people are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. The security system is the communication of anything with any other thing, the communication mainly transferring of usable data, for example, a sensor in a room to monitor and control the temperature. Theft of valuable objects is some of the never-ending problems in the world. Several detecting devices are already available in the market today. Example of such is to provide an alarm which can be activated using a remote control. Unfortunately, these devices had no provision to automatically detect theft attempts by alarming the owner. To solve this problem, Camera footage-based theft detection will be used in this project with the help of image processing

to detect theft occurrence. The system will capture the image frames and by comparing the two frames, it will be able to detect motion and immediately an alert message and call will be sent to the owner along with the captured image.

Smart energy monitoring and theft detection using IOT

Every year, electricity thefts increase in both domestic and industrial domains, affecting the country's economic status. Several wireless communication methods are available to detect power theft, however they lack the necessary infrastructure to be used. The project's goal is to create a system for monitoring power consumption by load and detecting and eliminating power theft in transmission lines and energy meters. This initiative also focuses on transmitting theft information to the Electricity Board (EB) via IoT. Because a network of linked devices, such as sensors, can exchange real-time information over the internet, it is possible to exchange real-time information. The Arduino Nano is used in this project to detect power theft and send commands to the GSM and Wi-Fi modules, which send the theft information message to EB. This system's deployment will assist in saving a significant quantity of electricity.

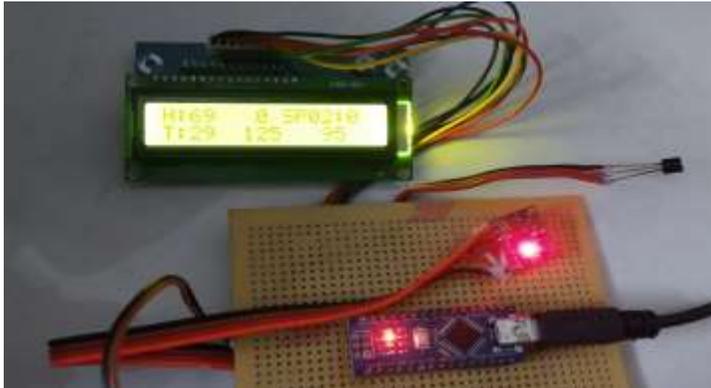


3. Connected Cars

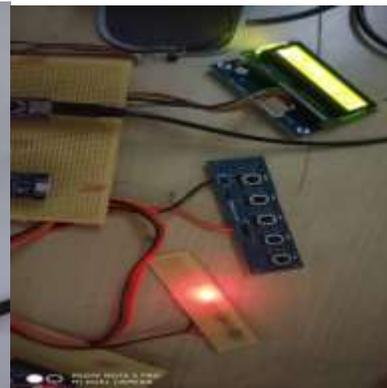
3.1 Smart Ambulance with Automatic Traffic Control System

Smart ambulance with automatic traffic control system helps to deal with traffic congestion that may occur during the arrival of the ambulance. To solve this issue a LoRA module-based system is proposed which can regulate the traffic signal at the junction when an ambulance passes by. The LoRA transmitter fixed inside the ambulance will get paired with the receiver which is set in the signal as the vehicle enters within the range. Also, the details of patients like pulse, oxygen level, temperature, and blood pressure can be accumulated using various sensors like oximeter, temperature sensor, and blood pressure sensor will be sent to nearby hospitals via IoT cloud. During the arrival of multiple

emergency vehicles, the prioritizing vehicle algorithm is used based on the severity of the patient.



Ambulance Module



Traffic Signal Module

Self Driving Vehicle Using Machine Learning

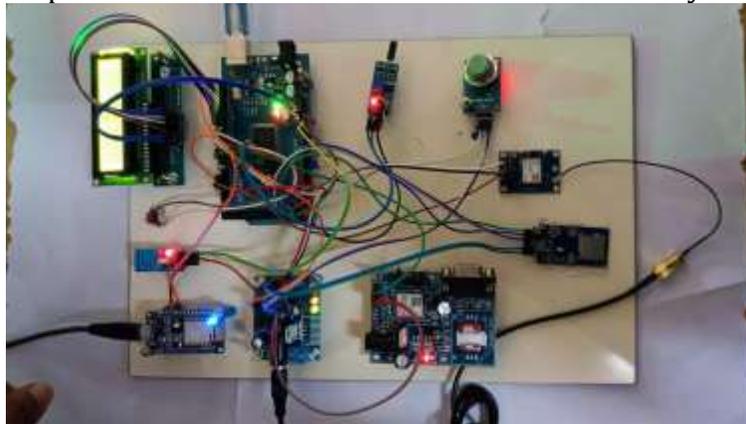
An autonomous car in this modern world is rendered costly and complicated for a small-scale commercial use. It is possible if only the required modules to operate a vehicle are used and a small self-driving vehicle can be operated in a small confined space for example in a warehouse. In this project, the goal is to develop a system for such a self-driving car which uses two modules, an obstacle detection and avoidance module and a lane detection module. The obstacle detection and avoidance module make use of an ultrasonic sensor connected to the vehicle which detects the obstacles and the controller instructs the vehicle based on the obstacle's position size etc. In the lane detection module, a camera module recognizes images from the actual world using image detection and the OpenCV Python Library to detect lanes. The decisions made by the vehicle is based on a machine learning algorithm known as reinforcement learning algorithm. A reinforcement learning mechanism is utilized to avoid collisions and make decisions based on the scenario. Q learning is used to make decisions in one of the following directions based on the object's position, size, and distance from the vehicle. Right, left, forward, or stop are the options, which are then followed by sending a signal from the Arduino to the vehicle's controller, which causes the vehicle to proceed in the appropriate direction without colliding.



Detecting the object and changing its path

Automotive based smart black box system using IOT

Accidents claim the lives of millions of people. The primary goal of this work is to give vehicle safety and a system that alerts the driver to be cautious automatically. In this Project, we employ IoT technology to continually monitor vehicle performance and driver behaviour utilising sensors. The alerts are sent to emergency contacts and shown on the LCD Display when the driver's alcohol consumption hits the maximum limit. This Project discusses the composition and performance of a sophisticated controller system of automobile recording machine. The system cannot solely record the most driving information of the automobile comprehensively and accurately in period, however additionally re-construct the accident with information method code, which may facilitate folks analyse the accident quickly and lawfully when a collision. The SD card module is used to take a log of sensor parameters which is continuously monitored by a controller and the system will update the information whenever an abnormal system event happened.



Traffic Management Based Air Pollution Monitoring System

Vehicles are the most significant source of air pollution. Population growth and urbanization have resulted in a concentration of people in specific areas. The use of heavy transportation may result in Inhaling contaminants because of low air quality. Heavy transportation may lead to poor air quality and inhaling pollutants for a long time also causes damages in human health. The main objective of this project is to introduce an equipment which manages the road traffic based on monitoring the air pollution level by pollutant gas sensor. In this work an Analytical Hierarchy Process has been employed to select the polluted road junctions and then the sample air is taken by the gas sensor and it will compare to the threshold value when the Environment air is above the threshold value. the buzzer indicates to the traffic police to clear the traffic and reduce the pollution in that area.

4. Agriculture

Io Based Precision Agriculture

The project proposes the software of cloud primarily based totally IOT with inside the agriculture domain. Precision agriculture is essentially an idea which insists to offer proper quantity of assets at and for specific period of time. These assets may be any matters which include water, light, insecticides etc. To put into effect precision agriculture the advantages of IOT has been applied with inside the proposed paper. The essential concept is to feel all of the required parameter from the agriculture area and take required choice to govern the actuator. These agriculture parameters are Soil Moisture, Temperature & Relative Humidity around plant, rain sensor. Based at the analysing sensed through the sensor

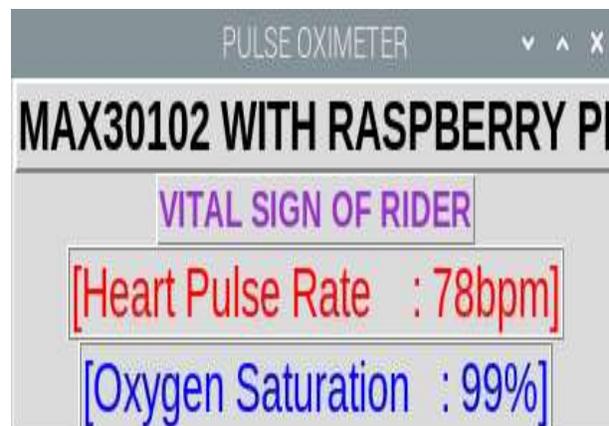
appropriate motion is taken i.e. irrigation valve is actuated primarily based totally on soil moisture readings, valve for fog is actuated primarily based totally at the Relative humidity(RH) readings etc. This paper proposed the improvement of the sensor node able to measuring most of this parameter and developing the actuation sign for all of the actuator. On pinnacle of that sensor nodes also are able to sending this statistics to cloud.

Aquaponics Using IoT (TNSCST Project)

To fulfil the demand of food products and aquatic products, Aquaponics is introduced as a farming culture. It is the combination of hydroponics and aqua culture. Hydroponics Is the process where plants are grown without using soil and aquaculture is the process of growing fish in tanks. Aquaculture waste produced by fish is used by plants as nutrients and this water is purified by plants. This water is again pumped back to the fish tank. During this process there will be changes in parameters like temperature, pH, salinity which are harmful for both plants and fish. These parameters should be regularly monitored. Manually doing this takes a lot of human effort and time. An IOT system can be used to simplify this process.

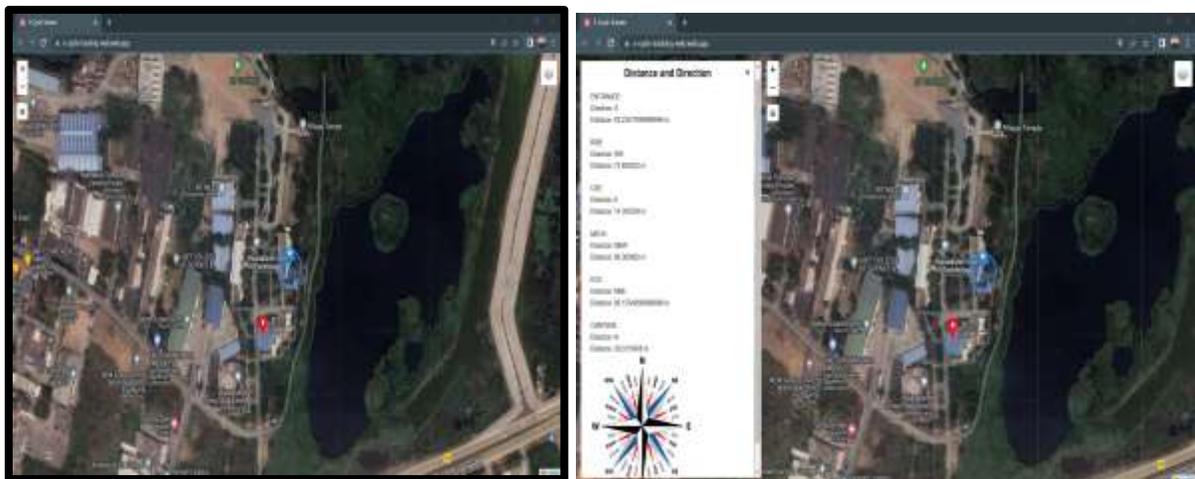
Implementation of E-Bicycle and Interfacing an Interactive Display Unit to Present The Vehicle Parameters

Transport is a fundamental requirement of modern life, but the traditional combustion engine using vehicles is becoming more and more expensive to buy and the fuel cost for these combustion engines have skyrocketed in the past decade. Two-wheelers are the most preferred vehicles among Indians. The Bicycle has gone from being an antiquated sporting item to a less contaminating method for transport and a reduced, super light private versatility instrument. E-Bicycles that are currently available now lack many features that will be of use to the rider while using the vehicle. This Project is used to bridge the gap between the technology lacking in the E-Bicycles. It gathers the vehicle parameters from the various sensors (speed, distance traveled, etc.) that are installed in the E-Bicycle and displays the values through an interactive display unit. The Vital Signs of the rider are also measured and displayed to keep track of them while riding. The Vehicle parameters and the vital signs of the rider are displayed using an interactive LCD display unit, which can be used to access that information using a GUI.



Smart Guiding System for E-Cycle

Electrically assisted bicycles (E-Cycles) are a new sustainable means of transportation for smart cities in the future. An electric bicycle is a gadget that combines the use of a bicycle as a mode of transportation with the addition of an electric motor as a driving force. Bicycles can be utilized without electrical components, as is well known. With the advancement of Internet and mobile technologies, there is a growing demand for electronic access to tourist information systems for service coordination and process integration. Various tourism services are implemented using mobile computing and mobile devices (e.g., electronic tourist guides and digital interactive maps). Current tourist portals are unable to provide proactive assistance to visitors. To address this issue, we propose the study, design, and implementation of a smart guiding system for e-cycles that can be accessed via wireless devices and makes use of Web technologies to represent information resources effectively. E-cycles are the most cost-effective mode of transportation on a variety of grounds, particularly for short-distance and inner-city travel. With the use of GPS, we accurately pinpoint the location of the e-cycle which can provide location based automated description of the location visually through texts on display or mobile devices.



Location Updated on Web Application

Distance and Direction Of Target Locations On Web Application

Events conducted by the Centre

1. Two days workshop on “Basics of Arduino board and Proteus Design suite for Beginners”

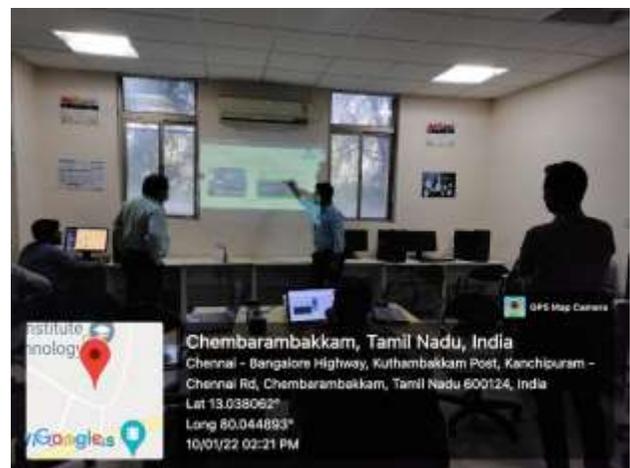
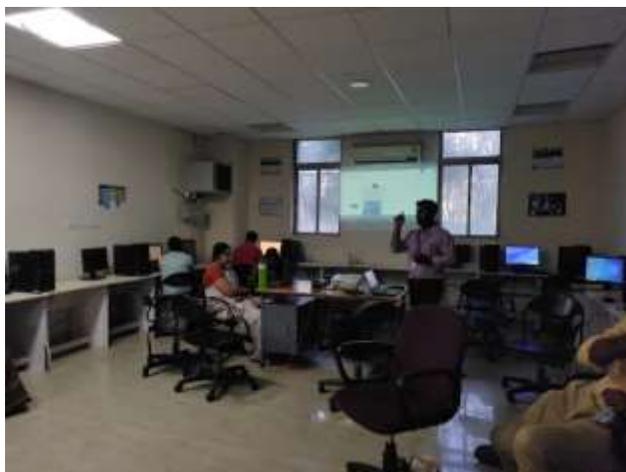
Centre for Internet of Things (CIoT) conducted “Two days workshop on “Basics of Arduino board and Proteus Design suite for Beginners” on 28th & 29th February 2020 at Rajalakshmi Institute of Technology, Chennai. Prof. Dr. Shanker Rajendiran Nagalingam, PhD, Founder of Chase Technologies, Chennai was the chief guest for the inaugural function. He gave a wonderful guest lecture on entrepreneurship, patents and other career opportunities. The workshop was targeted for the second-year students of CSE and ECE of RIT to enhance the skill over basic development boards like Arduino and proteus design suite to visualize the prototype working. Totally **Sixty-Seven students** from both departments have successfully

attended the workshop. In this workshop a brief introduction to Arduino uno was given followed by Simulation of various Arduino based project using Proteus ISIS software. The workshop aims to impart sufficient knowledge to the student's community to create their own innovative projects and there by solve social problems. This event is conducted in association with Department of Electronics and communication Engineering and IEEE student branch of RIT.



Two days workshop on “Learn Arduino with Tinkercad”

Centre for Internet of Things (CIoT) conducted “Two days workshop on “Learn Arduino with Tinkercad” on 10th & 11th January 2022 at Rajalakshmi Institute of Technology, Chennai. Mr. Rahul Krishnan, Assistant Professor, Electronics and Communication Engineering, Rajalakshmi Institute of Technology, Chennai. He given a wonderful session on Arduino development board using Tinkercad platform. The workshop was targeted for the teaching and non-teaching faculties of ECE and CCE of RIT to enhance the skill over basic development boards like Arduino to visualize the prototype working. Totally **25** faculties from both departments have successfully attended the workshop. In this workshop a brief introduction to Arduino uno was given followed by Simulation of various Arduino based project using Tinkercad online simulation software. The workshop aims to impart sufficient knowledge to the faculty community to equip their students to create their own innovative projects and there by solve social problems. This event is conducted in association with Department of Electronics and communication Engineering and IEEE student branch of RIT.

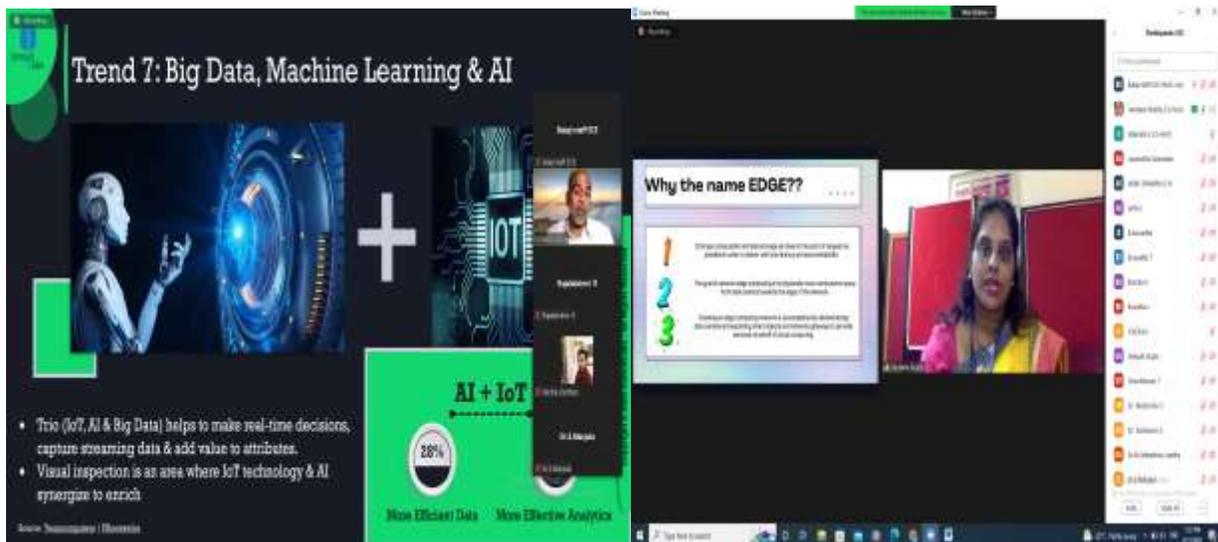


Five days online FDP on Embedded Systems and IoT during 08.08.2022 to 12.08.2022

The Programme started with Invocation followed by the inaugural address by Dr.S.Manjula, Head of the Department of Electronics and Communication Engineering. She welcomed, introduced, and congratulated the Guest Speaker. The programme was organized by the Department of Electronics & Communication Engineering in association with Center of IoT. Dr.S.Manjula, HoD-ECE spoke about the importance of internet of things and their applications. She also told that opportunities under internet of things.

The important topics covered during the guest lecture includes:

- Overview of Embedded systems and IoT in practical world
- Introduction to Sensors and Actuators
- IOT Networking and Applications
- Research Insights of Industry IoT with Business Model
- Implementing IoT with Arduino
- Recent Advancements in Microcontrolled Embedded Systems-An overview of Interfacing and Programming
- Future Advancements in Internet of Things
- Integration of sensors with Raspberry PI
- Research issues and case study in IoT



The FDP was followed by question and answer discussion and the expert clear the doubts raised by the faculty in an understandable manner. Faculties were interacted and introduced how to design and develop their own project and extend their research work much more detail towards achieving it. Finally, Faculty from various colleges given their valuable feedback. Mr.A.Balaji, Assistant Professor-ECE gave the Vote of thanks.