IoT based Smart Building Management System using Arduino

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Abstract - This paper present a smart building automation system based on Arduino and Arduino software for programming. The system supports various sensor and its functionality with a very practical and convenient cost system configuration. In various ways, the design and implementation of BMS (Building management system) and fulfilment of many type of green project today, but it uses technology to provide for a superior space. With the help of these system we reduces the human effort. The key features of our project is to opening and closing gate via RFID module, common area lighting, door opening and closing with the help of keypad and fire detection and alert to main system. All the hardware sensor and Arduino components are put into a best demonstration model with the motive of the test of the system and presentation in real-time. With the help of these model, the smart BMS environment is animated and correlated function becomes simple understood. BMS is reliable circuit that takes over the task of controlling various system used in it.

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

1. INTRODUCTION

In today's world, there is a persistent requirement for automated appliances. With the expansion in the way of life, there is a sense of urgency for creating circuits that would facilitate the complexity of life. While planning an intelligent building, a Building service engineer, an Architect & Hardware Engineer is required, but in the case of the ordinary building, a Building service engineer and an Architect are enough. For many years, buildings that offer comfortable, a flexible and energy efficient living environment at a minimal cost has been the expectation of building owners and occupiers. 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.

Building automation frameworks are the smart systems that include a combination of suitable software and hardware which are utilized for automation of computer systems. These system ease usage of important functions such as gate opening, door opening, lighting, fire extinction, and security. Some building automation systems can also provide an emergency alert service.

However, current building applications have a some common problem, such as comprehensive functions operate in isolation, can't be managed in overall fashion although overall management's tremendous potential in future applications. European Union supported Building as a Service (BaaS) project deals with this various problem which aims to provide a comprehensive software platform for present and future commercial building management and building innovation, with flexible and cost-efficient integration of mentioned services, an overall management idea is targeted.

As a rising idea, building automation coordinates numerous applications which can support different usages. For instance; a dc motor engine can be utilized to control the gate and door; on the other hand, this work has been supported by 9140003 ITEA BaaS/Tubitak. it is appropriate for pet sustaining. Essentially, all household exercises can be adjusted to the computerization idea by the assistance of encouraging the electronic component. The remote access renders it progressively down to earth and valuable in the home condition. At the point when the majority of the equipment based administrations and easy to use interface are joined in a framework, the ascent of building computerization framework is inescapable. For such a blend, security is a huge issue. As a commendable arrangement of this issue, in our framework, motion sensor i.e., IR sensors and entryway controls are used so as to get data about strange exercises like a robber at home. In addition; gas, smoke and flame sensors give steady data about exceptional circumstances and raise caution.

In this project, building automation system is developed by composing Arduino circuit that involves smart home functionalities which connected with sensors which are controlled by an Android based application. The fundamental controls like lights, door, gate, fire and gas alarms are all included in this project. However, system's functionality is display in real-time by an unique developed demonstration model which shows system properties clearly and possible benefits of smart building automation system in a modeled home environment.

2. GOALS AND OBJECTIVE

Goals:

The main goals of our system is, Central controlling facility Automate and take control of various operations, manages

all the systems which coordinates various systems to provide a comfortable working environment in an efficient way. To provide a best facility in building area and reduces the human effort.

Objective:

The main objective of our system is to provide building automation in building area like opening and closing gate via RFID card, smart common area lighting depends on object motion or human motion, smart door lock system using keypad as well as fire detection and alert to main system etc.

Purpose:

Behind choosing this project, automated central control system in all modern big buildings is very important and necessary for the qualitative improvement of the working conditions as well as rational energy distribution. All buildings system have some form of mechanical and electrical system in order to provide the functional necessary for maintaining exact working environment.

3. LITERATURE SURVEY

[1] IoT Based RFID Gate Automation System:

The main aim of the system is that it utilizes the RFID framework alongside IOT which is the eventual fate of electronic correspondence. Here we likewise supplant the microcontrollers prior utilized with a raspberry pi 2 which is a mini processor that is both a microcontroller just as a server. The vehicle that should be approved is given a RFID tag with an exceptional number. Presently when the vehicle comes to close to the door RFID tag peruses the code, and send a flag to raspberry pi which checks for the relating subtleties of the one of a kind number and on the off chance that it matches with the spared information in the database, at that point it again makes an impression on the engine which opens the entryway. The IN and OUT time of each vehicle that enters the are is spared in a database and furthermore a web server which encourages us to get to those subtleties wherever we are utilizing IOT.

[2] Automatic Room Light Controller with Visitor Counter:

In these project, they designed and implemented a Bi-Directional Counter & Home Automation utilizing the idea of an Embedded System. The objective clients of the project can be anyone right from a common man to any association. Suppose if anyone uses our project for Seminar Purpose then the track reputation of the persons attending the seminar will give the exact idea about the no. of person attending and leaving the seminar and accordingly the Project Model will control the Electronics Gadget of the room. This type of project is useful in

developing countries and this project has a splendid future. In this computerized world, Technology is very advanced and we prefer things to be done automatically without any human efforts.

[3] Design and Implementation of a Digital Code Lock using Adriano:

Digital code lock system is totally depends on arduino. Arduino has been the brain of thousands of embedded projects. We can set the PIN and reset it without using external device. It is useful. It is 90% working and can be easily developed. The project explain here is based on Arduino and is more simple and reliable than simple microcontroller based digital code lock. Here is an LCD display which is used to interface with the project to output lock status. In this project, we have an additional advantage that the user can change the PIN. The user will be prompted to set a password at installation. This password inputted at installation will continue to serve the lock until it is changing. The program will check for the current password and allows the user to change Password only if the current password is input correctly. Applications: It can be used in places where we required more security. It can also be used indoor, lockers, offices, main gate of the house, ATM etc.

[4] Intelligent Building Automation System:

The intelligent building automation technologies are an interconnected network of hardware and software that monitors and controls the building facility environment. An intelligent building, according to the Intelligent Building Institute (IBI) is one that provides a productive and cost-effective environment through optimization of its four basic elements: structure, systems, services and management, and the interrelationship between them. The European Intelligent Building Group defines an intelligent building as one that 'incorporates the best available concepts, materials, systems, and technologies.
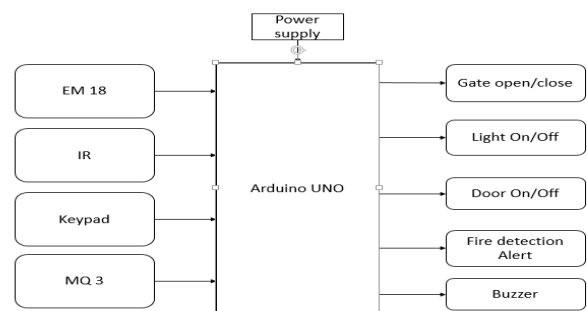
4. SYSTEM ARCHITECTURE

Figure1. System architecture

In the building management system, when vehicle or person enter into building the RFID tag required to enter

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into the building in the system architecture shows the all functionality. i.e. Gate open and close automatically when the RFID tag is scan on the gate, rooms door can open via pin password or smart card if unauthorized person cannot be able to enter into the room, fire alert module is used for the when the temperature increased then it give the alert message. If fire happened then sensor sense and give the alert message. Alarm system. Power changes according to brightness.

When the corridor light is on unnecessary then waste of energy and money. In this paper we develop the system like when the light is required then only light will be on otherwise off. The light system also depends on the brightness. According to motion light will be on and off.
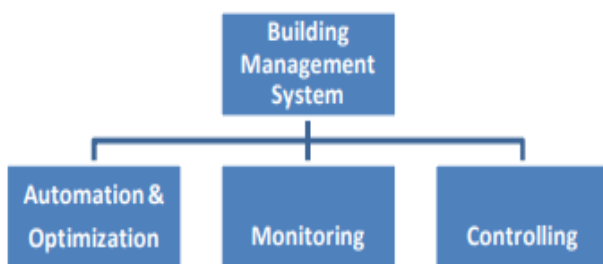
5. BASIC FUNCTION OF BMS:

Fig2. Basic function of BMS

In the comfort way of human lifestyles in the building, there are many systems has automated, with increase the almost all the function to throughout all the system with less economics introduces. The Building structure is equipped with electronic circuits, monitoring, controller, sensors, and DC motors. To provide better security. Sensor and hardware part are implemented. Light control, fire system, gate open close, door control proposed here. Keeping in the mind internal facility has also automated, controlling light in buildings should be necessary. Keeping all the things in the mind all the system are introduces building automated here.

6. WORKING MODEL OF BMS:

Building automation systems

Most basic criteria for building automation operation for commercial buildings are to ensure comfort for users and security of the building, by controlling building technological infrastructure, while minimizing energy consumption. The comfort means providing optimal conditions of indoor thermal parameters and indoor air quality (CO_2 and humidity) and parameters of indoor lighting of a workplace and common areas. The security means to execute the functionality of occupancy monitoring, controlling who has access to protected areas of the building and alarming by I&HAS (Intruder & Hold-up Alarm System).

Smoke alarm system:

Smoke evacuation systems are vital to the safety of building living people and other visitors in your building. The system detect the smoke contain then system gave the alert message. A smoke or fire is detected with the help of MQ3 sensor. A smoke evacuation system identifies where the smoke originates from and controls the movement of the smoke so it does not reach exit areas and other safe zones within the building. Whenever smoke or fire is detected that time buzzer or alert system will be active.

Door lock system model:

In this model the user can set the door lock password pin to open the door. The user or building person have authority to change the password as per there requirement or as per security purposes. We use keypad for set or enter password to open the door. Small motor is adjusted with door whenever user pass the correct password that time door will be open else door not open. Unauthorized person cannot be open the door.

Gate open:

In this model user uses the RFID card for the gate open and close. When the peoples entering into the building RFID card is required. Unauthorized people cannot enter in the building. Security is increased by this system.

Light model:

In this module the wastage of energy is reduces. In this model the system on the light depend on the person availability of the people. When person move from corridor then light will be ON/OFF. We use IR sensor for detect the object or motion in corridor or common area for glowing lights or LED.

7. ADVANTAGES:

* Increasing the value of your business and property

* Providing sustainable solutions to your building infrastructure and the environment

* Providing security for your property, building, its' occupants, and business assets such as IT data and resources

* Providing indoor environmental safety and comfort through your HVAC system

* Decreasing equipment operating cost expenditures by about 15% annually

8. CONCLUSION:

For the most part, we can say that the intelligent building management system is a set of software and hardware for monitoring and controlling different sections of a building. In this 21st century with the advent of the several artificial intelligent technology the work places became very cozy to work with. It has changed the uncondensed working environment leading to the increased output and also lessen the running cost to a certain extent. Lighting efficiency it will cut down the electricity bills. But any how today the cost of such equipment's to make a building artificially intelligent is a costly means. With the increase in demand of such systems the cost of these will become affordable as more and more builders will be using such systems in future

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