Building Management System Using Arduino

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Abstract: *Arduino based intelligent building management system using IoT is future technology used in building for safety and monitoring. in this building, a 3-level distributed structure is adopted in the monitoring system, which includes a central server, local controller, and intelligent acquisition node. Here we are using different application specific components like fire sensor, meme sensor, load cell, and GSM module which are interconnected to the microcontroller. The microcontroller is also connected with the IoT devices with can control the output reading wirelessly and can be monitored accurately here using the special dynamic IP source which we created by using HTML and embedded code we can check the regular updating output results and get the alert messages when there are any sensitive increasing changes which are not relatable to the optimal conditions that design. This building system is the perfect example for the safe and real-time data transmission between the local controller and central server. This proposed building management system is checked and it is stable and effective.*

Keywords: Arduino Uno, IoT, Sensors

Introduction:

Smart buildings are going to be real with the implementation of Building Management Systems (BMS), with installing, monitoring, and communication between smart devices like sensors, electrical equipment, power meters. Smart buildings are the ones where various parameters like temperature, water, etc. are monitored and analysed to make them highly efficient. The Arduino Is used in an efficient way for implementation, powerful and economic smart building management here the Arduino is connected with application-specific individual sensors with can measure real-time measurement or reading. In this project, we are designing a system that will Monitor and take measurements controlled by a smartphone application. In this project, there are components like ultrasonic sensors, water level sensors, fire sensors, and water sensors. The ultrasonic sensor is used for the detection of real time motion readings we can use this sensor in parking spaces for a smart parking slot. Here we use Arduino Uno and we give poser supply to the Arduino Uno. And we connect the sensors like MEMS sensor, fire sensor, load cell, pump motor, and a GSM module we use a UART protocol. For Arduino Uno, we use Embedded C coding and Proteus software. And HTML is for web page coding. A water level sensor is used in the water tanks to control the overflow and efficiently stop water Wastage. The fire sensor and gas sensor are also used in this building so when any accidents happen the persons in the building can get there safe by those sensors' warnings.

Literature survey:

Buildings are most electricity consumers and should protect from any type of accidents, that too mainly apartments and other high stored buildings. To reduce it we tend to introduce smart technologies, we also make sure that we have correct and accurate information for building management. Here we used Arduino Uno microcontroller for correct processing and handling of the data and to intimate other sensor devices around the building. Arduino supports various connections and sensor devices as mentioned like fire detection, pressure detection. if any error occurs or an accident occurs the alarm systems connected are to be alerted throughout the building making a wireless sensor network (WSN), Arduino always analyses and transmits the data to do building management. the power source of Arduino is taken from the battery. we use the best sensor devices for best management results without any troubles. In our proposed model, we go for the wireless medium as wired connections are not the best solution for building management when any fire accident occurs. similarly, sensor devices are effectively interconnected. we also connected this total system model with IoT technology, as it is an emerging technology for wireless devices. we have also

programmed the Arduino for automatic instructions when everything is out of control using various programming code languages. we can control the total mechanism through any wireless devices like computers, laptops.

Internet of things:

The ability of various physical devices to the network is simply known as the internet of things. the embedded systems connected to the internet the sensor collects the data and transfer it to the other devices using the internet of things. the internet of things (IoT) contains many protocols, application domains. the instructions given to the controller can predict the changes and intimate using IoT technology. To connect all the sensor devices around a smart building we use the concept of "things" such that all these sensors are connected as a network making building management easy to access and free from accidents. As mentioned all the sensor devices are connected to the Arduino controller it processes out total information. a building can be any of the industry, residential, enterprise models connecting into smart grid buildings. thanks to IoT technology for achieving and providing good reliability and the best solutions to interact with physical devices.

IoT Diagram

Block Diagram:
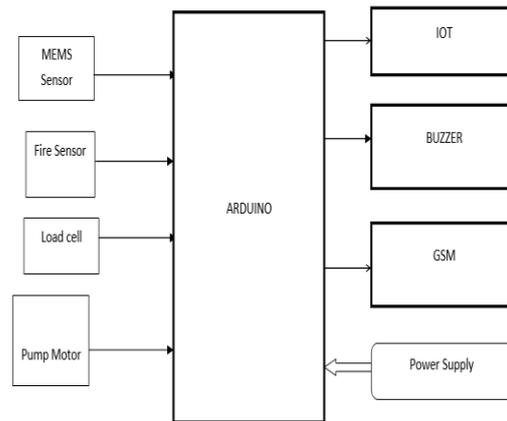

Basic Block Diagram

Methodology:

In our present scenario, we have few building management techniques with minor and major drawbacks, to overcome these flaws we tend to use some new techniques and methods to improve the existing building management system. we have also added some other new devices for better building management. some of the present building's management techniques are, connecting physical devices through wire medium, the data transmission is difficult and the data is not accurate to analyse, present using techniques consumes more power with less efficiency. To overcome all these problems, we have improved and implemented the new techniques. new sensor devices and other measurement devices are included for better management, using less power consumption with high data transmission and high accuracy for analysing. one of the main improvements is using Arduino controller, which can capable of doing all the works with instructions given.

Components Description:

Arduino Uno:

Arduino Uno Can be simply known as a microcontroller board with open-source software based on the microchip, technically known as "ATmega328P". this microcontroller is developed by Arduino company and manufactured by multiple companies. the board consists of various sets of digital and analog pins consists of both input and output pins. these pins are used to connect the other

devices and the board can programmable using a micro-USB port. the power source for the board can be given using an external battery. the CPU is based on a Microchip AVR 8-bit, here SRAM memory is used. the clock speed is approximately 16mhz and other pins like reset pin, ground pin are included onboard.
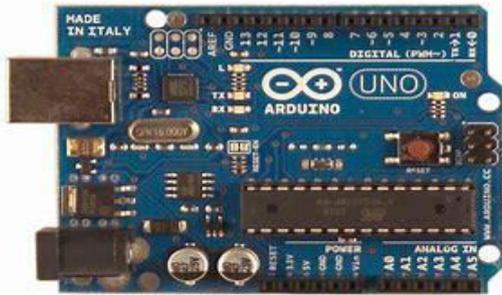
Arduino Uno

MEMS Sensor:

MEMS Sensor is not a single sensor but a group of sensors called MEMS Sensor, they are the low cost sensors, highly accurate inertial sensors. mems sensors are used heavily in industrial range applications. the full form of mems is "micro electro mechanical systems". the name itself explains it contains mechanical actuators, structures, microsensors, and microelectronics. this sensor uses chip-based technology. these sensors are very capable of identifying external changes and quickly respond to the changes that happened mechanically.

MEMS Accelerometer

Fire sensor:

Fire sensors simply sense few fire phenomena results like fire, smoke, radiation, gas, heat. they are known as detectors as they detect the given results. if they detect any changes, they inform the controller to start alerting others. flame or fire detector responds and

sends the data so no damage occurs in the building. in industrial buildings, the fire sensor is essential because if any ignition systems, power line got disturbed they catch fire this can damage the entire building. so fire detectors are to be installed.

Fire Sensor

Load cell:

It is Also Known as Forced Transducer, as it converts the force into electrical signals. the force can be the tension, compression, and pressure. this is one of the physical devices which is essential for building management as it detects any changes in forces as mentioned above so if any defect arises the building will not get damaged. these sensors are mostly used in industrial areas and people living in buildings. the load cell sensor is divided into three main types, Strain gauge, pneumatic load cell, and hydraulic load cells, other types are available for other materials.
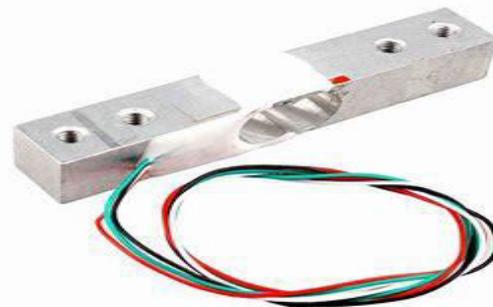
Load Cell

GSM:

The full form of GSM is a Global system for communication. it is developed by the European telecommunication standard institute. the gsm describes the protocols for the second generation digital networks used by mobile handsets. here we use gsm technology for a connectionless medium between the physical sensor devices.

GSM Module

Applications:

1. Residential Buildings like Apartments
2. Small Scale Industries
3. Security and Monitoring Systems

Conclusion:

Here, We have developed a System Model that can be installed for building management. It can provide us security, free from accidents, controlling the physical devices by connecting to the system, and others. Although we have other options for building management systems, we have tried to implement new technologies to remove the limitations of old technologies.

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