PRISON BREAK MONITORING AND ALERTING SYSTEM USING IOT

PROJECT REPORT

Submitted by

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BONAFIDE CERTIFICATE

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INTERNAL EXAMINER **EXTERNAL EXAMINER**

PRISON BREAK MONITORING AND ALERTING SYSTEM USING IOT

ABSTRACT

Security is one of the most important aspects of prison management, which includes security of inmates, staff as well as the public. As the prisoners are very dangerous, the Prison break monitoring and alerting system using IOT here proposed will be very useful for the police department. To monitor the prisoners regularly in the jail and to monitor the prison breaks, this system has been proposed. So, it would be quite easy for the authorities to monitor the prisoners and keep them under their control. This system will alert the authorities when the prison break happens so that the prisoners could not escape from the jail easily. It is based on RF Transmitter and Receiver technology on ultra-high frequency range which can be applied to use in access control by using RF Transmitter and Receiver tag. The RF Transmitter and Receiver tag contains a unique set of number as a code, so it can be identified. The RF Transmitter will act as the bracelet and the RF Receiver will be at the server side. There is no need of keeping continuous watch due to this technology, for example if the prisoner runs away from the jail a message will be sent to the jailer and buzzer will ring immediately. The alert message will be passed to the authorities using the wireless connections to the cloud and it would be easy for the authorities to monitor them.

Keywords: IOT,RF Transmitter Receiver, Wireless connection, Cloud.

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LIST OF ABBREVIATIONS

1.	WSN	Wireless Sensor Network
2.	UART	Universal Asynchronous Receiver/Transmitter
3.	MCU	Micro Controller Unit
4.	TTL	Transistor Transistor Logic
5.	ADC	Analog to Digital Converter
6.	IDE	Integrated Development
7.	ROM	Read Only Memory
8.	VREF	Voltage Reference
9.	IC	Integrated Circuit
10.	AC	Alternating Current
11.	DC	Direct Current

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INTRODUCTION

A Prison break monitoring, and the alerting system has been established to help the police department and higher authorities in many ways. Because this system notifies the authorities if a prison break happens. Using the RF module, the authorities could easily track the prisoners because it transmits and receive the radio signals so that if the prisoner tries to escape from the prison, it gives the alert message to the authorities by the cloud using the wireless method. When the prisoner tries to break the prison, the system also gives the buzzer sound and displayed it on the LED so that the authorities could be easily notified that the prisoner is trying to escape from the jail. On the other side, the system also has the IR sensor which the prisoner uses on a daily basis to avoid escaping from the jail. This IR module keeps sensing the contact between the prisoner's body and the sensor so when the prisoner tries to break the sensor or remove the sensor, the alert message will be sent to the authorities. The Node Mcu plays the major role as a microcontroller and the Esp8266 module plays the role of a wireless sensor for the notification purpose. Here we propose a prison break Monitoring and alert system that helps detect prison breaks and instantly alert authorities using IOT. Internet of things is a system of interrelated computing devices with sensors, software and other devices.

1.1 Relevance of the Project

Prison is the place that held and transforming criminals Safety is the first of all to guarantee. To protect the safety of society, and to protect the safety of personnel and stability of guards and detainees. By installing security monitoring systems, it can effectively strengthen the management of prisoners, reflect the important location of site's condition intuitively and in time; to enhance the security measures is a useful tool for modern prison management. With the

extensive application of computer technology in all walks of life, making the rapid development of computer software and hardware have reached the prison monitoring system application's requirements, and gradually into the practical. By combining the new security system and the computer technology, it can effectively strengthen the management of prisoners and reduce accident's Happening. To strengthen security measures and strengthen prison modernization, putting forward a kind of prison security system design scheme based on wireless sensor network (WSN).Wireless sensor network (WSN) is a collection of microelectromechanical system, sensor technology, embedded computing technology, information processing technology, modern network and wireless communication technology and digital electronics in the integration of a new generation of task oriented distributed network. It is deployed in monitoring area of a large number of tiny sensor nodes of stationary or mobile, which through wireless communication form a multiple hops self-organizing wireless network. Its purpose is to perceive, acquisition, processing and transmission.

1.2 Problem Statement

- Security place a major role in prisons or jail. There is no exact data count but heard and still keep hearing of a variety of prison escapes happening globally.
- So here we propose a prisoner tracking system that helps detect prison breaks and instantly alert authorities using IOT.

1.3 Objectives

The main objective of the system is:

- To monitor the prisoners on regular basis.
- To detect the location and change in location of the prisoners with the help of radio frequency.
- To send the alert signal throughout the prison if there is any prison break.

1.4 Scope of the Project

- The scope of the project prison break monitoring and alerting system is worked mainly based on the security purpose .
- Helps to track the prisoner whether he or she is inside or outside the prison by using RF and IR technology.

- The escape of the prisoners cannot be stopped but the alert messages can be sent to the authorities so that the security can be tightened.
- The main goal of the system is to monitor each prisoner continuously without any break.

CHAPTER:2

LITERATURE SURVEY

CHAPTER:2

LITERATURE SURVEY

Literature Survey is a systematic and thorough search of all types of published literature as well as other sources including dissertation, these in order to identify as many items as possible that are relevant to a particular topic.

2.1 The Target-Barrier Coverage Problem in Wireless Sensor Networks

Author: Chien-Fu Cheng, Member, IEEE, and Chen-Wei Wang

Publication: IEEE transactions on mobile computing, vol:17,Issue:5 ,2018 [5]

Chien-Fu Cheng in 2017, proposed a system for the target barrier coverage problem in wireless sensor networks. In this proposed system the target barrier coverage is used in the application of defense surveillance. The defense surveillance of the target barrier will be classified into two categories: Detection of intrusion from outside and prevention of barrier breaching from inside. The application in detection of intrusion from outside that will be used in defense surveillance at important military areas, ecology monitoring at environmental protection zones, and refugee camps. The application in the prevention of barrier breaching from inside will be used for surveillance or monitoring of an infectious disease isolation zone, an oil leak in the ocean, etc. The algorithm used here is the Heuristic target barrier construction algorithm that was proposed to solve the target barrier coverage problem.

2.2 An automated system for identification of fire and behaviour of prisoners through posture using Iot

Author **:** Dr. Suvarna Nandyal, Soumya Mugali

Publication **:**IEEE Second International Conference on Green Computing and Internet of Things (ICGCIoT),2018.[4]

Suvarna Nandval in 2018, proposed a system of an automated system for the identification of fire and behavior of prisoners through posture using IoT. In this system, the activities and posture of the prisoners were monitored using accelerometer sensors and smoke sensors. The values of the sensors are uploaded in the cloud manually which are considered initial accurate values. These sensors are placed in the prisoner's body on the hand and leg parts mainly. When the prisoner tries to misbehave or escape from the jail the updated sensor values get changed in the cloud via GPRS and notifies the authorities. So, it would be easy for the authorities to monitor the prisoners continuously on daily basis.

2.3 Smart Prison - Video Analysis for Human Action Detection

Author **:** Peter CK Law ,Andy WC Chun, Lawrence CK Poon

Publication **:** IECON 2020 The 46th Annual Conference of the IEEE Industrial Electronics Society, 2020.[2]

Peter CK Law at 2020, proposed a system of Smart Prison-Video analysis for human action detection. In this system, smart prison has been established, so that the activities of the prisoners will be monitored continuously. The system includes high-definition network cameras and a high-performance computing system. Network cameras will be installed in multiple areas that provide comprehensive surveillance coverage of the jail. These cameras will be connected to the computing system. The videos will capture the following activities of the prisoners such as abnormal behaviors, prisoners fighting, falling down, and self-harming. So, this system helps the authorities to easily detect the prisoners in a contiguous manner. When these abnormal behaviors were detected a warning signal will be sent to alert the authorities.

2.4 Intelligent monitoring of indoor surveillance video based on deep learning

Author **:** Yun-Xia ,Yang Yang, Aijun Shi, Peng Jigang, Liu Haowei

Publication **:** IEEE (21st International Conference on Advanced Communication Technology (ICACT)), 2019.[3]

Yun-Xia Liu in 2019 , proposed a system of Intelligent monitoring of indoor surveillance video based on deep learning. The proposed system uses intelligent video surveillance in-order to automatically detect the target category and location information without manual intervention. An alarm will be buzzer in time to effectively notify the monitoring authorities. The system uses a deep learning method called the state of art framework for instance segmentation to understand the video content. This system helps in reducing the storage and processing pressure of massively stored monitored videos. The automatic alarm system function was developed for monitoring the abnormal events that reduce the workload of monitoring authorities.

2.5 Machine Learning vs. Human Performance in the Realtime Acoustic Detection of Drone

Author **:** Vishwa Alaparthy, Sayan Mandal Mary, Cummings

Publication **:** IEEE Aerospace Conference (50100), 2021. [1]

Vishwa Alerpathy in 2021, proposed a system of Machine learning vs Human performance in real-time acoustic detection and drones. In this system, when prisoners come out of the prison to outdoor spaces this system will monitor the activities of the prisoners using the detection drones. The outdoor spaces mentioned here denote prisons and recreational venues which are more suspectable to do malicious activities and these activities will be captured in the drones that will alert the higher authorities. The drone detection system has been built using the RADAR which will help ineffective for detecting small drones. The system uses a deep learning algorithm that leverages MFCC and its features.

CHAPTER :3

METHODOLOGY CHAPTER : 3

METHODOLOGY

In this proposed system we are using RF and IOT technologies. Internet of Things is nothing but to connect the internet for any electronic devices and can get the updates of these from anywhere. Radio Frequency transmitter and Receiver are paired by using the Radio frequency. An RF module is a small electronic device used to transmit and/or receive radio signals between two devices. Our project consists of two parts, one is the transmitter part which is attached to the prisoner and the receiver part is attached to the Security person of the jail. The transmitter part consists of a battery, RF transmitter and IR sensor. An IR sensor is used anywhere to detect the object's presence in front. Here the IR is used to ensure the wearing of these devices to the prison. RF transmitter continuously sends the RF signals, and RF receiver receives incoming radio frequency. Communication between two devices at a particular distance

only. When prisoners try to escape from the jail, RF communication is cut automatically, once the communication is cut automatically the receiver sends an alert to the jailer through Buzzer alarm and sends Email notification to the police through IOT.LCD is attached to the Receiver unit which is used to view the update of the prison.ESP8266 WIFI Module is attached to the microcontroller for providing internet connection through this, able to send the notification of prison status to any person through Email. Here Adafruitio is an IOT software platform where we connect Adarfruitio with Microcontroller and Email. The RF Transmitter frequency is 433.92 MHZ using here.

3.1 Hardware Specifications

3.1.1 Node MCU ESP8266

NodeMCU 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.

The NodeMCU ESP8266 development board comes with the ESP-12E module containing ESP8266 chip having Tensilica Xtensa 32-bit LX106 RISC microprocessor. This microprocessor supports RTOS and operates at 80MHz to 160 MHz adjustable clock frequency. NodeMCU has 128 KB RAM and 4MB of Flash memory to store data and programs. Its high processing power with in-built Wi-Fi / Bluetooth and Deep Sleep Operating features make it ideal for IoT projects. Node MCU can be powered using Micro USB jack and VIN pin (External Supply Pin). It supports UART, SPI, and I2C interface. Figure 3.1 is referred from [15].

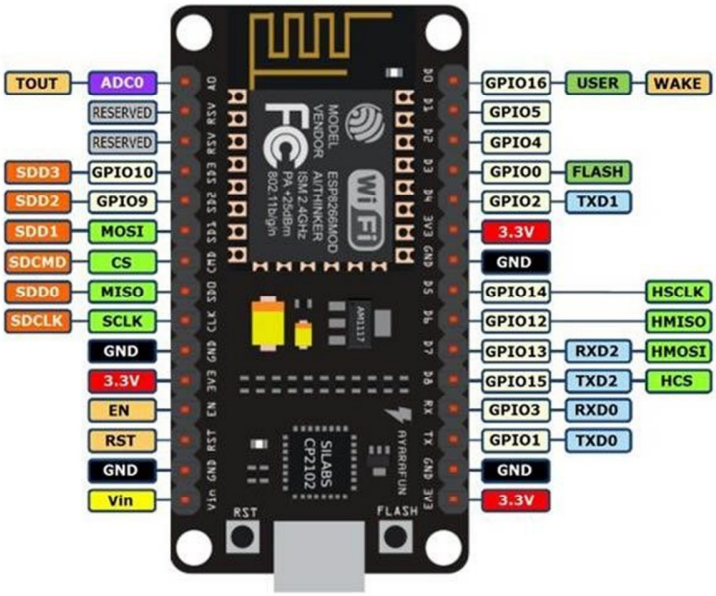


Figure 3.1 Node Mcu

3.1.2 RF Transmitter

The TWS-434 transmitter accepts both linear and digital inputs can operate from 1.5 to 12 Volts-DC, and makes building a miniature hand-held RF transmitter very easy. The P2_0, P2_1, P2_2 and P2_3 pin of controller is assumed as data transmit pins. The DATA_OUT pin of encoder is connected to the DATA_IN pin of RF Transmitter and then the RF Transmitter transmits the data to the receiver. Figure 3.2 is referred from [16].

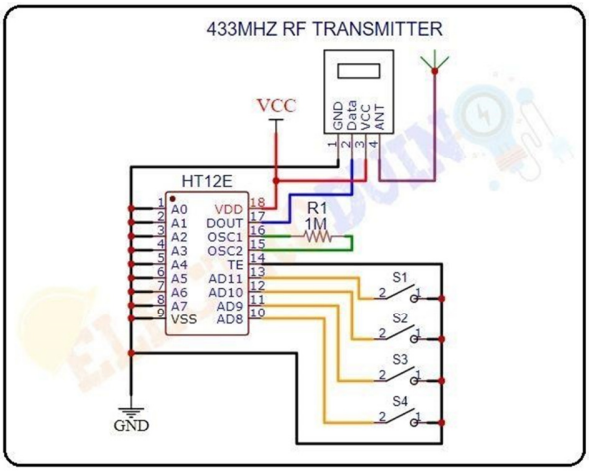


Figure 3.2 Transmitter circuit diagram

3.1.3 RF receiver

The receiver also operates at 433.92MHz, and has a sensitivity of 3uV. The TWS-434 receiver operates from 4.5 to 5.5 volts-DC, and has both linear and digital outputs. The P2_0, P2_1, P2_2 and P2_3 pin of controller is assumed as data transmit pins. The DATA_OUT pin of RF Transmitter is connected to the DATA_IN pin of DECODER and then the data is processed by the decoder. Figure 3.3 is referred from [17].

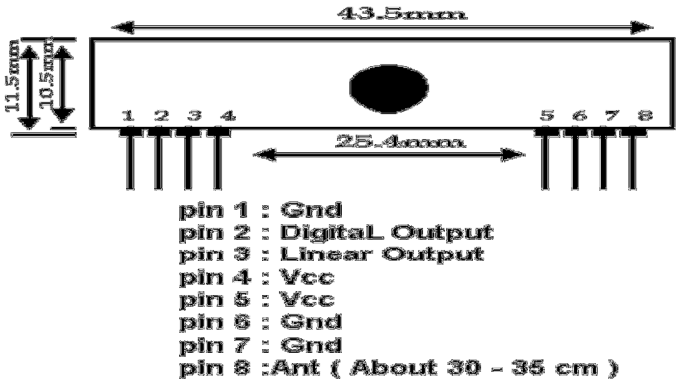


Figure 3.3 Receiver circuit diagram

3.1.4 LCD display

Liquid crystal cell displays (LCDs) are used in similar applications where LEDs are used. These applications are display of display of numeric and alphanumeric characters in dot matrix and segmental displays.

A liquid crystal display (LCD) is an electronically-modulated optical device shaped into a thin, flat panel made up of any number of color or monochrome pixels filled with liquid crystals and arrayed in front of a light source (backlight) or reflector. It is often utilized in batterypowered electronic devices because it uses very small amounts of electric power. LCD has material, which continues the properties of both liquids and crystals. Rather than having a melting point, they have a temperature range within which the molecules are almost as mobile as they would be in a liquid, but are grouped together in an ordered from similar to a crystal. Figure 3.4 is referred from [18].

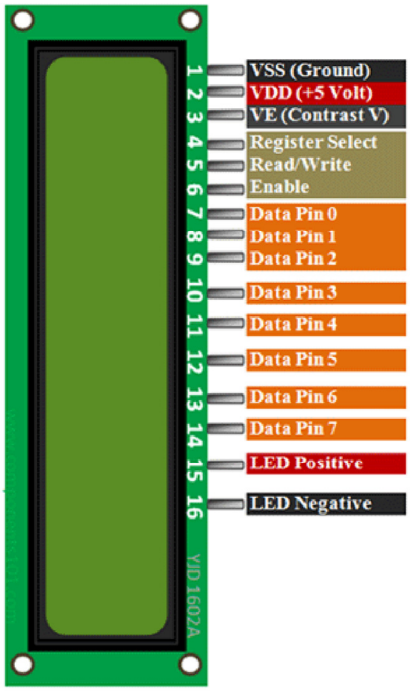


Figure 3.4 LCD

Table 1.1 Pin description for lcd:

PIN NO	SYMBOL	FUNCTION
1	Vss	Ground terminal of Module
2	Vdd	Supply terminal of Module, + 5v
3	Vo	Power supply for liquid crystal drive
4	RS	Register select RS=0…Instruction register RS=1…Data register

5	R/W	Read/Write R/W=1…Read R/W=0…Write
6	EN	Enable
7-14	DB0-DB7	Bi-directional Data Bus. Data Transfer is performed once ,thru DB0-DB7,incase of interface data length is 8-bits;and twice, thru DB4-DB7 in the case of interface data length is 4-bits.Upper four bits first then lower four bits.
15	LAMP-(L-)	LED or EL lamp power supply terminals
16	LAMP+(L+) (E2)	Enable

3.1.5 IR Module

Infra red sensors are the most often used sensor by amateur roboteers. Understanding how they behave can help address many of your requirements and would suffice to address most of the problem statements for various robotics events in India. Be it a typical white/black line follower, a wall follower, obstacle avoidance, micro mouse, an advanced flavor of line follower like red line follower, etc, all of these problem statements can be easily addressed and granular control can be exercised upon your robot's performance if you have a good operational understanding of Infra-red sensors. Figure 3.5 is referred from [19].

Figure 3.5 IR sensor

3.1.6 Buzzer

A buzzer or beeper is a signaling device, The word "buzzer" comes from the rasping noise that buzzers made when they were electromechanical devices, operated from stepped-down AC line voltage at 50 or 60 cycles. Other sounds commonly used to indicate that a button has been pressed are a ring or a beep. Figure 3.6 is referred from [20].

Figure 3.6 Buzzer

3.1.7 Step down Transformer

A Step-Down Transformer is designed to reduce the current from high voltage to low voltage. It converts a high voltage & low current alternating source to a low voltage & high current alternating supply. A transformer is a type of static electrical equipment that transforms electrical energy (from primary side windings) to magnetic energy (in transformer magnetic core) and again to the electrical energy (on the secondary transformer side). A step-down transformer has a wide variety of applications in electrical systems and transmission lines. Figure 3.7 is referred from [21].

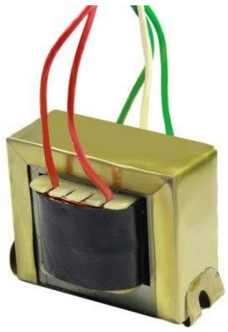


Figure 3.7 Transformer

3.1.8 Rectifier

There are several ways of connecting diodes to make a rectifier to convert AC to DC. The bridge rectifier is the most important and it produces full-wave varying DC. A full-wave rectifier can also be made from just two diodes if a center-tap transformer is used, but this method is rarely used now that diodes are cheaper. A single diode can be used as a rectifier but it only uses the positive (+) parts of the AC wave to produce half-wave varying DC. Figure 3.8 is referred from [22].

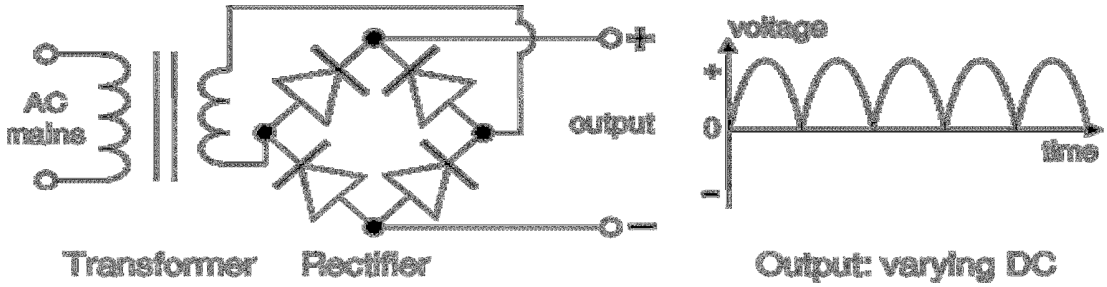


Figure 3.8 Rectifier circuit diagram

3.2 Software Specification

3.2.1 Arduino IDE

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them.

The program or code written in the Arduino IDE is often called as sketching. We need to connect the Genuino and Arduino board with the IDE to upload the sketch written in the Arduino IDE software. The sketch is saved with the extension. Figure 3.9 is referred from [23].

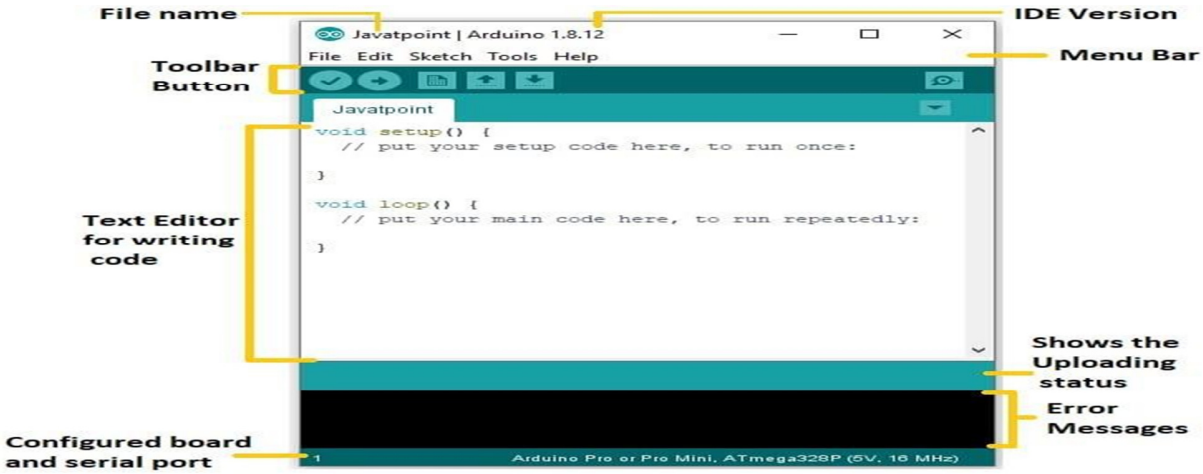


Figure 3.9 Arduino IDE

3.2.2 Proteous software

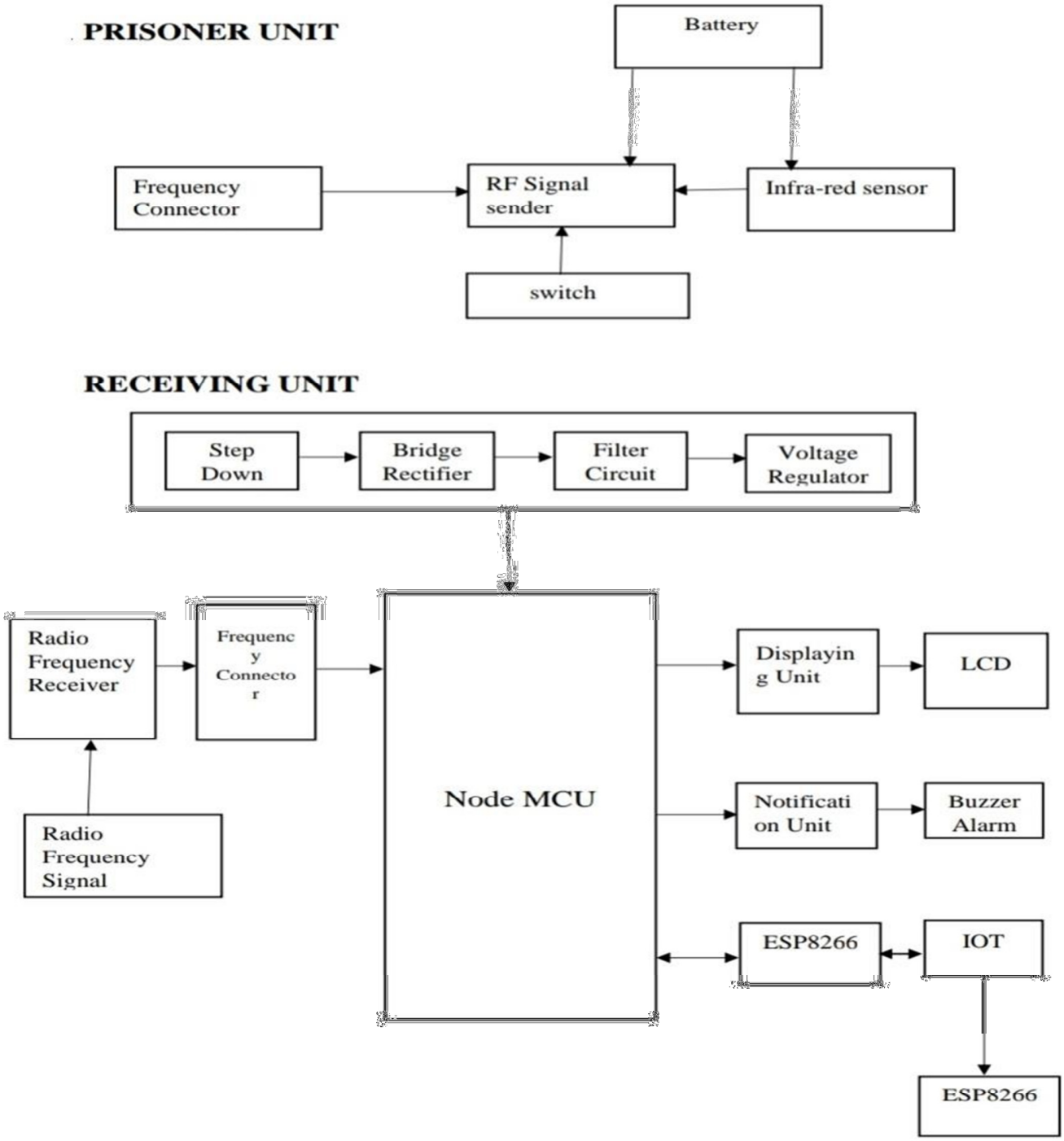
Proteus is a fully functional, procedural programming language created in 1998 by Simone Zanella. Proteus incorporates many functions derived from several other languages: C, BASIC, Assembly, Clipper/dBase; it is especially versatile in dealing with strings, having hundreds of dedicated functions; this makes it one of the richest languages for text manipulation.

Proteus owes its name to a Greek god of the sea (Proteus), who took care of Neptune's crowd and gave responses; he was renowned for being able to transform himself, assuming different shapes. Transforming data from one form to another is the main usage of this language.

CHAPTER: 4

IMPLEMENTATION CHAPTER :4 IMPLEMENTATION

The proposed system has two modules prisoner unit and the receiving unit.



4.1 Hardware Implementation

In the prisoner unit the frequency connector and Infra-red sensor is connected to the RF signal transmitter and receiver.

Both the RF signal transmitter, receiver, and the infra-red sensor is connected to a battery.

The switch is connected to RF signal so that the current will be passed to the whole prisoner unit.

In the receiving unit the Radio frequency signal will receive the signal from the prisoner unit and the RF is connected to the frequency connector.

The received signal from RF will be connected to the step-down transformer to equalize the amount of current passing in the unit.

Both the frequency connector and the step-down transformer are connected to Node MCU Microcontroller.

The NodeMCU Microcontroller is connected to LCD, Buzzer alarm, and ESP 8266.

Through the wireless connection method, the ESP 8266 is connected to the cloud platform to receive the notification when the prisoner is escaped.

4.2 Working Model

The working model is explained below:

Step 1: At first the IR sensor is mounted with the bracelet and will be tied on each prisoner's Wrist to monitor him/her.

Step 2: If the prisoner is inside the campus the signal i.e., frequency will be in some range limit (set by the authority) for that bracelet. The RF transmitter will transmit the signal that will be received by the RF receiver.

Step 3: Node Mcu is used as a wireless network for receiving signal from IR module which implemented at transmitter side.

Step 4: The transmitter will be implemented on the bracelet and the receiver will be implemented on the server. For inside campus there will be some range limit given which will indicate that the prisoner will be in jail. And if the prisoner tries to harm the bracelet the sever will generate an alarm even the message will be sent to the authorities of jail on his mobile. so accordingly, the prisoner will be monitored continuously without any CCTV Camera.

Step 5: Node Mcu is used as a wireless network for receiving signal from IR module which implemented at transmitter side.

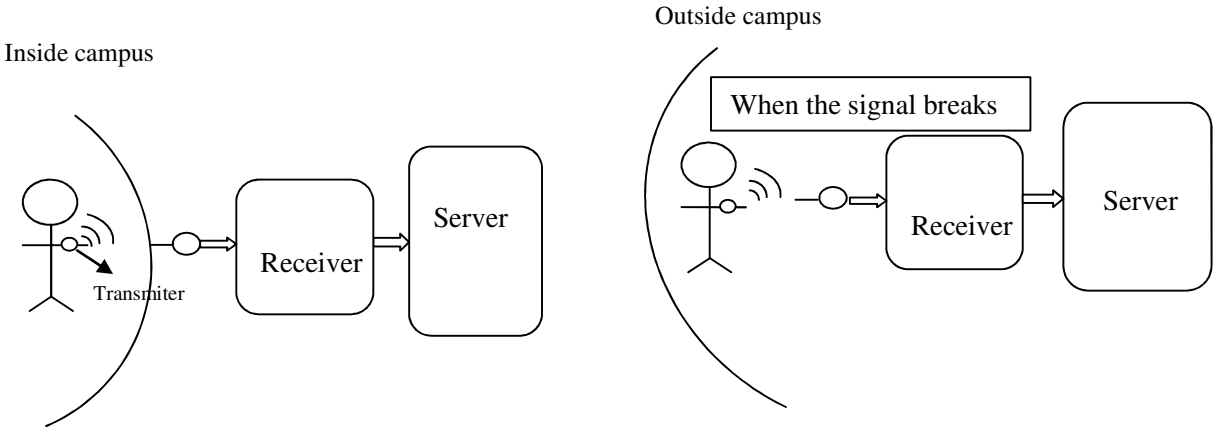


Figure 4.1 Architecture for inside and outside campus

Step 6: And also, if the prisoners try to break or remove the bracelet immediately the alarm will be buzzered to the authorities and the server will display the prisoner status as “PRISONER EASCAPED” and the immediate actions will be then taken to catch the prisoner who tries to escape.

Step 7: When the prisoner wears the bracelet properly and does not try to escape or harm the device then the server will display the prisoner status as “PRISONER NORMAL”.

Step 8: Through the wireless connection method the ESP 8266 is connected to the cloud platform to receive the notification of the prisoner status.

CHAPTER: 5

RESULTS

CHAPTER: 5

RESULTS

The final results of the implementation are as follows,

1. Step down transformer
2. Rectifier
3. Liquid Crystal Display(LCD)
4. RF receiver
5. Node MCU
6. Buzzer
7. Battery
8. IR sensor
9. RF transmitter

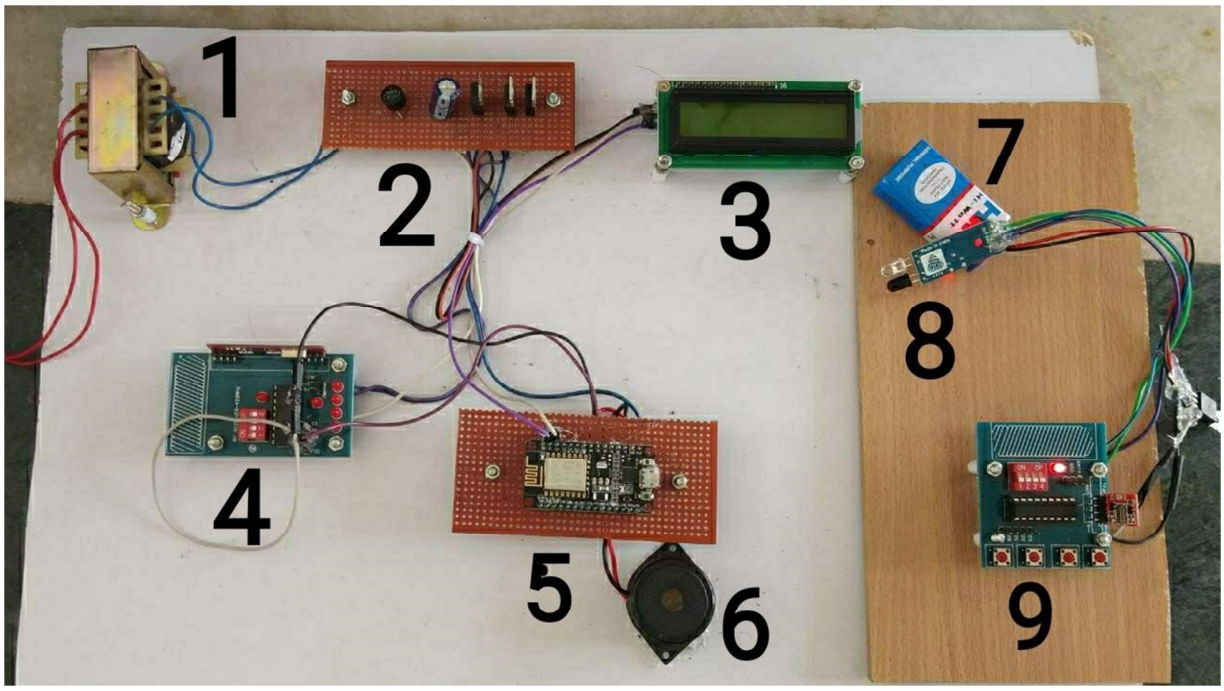


Figure 5.1 Prisoner and Receiver modules

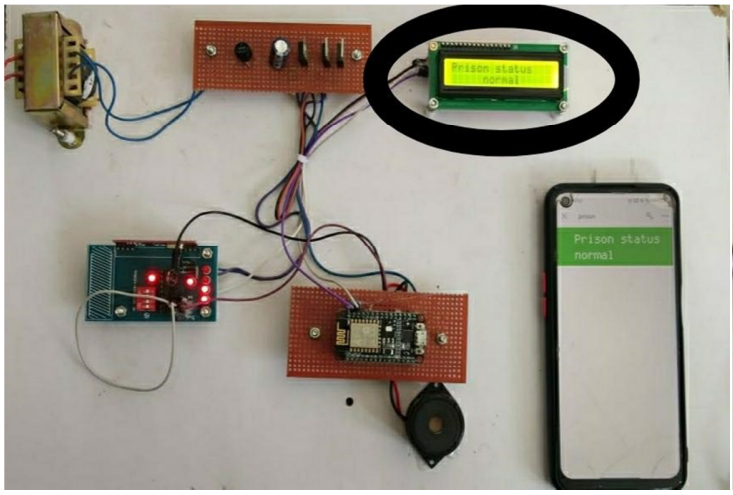


Figure 5.2 Prisoner status normal

Figure 5.3 LCD showing prisoner status normal

When the prisoner wears the bracelet properly and does not try to escape or harm the device then the server will display the prisoner status as “PRISONER NORMAL” as shown in the figure 5.2 and 5.3

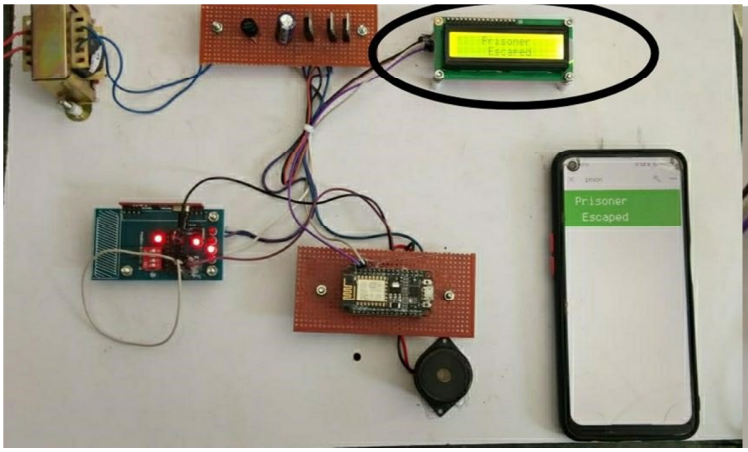


Figure 5.4 Prisoner escaped

Figure 5.5 LCD showing prisoner escaped

If the prisoners try to break or remove the bracelet immediately the alarm will be buzzered to the authorities and the server will display the prisoner status as “PRISONER EASCAPED” and the immediate actions will be then taken to catch the prisoner who tries to escape as shown in the figure 5.4 and 5.5

CHAPTER :6

CONCLUSION & FUTURE SCOPE
CHAPTER : 6

CONCLUSION

The conclusion of the proposed system is that if this system is implemented in our prison, it would add a new level to the security rules of our country. By monitoring the IR sensor, the alert will be generated so that the police authority can manage the situation with greater efficiency. The proposed work shows 100% results for behaviour recognition using sensors. The proposed system is used to avoid the escape of the prisoner from the prison and can maintain a secure environment in and out of the prison. Careful consideration should be given to any control system in a prison because of the unique problems likely to be encountered in this environment. Two such problems are the anticipated non-cooperation of inmates and the likelihood that the inmates will damage the equipment.

Finally, a tracking system is an extremely useful tool if it is important to know the precise location of individuals. A variety of tracking systems are available employing a number of technologies. These are commonly used by lone workers as a means of quickly notifying a response team of their location should they have an accident or feel in danger. To establish their suitability in locating inmates, trials would need to be undertaken.

Future Scope

In proposed system only one module of RF transmitter and receiver is implemented. But in future several modules can be placed so that it would be easy for the authorities to monitor the prisoners in vast prison environment. Multiple prisoner module can implement but the cost of the system would be little high.

The handover of the prisoner module can also be done .So it would be easy for the police department to monitor the prisoners in daily basis and it is also cost efficient.

The Video Image Display (VID) will effectively replace the wall of monitors found in conventional control rooms and will be used either in full screen mode, or divided into four. Where more than four images are required to be displayed at one time, the VRD will be used as a further video display. This will occur typically when there are several live images, from perimeter cameras, together with the corresponding looped replay sequences. The third display will normally be used for the selected view from the Virtual Reality model of the prison, primarily to assist the operator in visualizing the location of the event being controlled. The views will normally be preselected for each alarm button or other device and will be displayed automatically without any action **by** the operator. However, the operator will be able to select an alternative view in most cases, by the use of a single button on the OCS screen.

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APPENDIXES

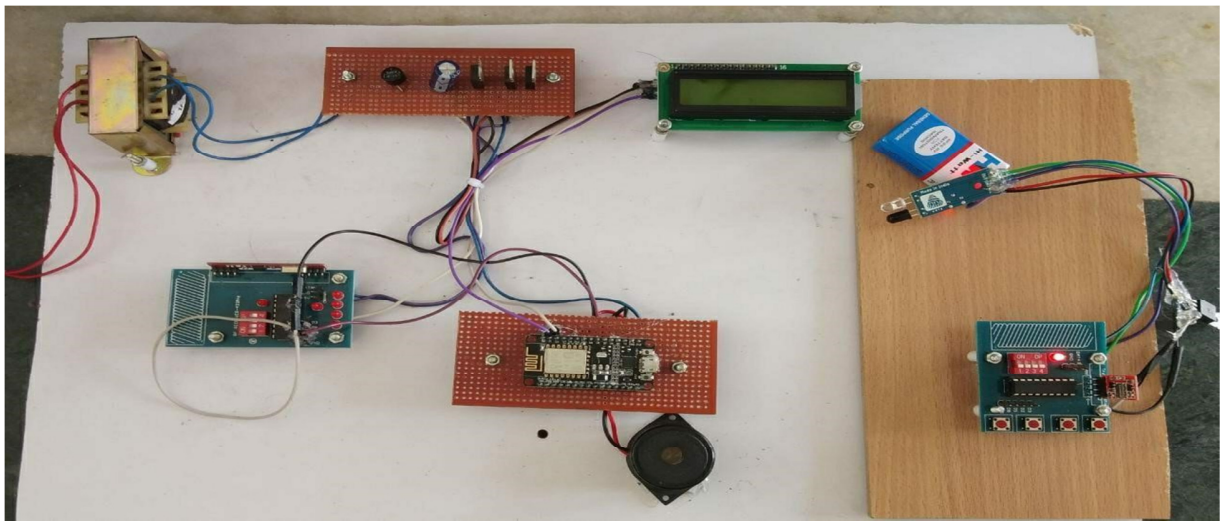
APPENDIX A:Sample Code

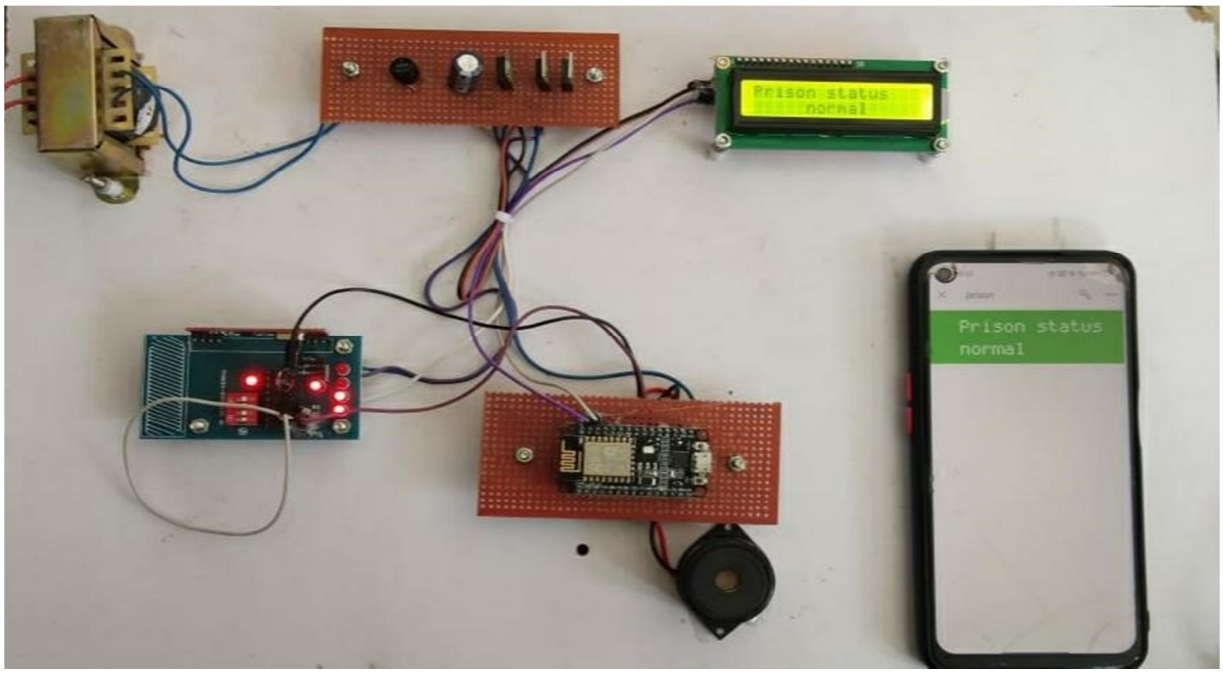
```
#define BLYNK_TEMPLATE_ID "TMPLEXiRZSai"
#define BLYNK_DEVICE_NAME "prison"
#include <BlynkSimpleEsp8266.h>
#include <LiquidCrystal_I2C.h>
```

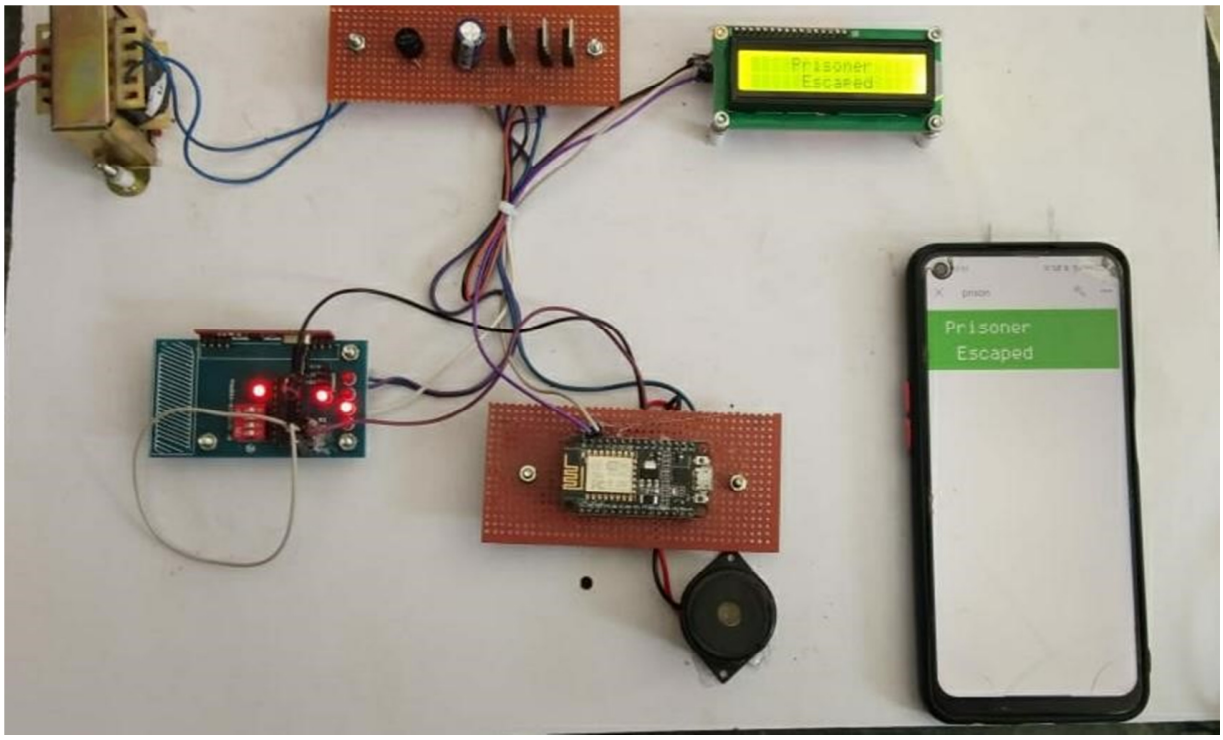
```
    int lcdColumns = 16; int
    lcdRows = 2;
    char ssid[] = "iot";  // type your wifi name char
    pass[] = "12345678";  // type your wifi password
    WidgetLCD lcd1(V7); void setup() {
    // put your setup code here, to run once:
    lcd.backlight(); lcd.init();
    pinMode(D7,INPUT);
    pinMode(D6,INPUT);
    pinMode(D5,OUTPUT);
    Serial.begin(9600);
    Blynk.begin(auth, ssid, pass);
    }    void
loop() {
   // put your main code here, to run repeatedly:
    Blynk.run();              digitalWrite(D5,0);
    lcd.setCursor(0,0);  lcd.print("       welcome
    "); lcd.setCursor(0,1); lcd.print("        To
    "); lcd1.print(0,0,"    welcome           ");
    lcd1.print(0,1,"     to                   ");
    delay(2000);
     lcd.setCursor(0,0); lcd.print("Prison
    Monitor    "); lcd.setCursor(0,1);
    lcd.print("     system     ");
    lcd1.print(0,0,"  Prison Monitor
    "); lcd1.print(0,1,"  system    ");
    delay(2000); lcd.clear();
    lcd1.clear(); int a=digitalRead(D7);
    int b=digitalRead(D6); while(1) {
    Blynk.run(); int a=digitalRead(D7);
    int b=digitalRead(D6);
    Serial.println(a);  Serial.println(b);
    delay(500); if(a==0&&b==0)  {
    lcd.setCursor(0,0); lcd.print("Prison
    status    "); lcd.setCursor(0,1);
    lcd.print("     normal     ");
    lcd1.print(0,0,"  Prison status
```

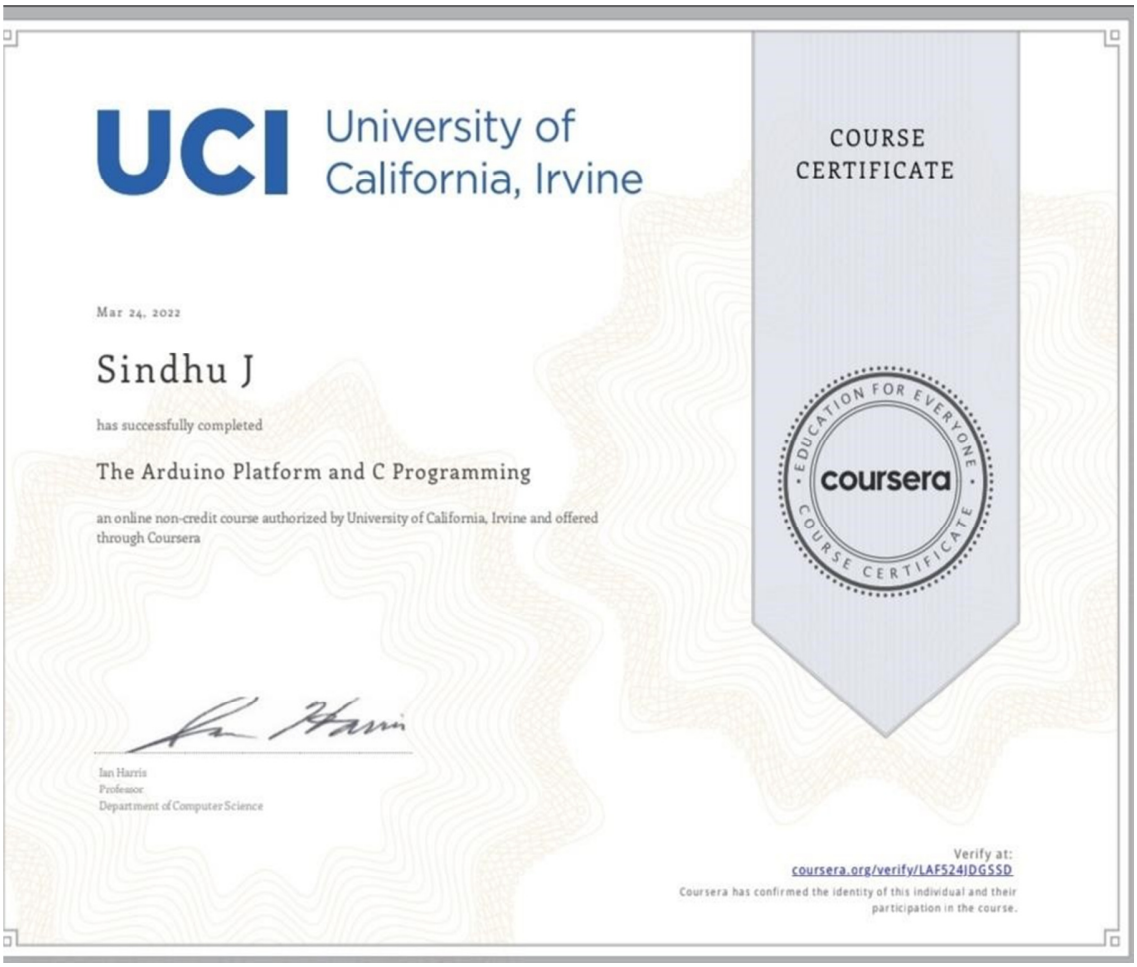
```
    "); lcd1.print(0,1,"  normal
    "); digitalWrite(D5,0);
      }          else  if(a==1&&b==0)      {
lcd.setCursor(0,0);             lcd.print("
Prisoner          ");   lcd.setCursor(0,1);
lcd.print("          Escaped            ");
lcd1.print(0,0,"  Prisoner              ");
lcd1.print(0,1,"   Escaped              ");
digitalWrite(D5,1);             delay(500);
digitalWrite(D5,0); delay(2000);
    }

    else if(a==0&&b==1)
    {  lcd.setCursor(0,0);  lcd.print("Prisoner
    not");                  lcd.setCursor(0,1);
    lcd.print("weared                 device");
    lcd1.print(0,0,"    prisoner    not    ");
    lcd1.print(0,1,"          weared     device
    ");     digitalWrite(D5,1);     delay(500);
    digitalWrite(D5,0); delay(2000);
        }          else  if(a==1&&b==1)      {
lcd.setCursor(0,0);       lcd.print("Prisoner
Didnot           ");      lcd.setCursor(0,1);
lcd.print("wear  device");  lcd1.print(0,0,"
Prisoner  Didnot         "); lcd1.print(0,1,"
wear  device                ");  delay(2000);
lcd.setCursor(0,0);   lcd.print(   "Prisoner
also    "); lcd.setCursor(0,1); lcd.print("
Escaped        "); lcd1.print(0,0," Prisoner
also         "); lcd1.print(0,1,"    Escaped
");      digitalWrite(D5,1);      delay(500);
digitalWrite(D5,0);
    delay(2000);
        }


      }
```

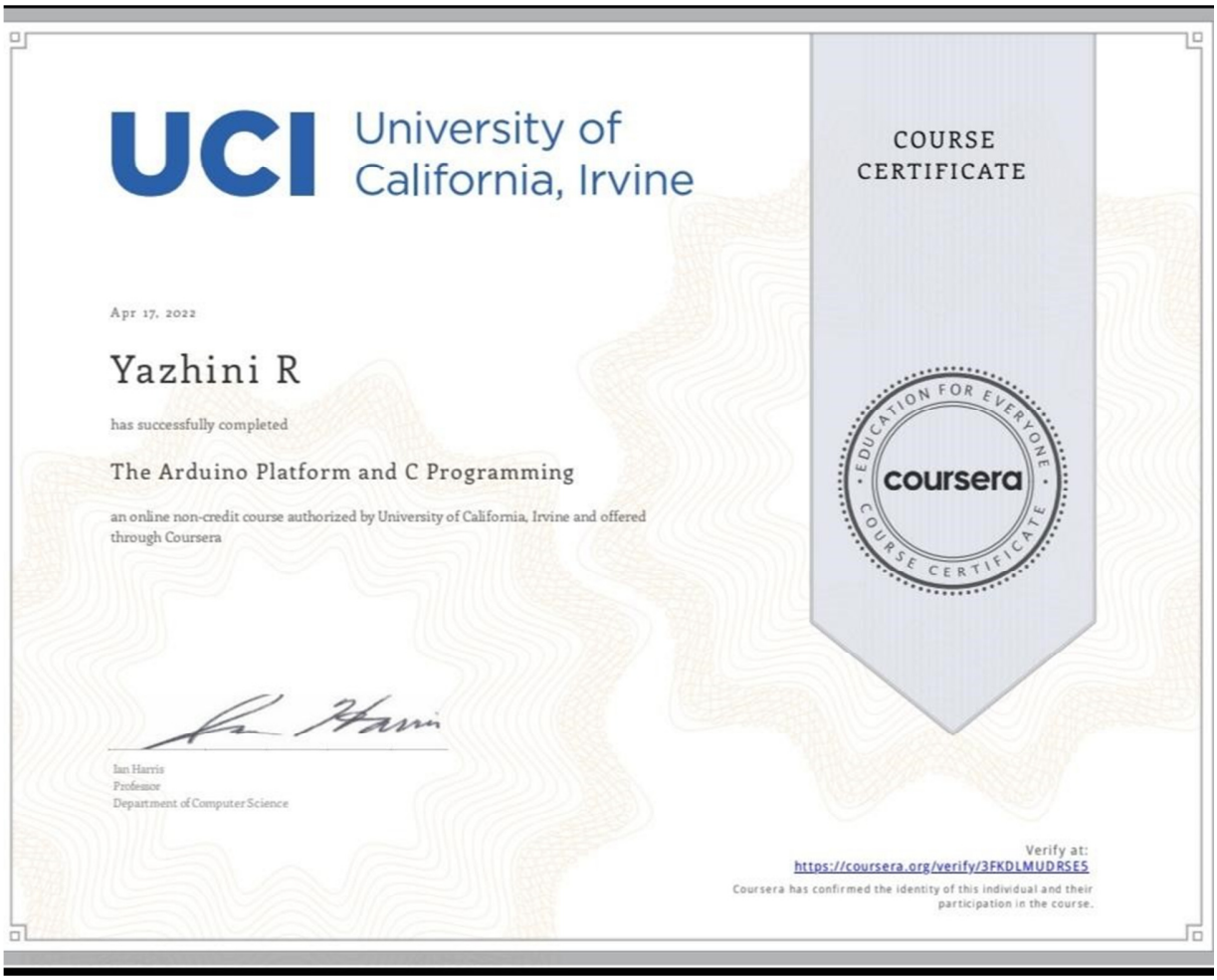
APPENDIX B: SCREENSHOTS

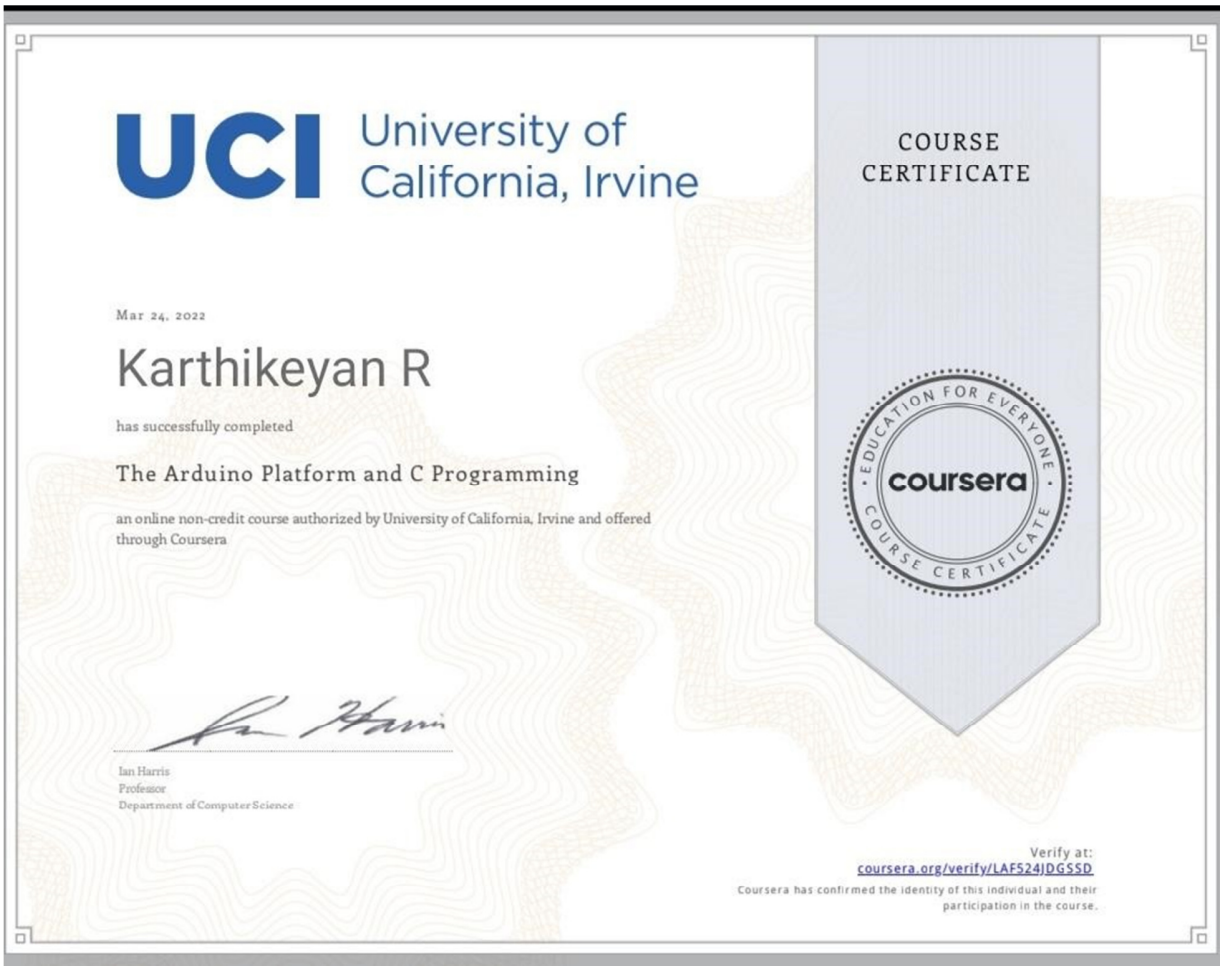





Prisoner
Escaped
Prisoner
Escaped


UCI University of California, Irvine
COURSE CERTIFICATE
Mar 24, 2022
Sindhu J
has successfully completed
The Arduino Platform and C Programming
an online non-credit course authorized by University of California, Irvine and offered through Coursera
EDUCATION FOR EVERYONE
coursera
COURSE CERTIFICATE
Ian Harris
Professor
Department of Computer Science
Verify at:
coursera.org/verify/LAF524JDGSSD
Coursera has confirmed the identity of this individual and their participation in the course.


UCI University of California, Irvine
COURSE CERTIFICATE
Apr 17, 2022
Yazhini R
has successfully completed
The Arduino Platform and C Programming
an online non-credit course authorized by University of California, Irvine and offered through Coursera
EDUCATION FOR EVERYONE
coursera
COURSE CERTIFICATE
Ian Harris
Professor
Department of Computer Science
Verify at:
https://coursera.org/verify/3FKDLMUDRSE5
Coursera has confirmed the identity of this individual and their participation in the course.


UCI
University of California, Irvine
COURSE CERTIFICATE
Mar 24, 2022
Karthikeyan R
has successfully completed
The Arduino Platform and C Programming
an online non-credit course authorized by University of California, Irvine and offered through Coursera
EDUCATION FOR EVERYONE
coursera
COURSE CERTIFICATE
Ian Harris
Professor
Department of Computer Science
Verify at:
coursera.org/verify/LAF524JDGSSD
Coursera has confirmed the identity of this individual and their participation in the course.