

Embedded Based Building Management System.

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Abstract – A smart building management system is one which integrate automation system began long before past time, with the help of controller. Smart building management can integrate with advance sensing technology to provide for controlling and monitoring the devices used in building area. In our proposed system we design a human effort less building management system where complete system divided in four sub module, as gate open closed, parking light, door lock system and fire or smoke alarm system. Day by day automation comes in building area where user don't have knowledge about how to use it and due to lack of awareness and user don't know about its value. With the help of our system user can interact with automation and due to our system security, manpower, electricity and many other problem are overcome.

Key Words: Building Management System (BMS), Arduino IDE, Embedded System, Automation, Building services, Sensor.

1. INTRODUCTION

The Building management system is clearly the building of the future. The goal of having a building management system only starts with early developing in the design stage. In many ways, this system the design and fulfilment of many green projects today, but it uses system to provide for a superior space. Its uses is to control, monitor and optimize building services e.g., lighting; door gate open close Security, alert and complete automated systems. Automatically with the alteration in environmental conditions controlled by system. In regular building there will be different room conditions depends on the changes in the environmental stages. While planning a smart building management, a Building service engineer, an Architect Hardware Engineer is required, but in case of ordinary building, a Building service engineer and an Architect is enough. In BMS, the security system, communication system, etc. are coordinated and automatically controlled by controller. The cost of construction of Intelligent Building is very high as compared to an ordinary building.

In today's era, there is a tenacious requirement for automated devices. With the enlargement in the way of life, there is a sense of urgency for creating system that would facilitate the convolution of life. To achieve this goal, a variety of advanced building technologies have been developed in the past two decades, aiming to improve the building performance to satisfy a variety of human needs and environmental sustainability.

2. GOALS AND OBJECTIVE

Goals:

The main goals of our system is, median controlling provision Automate and take control of various system, manages all the sensor which coordinates various appliances to provide a comfortable working environment in an efficient way. To provide a best services in building area and reduces the human effort using different types of sensor.

Objective:

The main objective of our project is to provide building automation in circular area like gate opening and closing using EM18 and RFID reader card, smart parking light system using IR sensor, smart door opening and closing system using matrix keypad as well as smoke or fire detection and alert to main system using buzzer etc.

3. EXISTING SYSTEM

[1] IoT Based RFID Gate Automation System:

The main aim of the techniques is that it utilizes the RFID system alongside IOT which is the endmost fate of electronic appliances. The vehicle that should be authenticate using given a RFID tag with a 12digit unique number. When the vehicle arrive reader scan RFID tag peruses the code, and send a signal to raspberry pi which checks for the unique number and on the basis of this operation will be down like open and close gate.

[2] Automatic Room Light Controller with Visitor Counter:

In these project, they developed and implemented a dual side system as Counter & Home Automation avail the idea of an Embedded Techniques. Suppose if any user enter in a room that time due to their motion sensor send signal to microcontroller and room light will be ON. If these system apply in seminar room then system can easily calculate the no of user entry in seminar room and if user are present in seminar then and then light will be ON.

[3] Intelligent Building Automation System:

The intelligent building automation system are connection between hardware and software that record and controls the building automation technology in an environment. An intelligent building, according to the Intelligent Building Institute (IBI) is one that impart a perspective and cost-

effective environment through refinement of its four basic elements: structure, techniques, services and management, and the combine relationship between them. The European Intelligent Building Group gives an intelligent building as one that ‘incorporates the best available concepts, materials, systems, and technologies.

4. SYSTEM ARCHITECTURE

There are a various uses for smart buildings and it has effective advantages. Our system reduces energy consumption, Give security access for doors, unauthorized vehicle are not allowed without security permission, fire detection and alert system and many more. System architecture are shown in below fig:

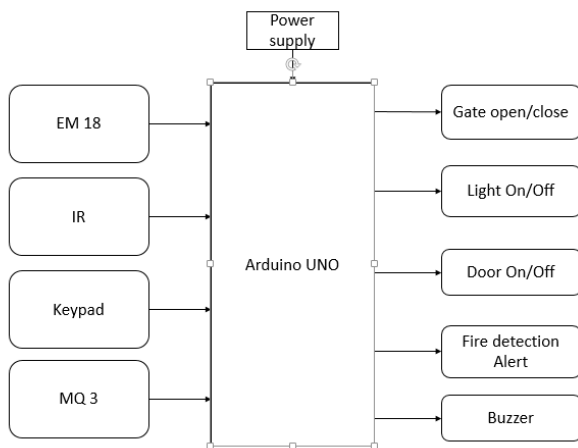


Figure1. System architecture

In our project building management system, when vehicle arrive in front of gate then system checks RFID tag is present or not with the help of EM18 reader if RFID tag is present and there 12 digit unique ID is save in our system then gate will be open for few second and then close automatically.

The electricity is main issue in our country where parking light or common area light will always ON due to this electricity wastage was done. To solve these problem we use IR based light control system where if any user is enter in parking area that time only lights will ON for some second as we provide in coddging. Due to these system we can overcome wastage of electricity.

The another functionality of our system is for door access system where in today’s era there are several system uses for door security in our project we used keypad based smart door access system where we set 3 digit password for door access permission if we enter correct password with the help of keypad then and then door will be open else door remain closed. The use of these system for no any user or unauthorized person can enter in a room without your permission.

The final techniques we used in our project is to detect smoke or fire in building area to give alert for users those are present in building, for alert we use buzzer. We set the limit for MQ3 sensor and if sensor sense the large amount of smoke or fire then and then system start alert and buzzer will be operated.

5. WORKING MODEL OF BMS:

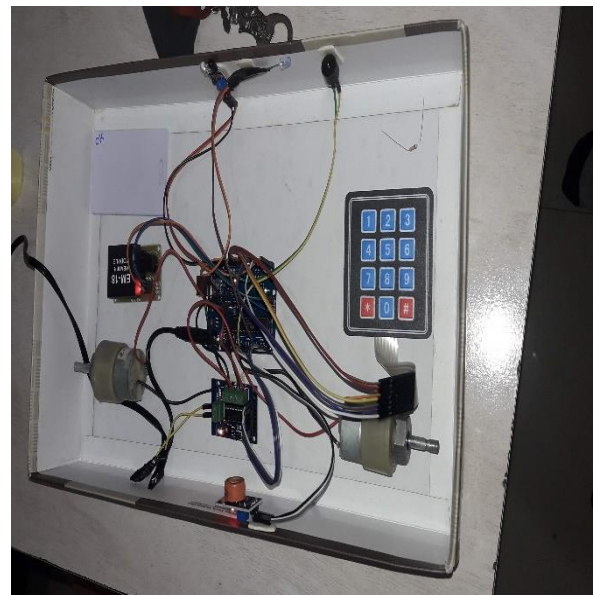


Fig 2: Actual Model

Hardware Requirement:

- Arduino UNO with cable
- Matrix keypad
- DC motor
- L293D
- MQ3 sensor
- IR sensor
- Buzzer
- EM 18
- RFID card
- Adapter 12V. 1A
- LED
- Connecting wire

Gate open:

In Gate open close we use three RFID card where 2 RFID card is valid and another card is invalid system can check valid card details with the help of below code and then open a gate for 10 sec and after 10 sec it will be closed. For our project valid card have 12 digit unique no as 0B00287C99C6 and 0B0028132515. With the help of these two RFID card gate open.

```

    if(((input) == rfid1) ||((input) == rfid2))
    {
  
```

```
state = readlock;

/* open the gate */

digitalWrite(motor1, HIGH);

digitalWrite(motor2, LOW);

delay(1000);

/* close the gate */

digitalWrite(motor1, LOW);

delay(10000);

digitalWrite(motor2, HIGH);

delay(1000);

/* stop rotation */

digitalWrite(motor1, LOW);

digitalWrite(motor2, LOW);

}
```

Light model:

For controlling light we use IR sensor to detect person or motion the system can check presence of user and if user present then system start LED and after few second system switch off LED for controlling LED we developed below code:

```
void readir()

{

/* check if person is detected or not */

IRState = digitalRead(IR);

Serial.print("IR= ");

Serial.println(IRState);

/* if people is detected then light will on */

while(IRState == HIGH)

{

digitalWrite(bulb, HIGH); // turn the LED delay
(20000);

IRState = digitalRead(IR);

}}
```

Door lock system model:

For door lock system we have to add library for keypad using library manager as and then use it as "#include <Keypad.h>" , after that we have to draw matrix as per keypad that we used for our project. For door access system we should enter correct password then and then door will be open else door remain close for door access permission we design below code:

```
if(num == 123)

{

/* open the gate */

digitalWrite(motor3, HIGH);

digitalWrite(motor4, LOW);

delay(500);

/* close the gate */

digitalWrite(motor3, LOW);

delay(5000);

digitalWrite(motor4, HIGH);

delay(500);

/* stop rotation */

digitalWrite(motor3, LOW);

digitalWrite(motor4, LOW);

}

else

{

/* if number is not matched then gate will not open */

state = readlock;

digitalWrite(motor3, LOW);

digitalWrite(motor4, LOW);

}
```

Smoke alarm system:

In these techniques we use MQ3 sensor to detect the smoke or fire are present or not in building environment area. If set limit for MQ3 if the value is goes up then and then buzzer will high and people get the alert, for this we developed below code:

```

void readfire()
{
/* Check level of fire */
digitalWrite(buzzer, LOW);

fire = analogRead(fire_pin);

Serial.print("fire = ");
Serial.println(fire);

/* if fire value is exceed above threshold */

/* then buzzer will on */

if(fire >= 750)
{
digitalWrite(buzzer, HIGH);
//FireDetection();
delay(2000);
}
}

```

Simulation Result

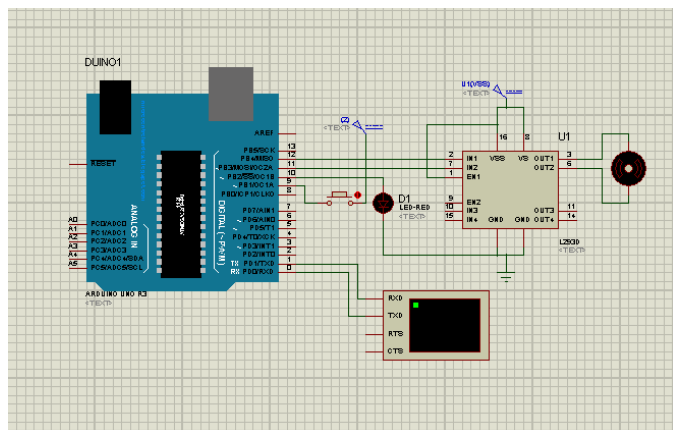


Fig : Simulation result system OFF

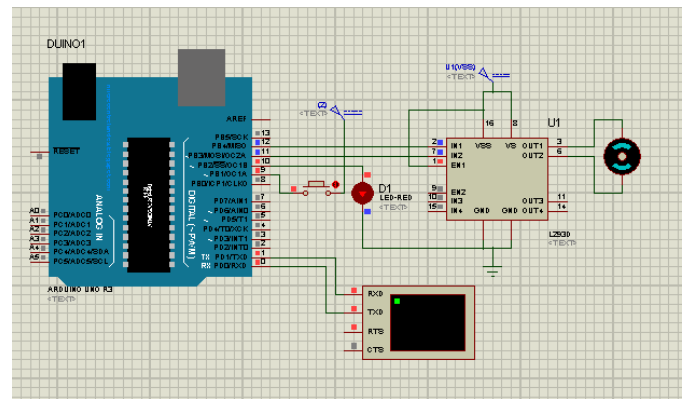


Fig: Simulation result system ON

6. MATHEMATICAL EQUATION

• Input feedback

$$\text{RFID card} = C = \{C1, C2, C3, C4, \dots, Cn\}$$

Where C1, C2, C3 is the input RFID cards

• Identify RFID cards

$$\text{IR} = \{I1, I2, I3, I4, \dots, In\}$$

Where IR is RFID reader

I1, I2, I3, I4 are the identify the RFID details

• Input features

$$\text{PIR motion detection} = P$$

$$P = \{P1, P2, P3, P4, \dots, Pn\}$$

Where P1, P2, P3 are input string like people motion

• Output feature

$$\text{Light will ON and OFF, } L = \{L1, L2, L3, \dots, Ln\}$$

$$\text{i.e. } P1 \Rightarrow L1$$

$$P2 \Rightarrow L2$$

$$(P = L)$$

• Input feedback

Keypad for PIN generation

$$\{\text{PIN}\} \Rightarrow \text{Digit}$$

Door (D1, D2, D3, ..., Dn)

$$\text{Validate digit} = \{D1 = X1\}$$

Where X1 is input PIN

- **Fire detection and alert**

$$F = \{F1, F2, F3\}$$

Where F is Fire, Smoke and Alcohol detected

F1, F2, F3 is alert system

7. CONCLUSION:

For the most part, we can say that the embedded building management system is a connection between software and hardware for monitoring and controlling different appliances. In this 21st century with the surfacing of the several artificial intelligent technology the work places became very cozy to work with. There are a various uses for smart buildings and it has effective advantages. Our system reduces energy consumption, Give security access for doors, unauthorized vehicle are not allowed without security permission, fire detection and alert system and many more. The boom of new technology comes is home automation or in building management user should know about new techniques for handling appliances in smart way. With the help of these automation we overcome the manpower or user effort in all over area.

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