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A REVIEW OF A LECTURE MONITORING SYSTEM USING IOT

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ABSTRACT
L**e**cture monitoring and evaluation system is used for school and collage Management System for recognition purpose i.e. the Head of Department will get information that a particular lecturer has entered the classroom when RFID card is inserted in the scanner and connected to WiFi after that the LED will blink and if there is Green signal in the LED then that means the lecturer has arrived otherwise red signal will blink and that means the lecturer isn't available in classroom and buzzer will ring, lecture monitoring and evaluation system is used for school and College management purpose.

Keywords: IOT, RF-ID, Wi-Fi, LED.

INTRODUCTION
The proposed system offers a trick for teachers to enhance the responsiveness and hence the attentiveness of the students. The system proposes a suggestion list for the teachers during the live online classes, with the motive of covering all the students in a random, but non-repetitive pattern using Fisher-Yates algorithm. The system's prototype has been developed using Python Programming language. The paper includes the results obtained from its implementation on a group of Undergraduate course students. The observations were noted and analyzed using SPSS statistical tool.

CONCEPTUAL REVIEW
With the continuous advancements in technology a potential innovation, IoT is coming down the road which is burgeoning as an ubiquitous global computing network where everyone and everything will be connected to the Internet. IoT is continually evolving and is a hot research topic where opportunities are infinite. Imaginations are boundless which have put it on the verge of reshaping the current form of internet into a modified and integrated version. The number of devices availing internet services is increasing every day and having all of them connected by wire or wireless will put a powerful source of information at our finger tips.
The concept of enabling interaction between intelligent machines is a cutting-edge technology but the technologies composing the IoT are not something new for us. IoT, as you can guess by its name, is the approach of converging data obtained from different kinds of things to any virtual platform on existing Internet infrastructure. The concept of IoT dates back to 1982 when a modified coke machine was connected to the Internet which was able to report the drinks contained and that whether the drinks were cold. Later, in 1991, a contemporary vision of IoT in the form of ubiquitous computing was first given by Mark Weiser. However in 1999, Bill Joy gave a clue about Device to Device communication in his taxonomy of internet. In the very same year, Kevin Ashton proposed the term "Internet of Things" to describe a system of interconnected devices. The basic idea of IoT is to allow autonomous exchange of useful information between invisibly embedded different uniquely identifiable real world devices around us, fueled by the leading technologies like Radio-Frequency I Dentification (RFID) and Wireless Sensor Networks (WSNs) which are sensed by the sensor devices and further processed for decision making, on the basis of which an automated action is performed.

THE PURPOSE OF IOT

In 2005, ITU reported about a ubiquitous networking era in which all the networks are interconnected and everything from tires to attires will be a part of this huge network. Imagine yourself doing an internet search for your watch you lost somewhere in your house. So this is the main vision of IoT, an environment where. Things are able to talk and their data can be processed to perform desired tasks through machine learning. A practical implementation of IoT is demonstrated by a soon-to-be released Twine, a compact and low-power hardware working together with real-time web software to make this vision a reality. However different people and organizations have their own different visions for the IoT. An article published in Network World revealed IoT strategies of top IT vendors, they carried out some interviews from the key IT vendors. As of HP's vision, they see a world where people are always connected to their content. Cisco believes in the industrial automation and convergence of operational technology. Intel is focused on empowering billions of existing devices with intelligence. Microsoft does not consider IoT as any futuristic technology; they believe that it already exists in today's powerful devices and that the devices just need to be connected for a large amount of information which could be helpful. While, IBM has a vision of a Smarter Planet by remotely controlling the devices via secured servers. Despite of having different visions, they all agree about a network of interconnected devices therefore more developments within the coming decades are expected to be seen including that of a new converged information society.

THE ARCHITECTURE OF IOT

More than 25 Billion things are expected to be connected by 2020 which is a huge number so the existing architecture of Internet with TCP/IP protocols, adopted in 1980, cannot handle a network as big as IoT which caused a need for a new open architecture that could address various security and Quality of Service (QoS) issues as well as it could support the existing network applications using open protocols. Without a proper privacy assurance, IoT is not likely to be adopted by many. Therefore protection of data and privacy of users are key challenges for IoT. For further development of IoT, a number of multi-layered security architectures are proposed. described a three key level architecture of IoT while described a four key level architecture.
The six layers of IoT are described below:

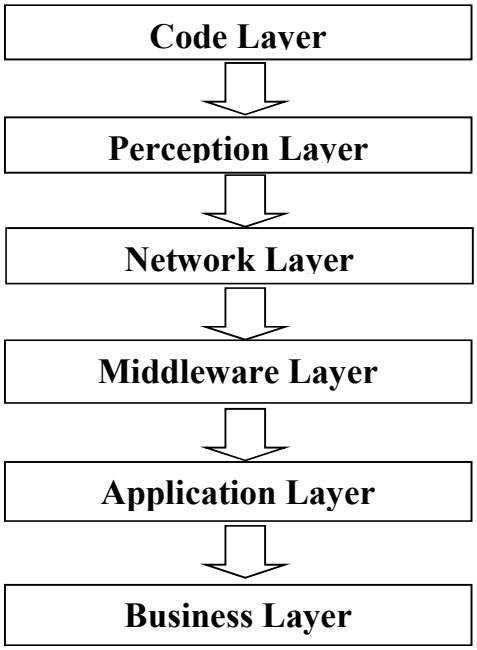


Fig1. Six-Layered Architecture of IoT

i. Coding Layer

Coding layer is the foundation of IoT which provides identification to the objects of interest. In this layer, each object is assigned a unique ID which makes it easy to discern the objects.

ii. Perception Layer

This is the device layer of IoT which gives a physical meaning to each object. It consists of data sensors in different forms like RFID tags, IR sensors or other sensor networks [23] which could sense the temperature, humidity, speed and location etc of the objects. This layer gathers the useful information of the objects from the sensor devices linked with them and converts the information into digital signals which is then passed onto the Network Layer for further action.

iii. Network Layer

The purpose of this layer is receive the useful information in the form of digital signals from the Perception Layer and transmit it to the processing systems in the Middleware Layer through the transmission mediums like WiFi, Bluetooth, WiMaX, Zigbee, GSM, 3G etc with protocols like IPv4, IPv6, MQTT, DDS etc.

iv. Middlware Layer

This layer processes the information received from the sensor devices. It includes the technologies like Cloud computing, Ubiquitous computing which ensures a direct access to the database to store all the necessary information in it. Using some Intelligent Processing Equipment, the information is processed and a fully automated action is taken based on the processed results of the information.

v. Application Layer

This layer realizes the applications of IoT for all kinds of industry, based on the processed data. Because applications promote the development of IoT so this layer is very helpful in the large scale development of IoT network. The IoT related applications could be smart homes, smart transportation, smart planet etc.

vi. Business Layer

This layer manages the applications and services of IoT and is responsible for all the research related to IoT. It generates different business models for effective business strategies.

THE TECHNOLOGIES INVOLVED IN IOT

The development of a ubiquitous computing system where digital objects can be uniquely identified and can be able to think and interact with other objects to collect data on the basis of which automated actions are taken, requires the need for a combination of new and effective technologies which is only possible through an integration of different technologies which can make the objects to be identified and communicate with each other. The relevant technologies that can help in the large-scale development of IoT are listed below:

i. Radio Frequency IDentification (RFID)

RFID is the key technology for making the objects uniquely identifiable. Its reduced size and cost makes it integral into any object. It is a transceiver microchip similar to an adhesive sticker which could be both active and passive, depending on the type of application. Active tags have a battery attached to them due to which they are always active and therefore continuously emit the data signals while Passive tags just get activated when they are triggered. Active tags are more costly than the Passive tags however they have a wide range of useful applications. RFID system is composed of readers and associated RFID tags which emit the identification, location or any other specifics about the object, on getting triggered by the generation of any appropriate signal. The emitted object related data signals are transmitted to the Readers using radio frequencies which are then passed onto the processors to analyze the data.

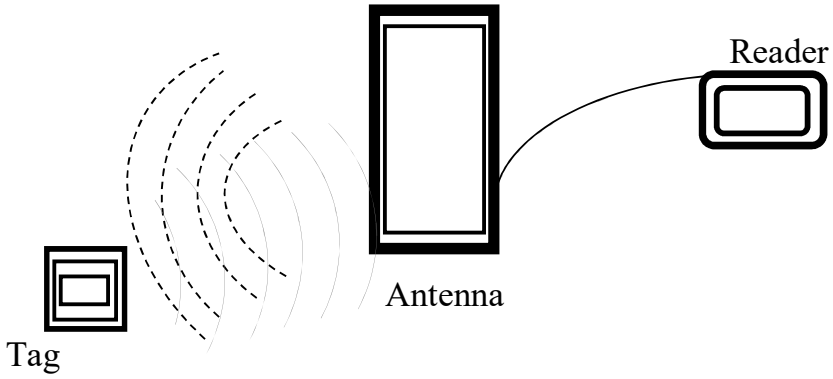


Fig 2. RFID Scenario

Depending on the type of application, RFID frequencies are divided into four different frequencies ranges, which are given below:
(1) Low frequency (135 KHz or less)
(2) High Frequency (13.56MHz)
(3) Ultra-High Frequency (862MHz 928MHz)
(4) Microwave Frequency (2.4G, 5.80)
Bar Code is also an identification technology which has almost the same function as an RFID but RFID is more effective than a Bar Code due to a number of its benefits. RFID being a radio technology doesn't require the reader to be physically in its vision while Bar Code is an optical technology which cannot work unless its reader is placed in front of it. Moreover, an RFID can work as an actuator to trigger different events and it has even modification abilities which Bar codes clearly don't have.

ii. Wireless Sensor Network (WSN)

WSN is a bi-directional wirelessly connected network of sensors in a multi-hop fashion, built from several nodes scattered in a sensor field each connected to one or several sensors which can collect the object specific data such as temperature, humidity, speed etc and then pass on to the processing equipment. The sensing nodes communicate in multi-hop. Each sensor is a transceiver having an antenna, a micro-controller and an interfacing circuit for the sensors as a communication, actuation and sensing unit respectively along with a source of power which could be both battery or any energy harvesting technology. However (Guicheng Shen et al) has proposed an additional unit for saving the data, named as Memory Unit which could also be a part of the sensing node. A typical sensing node is shown in the figure below:

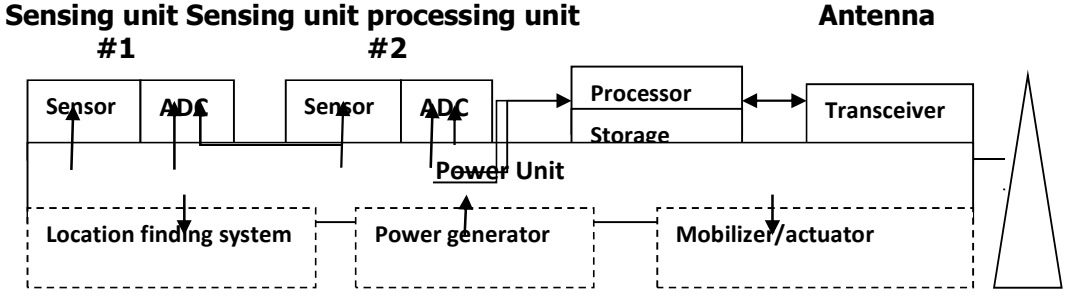


Fig 3. A typical sensing node

Wireless Sensors Network technology and RFID technology when combined together opens up possibilities for even more smart devices, for which a number of solutions have been proposed [Atzori, et al]. An example solution is provided by the Intel Research Labs in the form of Wireless

Identification Sensing Platform (WISP) [WISP" by Intel Labs;]. WISP is a passive wireless sensor network with built-in light, temperature and many other sensors [E. M. Tapia, et al]. Both WSN and RFID Sensor Networks have their own advantages but RFID Sensor Networks have a low range and their communication is Asymmetric while WSNs have a comparatively longer range and their communication is Peer-to-Peer. Moreover most of the WSNs are based on the IEEE 802.15.4 standard [Atzori, A.Iera,], which specifies the Physical and MAC layer of Low-Rate Wireless Personal Area Networks (LR-WPANs) [IEEE 802.15 WPAN Task Group 4.]. The technologies that enable the integration of WSN with the IOT are a hot research topic, many solutions have been proposed for that including that of a 6LOWPAN standard [G. Montenegro, et al] that allows IPv6 packets to be transmitted through the networks that are computationally restricted. Also there's ROLL routing standard for end-to-end routing solutions [R. Roman, C. ALcaraz et al].

THEORETICAL REVIEW

The IoT-Based Academic Monitoring System is an innovative solution that can assist in implementing the Integrity Zone at the Manado State Polytechnic. This system utilizes Internet of Things (IoT) technology to monitor the academic performance of lecturers and students in real-time. Implementing the Integrity Zone is an effort by the Government of Indonesia to encourage the creation of sound and clean governance. One indicator of the Integrity Zone is the quality of good public services, including education.

The attendance system has an essential role in everyday life, especially in schools, universities, factories, offices, hospitals, and other places that use attendance as a sign of attendance. In line with the development of technology, the attendance system in the world of education, especially at the Manado State Polytechnic, is generally still carried out manually, including attendance at universities, where this is very inefficient because information about the technology is taught for the first time in the world of education.

Therefore, it is essential to apply technology that can help process university attendance. So that it can improve the system's quality of student attendance services; absence is an attendance data collection that is part of reporting activities within an institution. Attendance is structured and managed so that it is easy to find and use when needed by interested parties.

The QR code is a matrix or two-dimensional bar code developed by Denso Wave, a division of Denso Corporation, a Japanese company, published in 1994. To read the QR Code, a reader or scanner is needed in software, namely the QR Code Reader or QR Code Scanner, which must be installed on the mobile device.

QR stands for Quick Response or quick response, whose purpose is to convey information quickly and get a fast response. In contrast to barcodes, which only store information horizontally, QR codes can store information horizontally and vertically.

For this reason, an application is needed to facilitate attendance activities in learning activities. In this study, the authors will design an attendance system that can be done using an Android smartphone by utilizing the camera system to read the QR Code. The way it works is that the system will display a QR Code at every learning activity meeting, and students scan the QR Code shown by the teacher. It is hoped that making this application will make it easier to monitor lecture activities. By implementing an IoT-based academic monitoring system, it is expected that Polimdo can improve the quality of teaching conducted by lecturers and create an Integrity Zone in the education sector.

The previous study by Yin et al. discussed using the QR Code. They say Standard barcodes can only be read from top to bottom in one way. As a result, they can only hold a limited amount of data, often in alphanumeric format. But QR codes are read in two directions, from top to bottom and right to left. This allows it to hold significantly more data. The QR Code system has become popular outside the automotive industry because of its fast readability and greater storage capacity than standard UPC barcodes. A QR code consists of black modules (square dots) arranged in a square grid on a white background. Our website uses this QR code system to mark student attendance

instead of using pen and paper for the same. Most smartphones have a QR scanner, sometimes built into the camera [L. R. Yin, et al]. Furthermore, by Yousaf *et al.*, the presence of students in class is a critical task, and if done manually, it will waste a lot of time. There are many automated methods available for this purpose, namely biometric presence.
These methods also waste time because students must queue to touch their thumbs on the scanner. This work describes an efficient algorithm that automatically marks presence without human intervention. This Attendance is recorded using a camera installed at the front of the classroom. It continuously captures student images, detects faces in the pictures, compares the caught faces with the database and marks their Attendance. This paper reviews related work in attendance systems and then describes the system architecture, software algorithms and results [M. H. Yousaf, et al].
The research of Olaniyi *et al.* explained Attendance is one of the most significant aspects of business and education, and its significance has increased to the point where it now influences various activities. Meanwhile, organizations are rapidly moving away from conventional attendance tracking methods [O. Olaniyi, et al]. Rjeib *et al.*, The current study proposes an RFID-based Attendance Management System (AMS) and an information service system for the academic domain using RFID technology in addition to programmable Logic Circuits (such as Arduino) and webbased applications. The proposed system aims to manage student attendance records and provide the ability to track student attendance and support information services, including student grades, daily schedules, lecture times and classroom numbers, and other student-related instructions provided by faculty department staff [H. D. Rjeib, et al]. Cheng et al. discussed research on Quick Response (QR) codes widely used in data storage and high-speed machine reading applications. Anyone can gain access to the information stored in a QR code; therefore, they are not suitable for encoding confidential information without adding cryptography or other protection. This paper proposes a visual secret-sharing scheme to encode a secret QR code into parts [Y. Cheng, Z. et al]. Lukkarinen *et al.'s*research describes existing state-of-the-art attendance systems using equipment developed exclusively for those systems; therefore, implementing a robust attendance system may not be a cost effective strategy. It took a long time to collect all the necessary information to create an individual student report at the end of the year. Skip all the distractions and automatically organize notes with the auto attendance tracker. The time that is so saved can be used for more critical managerial tasks [A. Lukkarinen, et al]. Research by Čisar *et al.* introduced the Bologna system requiring class attendance.
Recording attendance is inefficient and takes up too much class time, especially with larger groups of students. If a professor records student attendance manually, they have to look at the student, write it down and go to the next student. One possible solution for this is an app called Muffin. Muffin consists of a mobile application students have on their mobile devices, an Arduino Uno board with a Bluetooth module, and a desktop application [S. M. Čisar, et al]. Perjwed *et al.* explained several alternative device-based attendance solutions, such as an RFID (Radio Frequency Identification) based student attendance system and a GSM GPRS-based student attendance system [Dr. Y. Perwej, et al]. Furthermore, Yan and Han's research conducted research aimed at designing a face recognition attendance system based on real-time video processing. This article mainly sets out four directions for considering the problem: the accuracy rate of the facial recognition system in actual check-in, the stability of the facial recognition attendance system with real-time video processing, the truancy rate of the facial recognition attendance system with real-time video processing and the attendance system interface setting. Facial recognition uses real-time video processing [H. Yang et al]. Perwej *et al.* are also continuing research on absenteeism, and they say at the beginning and end of each session, attendance is an essential aspect of daily class evaluation. They feature a real-time Facial Recognition System to track student attendance in this work. The suggested method includes identifying a human face from a webcam using the Viola Jones technique, resizing the recognized face to the desired size, and then processing the resized beginning using a basic Local Binary Pattern Histogram algorithm [Dr. Y. Perwej, et al].

Furthermore, the latest research by Wadhwa et al. Explains that the conventional register-based attendance system for students in institutions is a time-consuming and tiring task for teachers, so we have developed and used an intelligent system based on a fingerprint scanner to replace the traditional attendance system that can acquire, store, and check student fingerprints. and export the data in the form of their attendance records to a centralized database which is used by the developed Android Application which helps administration and students to see their attendance in real time, the whole system is cheap and reliable [P. Wadhwa. et al].

METHODOLOGY

Internet of Things (IOT) is a concept where each device is assign to an IP address and through that IP address anyone makes that device identifiable on internet. The mechanical and digital machines are provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. Basically, it started as the "Internet of Computers." Research studies have forecast an explosive growth in the number of "things" or devices that will be connected to the Internet. The resulting network is called the "Internet of Things" (IoT). The recent developments in technology which permit the use of wireless controlling environments like, Bluetooth and Wi-Fi that have enabled different devices to have capabilities of connecting with each other. Using a Wi-Fi shield to act as a Micro web server for the Arduino which eliminates the need for wired connections between the Arduino board and computer which reduces cost and enables it to work as a standalone device. The Wi-Fi shield needs connection to the internet from a wireless router or wireless hotspot and this would act as the gateway for the Arduino to communicate with the internet. With this in mind, an internet based home automation system for remote control and observing the status of home appliances is designed.

MODELING AND ANALYSIS

i) BLOCK DIAGRAM

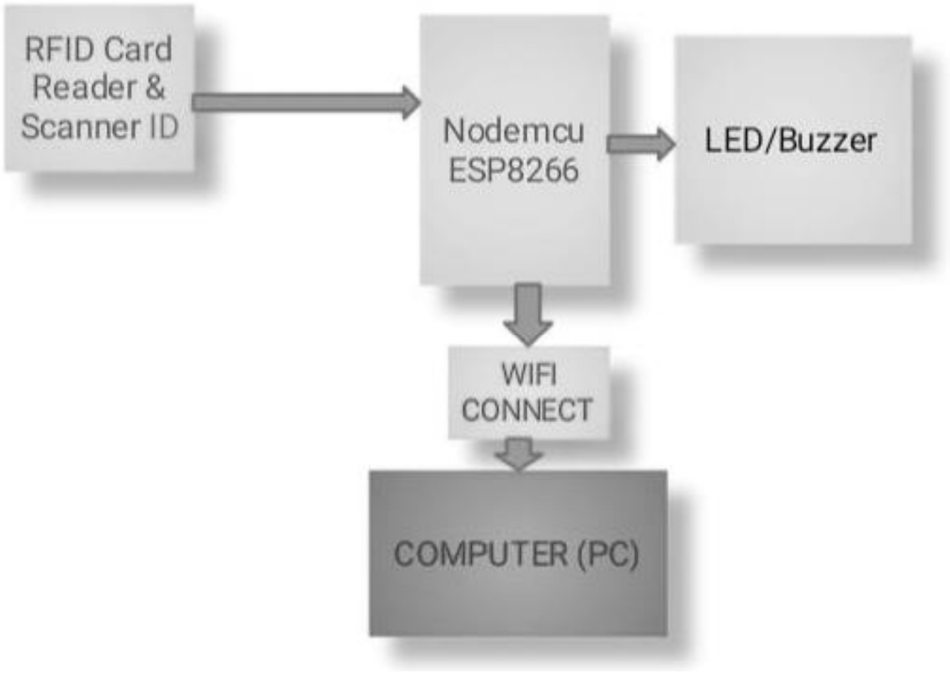


Fig 4. Block Diagram of Proposed

EXPLANATION

This system uses the RFID and Zig Bee wireless communication technologies Radio frequency identification (RFID) is the wireless use of electromagnetic fields to transfer data, for the purposes

of automatically identifying and tracking tags attached to objects. Some types collect energy from the transponder. Other types have a local power source such as a battery and may operate at hundreds of meters from the reader. Radio frequency identification (RFID) is one method for Automatic Identification and Data Capture (AIDC).

Node-MCU is a low-cost open source IoT platform. It initially included firmware which runs on the ESP8266 Wi-Fi SoC from Espress if Systems, and hardware which was based on the ESP-12 module (Jason Pontin, 2005). Later, support for the ESP32 32-bit MCU was added (Kevin Ashton, 2009).

a) HARDWARE REQUIRED

- Node-MCU
- R305 Fingerprint sensor
- I2C Module for 16x2 (1602) Alphanumeric LCD
- Breadboard
- 16*2 Alphanumeric LCD

1. Node-MCU

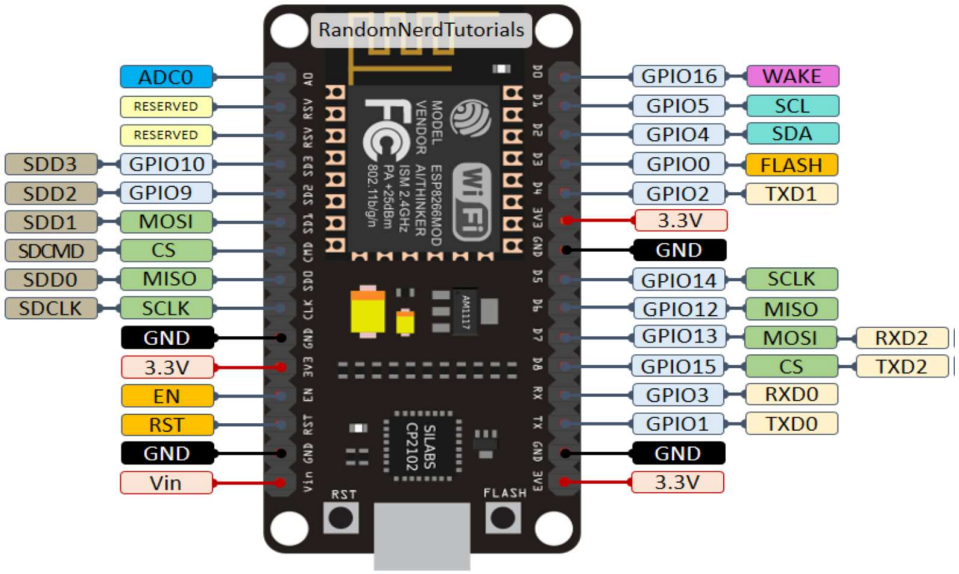


Fig 5: Node MCU

Specifications of ESP8266 :

• It's a 32-bit microcontroller.
• The CPU used in it is Tensilica Diamond Standard 106Micro. (aka. L106)
• Memory – 32 KiB instructio, 80 KiB user data.
• Input is through 17 GPIO pins.
• It requires 3.3v V DC Power supply.
• Successor – ESP 32

Fig 6: RFID

Specifications of DHT11 Sensor :

- Operating Voltage: 3.5V to 5.5V
- Operating current: 0.3mA (measuring) 60uA (standby)
- Output: Serial data
- Temperature Range: 0°C to 50°C
- Humidity Range: 20% to 90%
- Resolution: Temperature and Humidity both are 16-bit
- Accuracy: ±1°C and ±1%

2. ICD Display

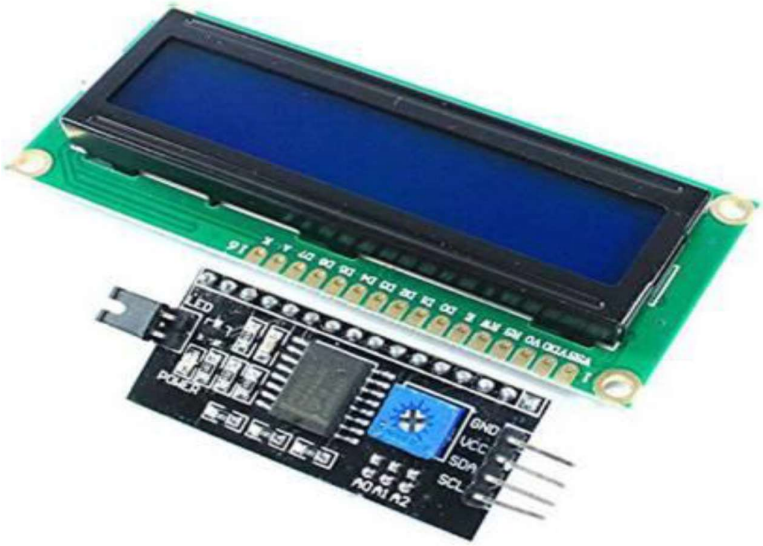


Fig7. LCD Display

Specifications:

- Display capacity: 16 character x 2 row
- Display color: Blue backlit
- Character size: 2.95 mm wide x 4.35 mm high
- Character pixels: 5 W x 7 H
- Voltage requirements: 5 VDC +/- 0.5V
- Current requirements: 2 mA @ 5 VDC
- Connection: 4-pin male header with 0.1”: spacing
- Communication: I2C
- Overall dimensions: 3.15 x 1.42 x 0.51 in (80 x 36 x 13 mm)
- Operating temperature range: 32 to +131 °F (0 to +55 °C)

B) SOFTWARE REQUIRED

Node MCU is an open-source Lua based firmware and development board specially targeted for IoT based Applications. It includes firmware that runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module.

EXPECTED RESULTS AND DISCUSSION

Circuit Diagram:

Fig 8: Circuit Diagram

PROCESS:

Step 1: Creating a new sheet:

First login to Google docs with your Google account credentials and then select for Google sheet there and opt to “Start a new spreadsheet”.

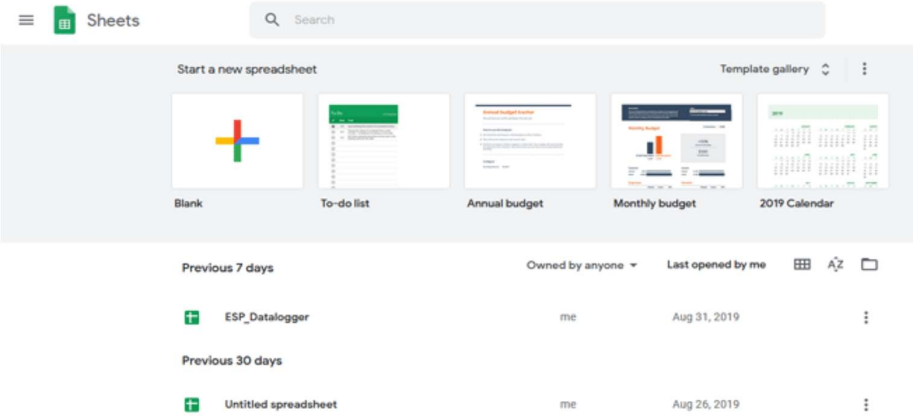


Fig 9: Create New project

Step 2: Rename the sheet

Rename the blank sheet to any name of your choice. In my case, it is ESP _Data logger. Then create columns in the sheet for Date, Time and Name.

Step3

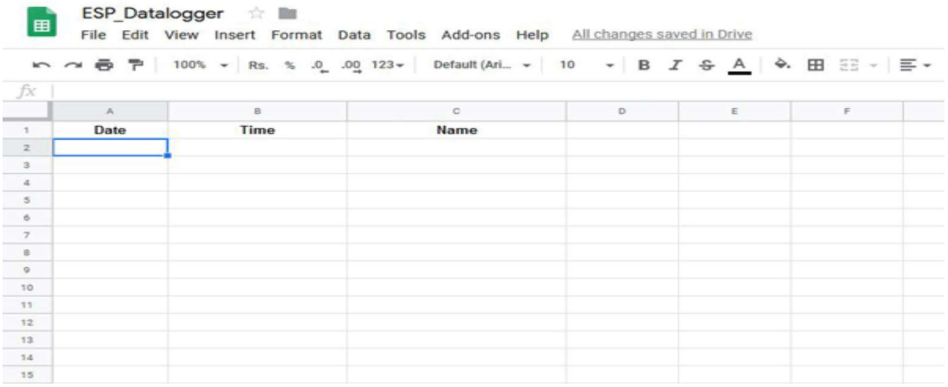


Fig 10: Rename the Sheet

Now go to Tools and click on the option "Script editor" where we will write functions to insert data into the sheet.

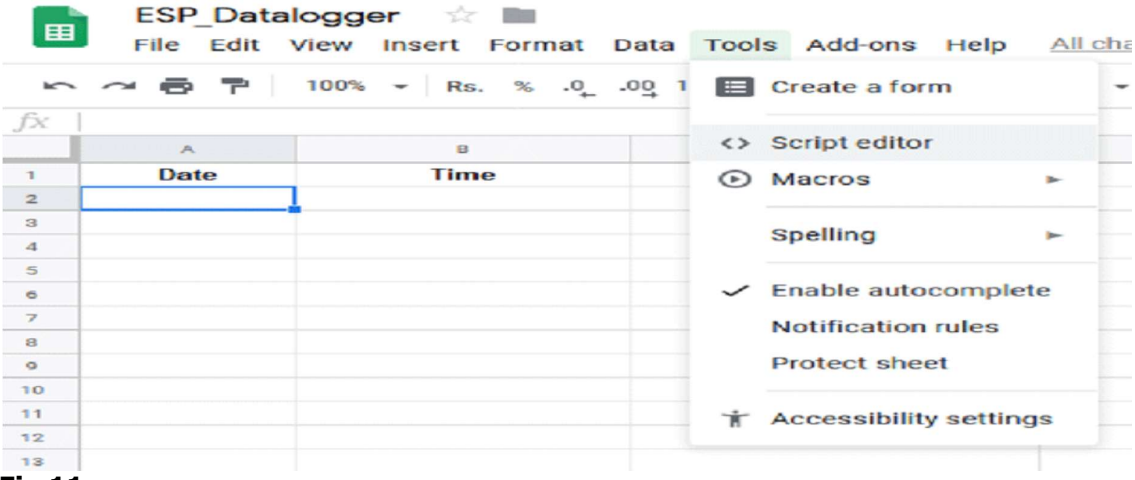


Fig 11

Step 4:

The new Google Script is created with default name "Untitled project". You can rename this Google Script File to any name of your choice. In my Case, I have renamed it to "esp_datalogger".

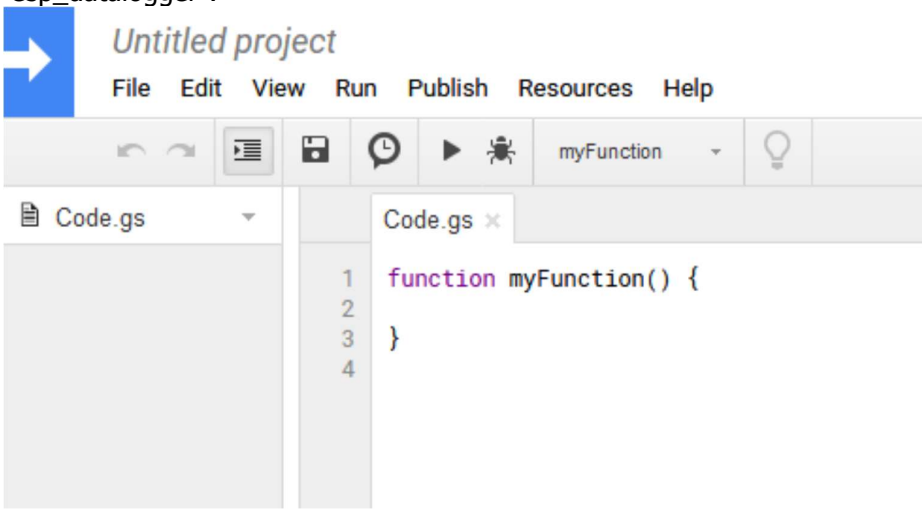


Fig 12: Untitled Project

Step 5:

Getting Google script ID

1. Go to publish and select deploy as web app.

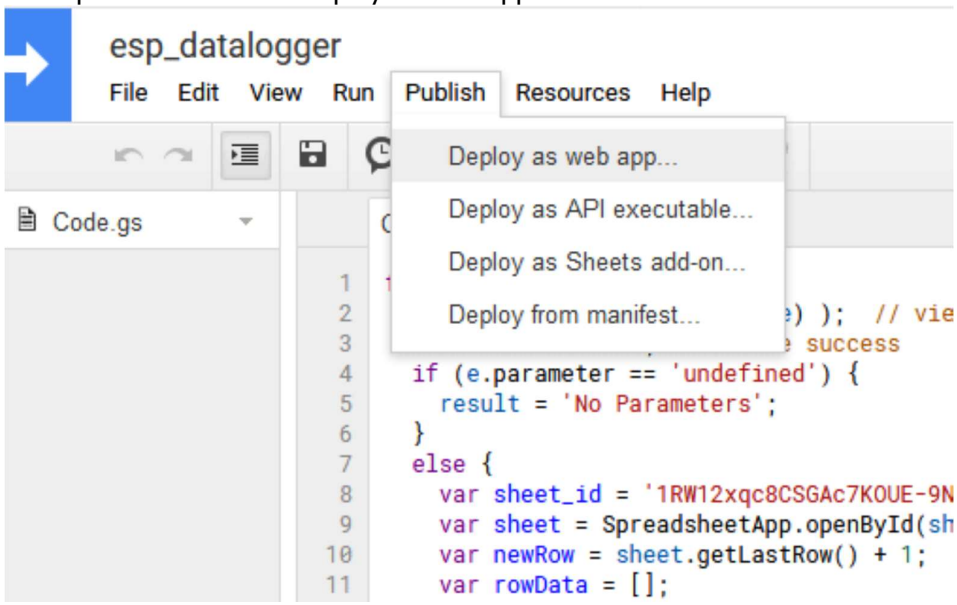


Fig 13: Getting Google Script

2. Select the "Project version" as "New". Select "email id" in the "Execute the app as" field. Choose "Anyone, even anonymous" in the "Who has access to the app" field. And then Click on "Deploy".

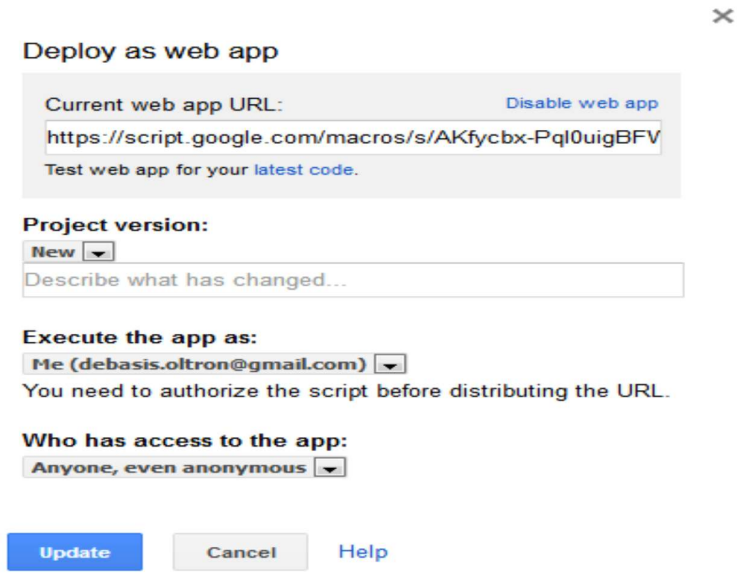
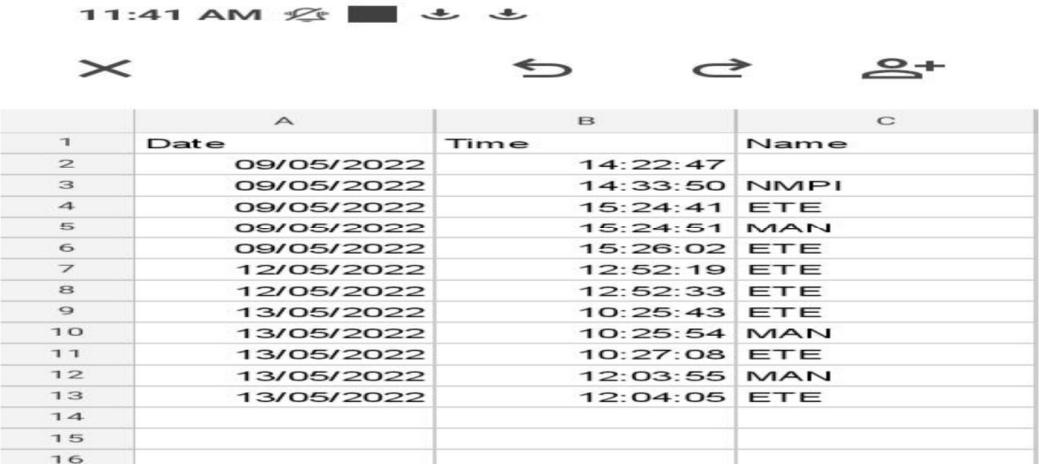


Fig 14: Project Version

Final Output:



	A	B	C
1	Date	Time	Name
2	09/05/2022	14:22:47	
3	09/05/2022	14:33:50	NMPI
4	09/05/2022	15:24:41	ETE
5	09/05/2022	15:24:51	MAN
6	09/05/2022	15:26:02	ETE
7	12/05/2022	12:52:19	ETE
8	12/05/2022	12:52:33	ETE
9	13/05/2022	10:25:43	ETE
10	13/05/2022	10:25:54	MAN
11	13/05/2022	10:27:08	ETE
12	13/05/2022	12:03:55	MAN
13	13/05/2022	12:04:05	ETE
14			
15			
16			

Fig 15: Final output

Advantages:

1. Our project lecture monitoring and evaluation system.
2. Will very helpful to the college as well as school.
3. Also we can use it for alerting purpose.
4. Simple circuit.
5. Low cost.
6. Low power consumption.

Disadvantages:

1. If essential requirements nod satisfied like chips it will not work.

CONCLUSION

Effective monitoring will enable the institution in identifying the challenges faced by students in either failing or passing the courses offered either because of lack of punctual or absence of lecturers/students. The school can be able to trace this issues via this monitoring device thereby enhancing effective lecture time utilization and students participation. It therefore advised that

institutions should venture into this technology to proffer solutions to the performance of their students and the encouragement given by the lecturers.

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