

Design and Implementation of Smart Society using IOT

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Abstract - In this paper, the implementation of smart home using IOT is discussed. Now a day, smart society achieved great popularity and it provides a smartest way of living, comfort and security. A smart home uses sensors, actuators and microchips, in order to collect data and manage it according to our need. Different controlling devices and configuration can be found in existing systems. Such system has been found already in many places for various applications. These IOT project allows objects to be sensed and controlled remotely across existing network. Lot of research are also carried out to automated the irrigation system by employing different methods. Irrigation system is a process of allowing water to roots of plants. But the market price of this type of system is expensive for the small area coverage. Thus, this paper proposes a design for smart irrigation by using efficient and cost effective devices.

Key Words: Internet of Things (IOT); Smart; home; TFT, arduino, sensors

1. INTRODUCTION

1.1 Internet of Things (IOT)

In recent years, in the world of digital connectivity, the demand of automation increases because it needs less manpower and helps in decreasing the wastage and helps to save the energy. To connect, to communicate the things with each other and to control them without much involvement of manpower can be done by using the most effective technology called as IoT (Internet of Things) which is the most important development of 21st century.

The IOT is the things that sense and collect data and send it to internet. These data can be accessed by others things too. It is used to generate real time data. These data can then analyze and used to create desire output. IOT inputs the required intelligence into basic building blocks of society and helps to make it smart. [1]

1.2 Smart Society

Implementation of automation in the society is known as smart society. A smart society is defined as "One that successfully harnesses the potential of digital

technology and connected devices and the use of digital networks to improve people's lives." [1]

Smart society involves the control and automation of lighting, heating, ventilation and security. Basically, smart society consists of two parts i.e. smart building and smart gardening. Smart home integrates household activities that include sensors to read input condition and centralized the control of electrical appliances. Smart garden includes implementation of smart irrigation system in the garden. This infrastructure helps owners, operators to improve asset reliability and performance which is used to reduce energy. As world urbanization continues to grow and thus the entire population expected to double by 2050, there exists an increased demand that reduce environmental impact and offer citizens a high-quality life. A smart city brings together technology, government and society to enable a sensible economy, smart mobility, a sensible environment, smart people, smart living and smart governance. This paper focuses on developing a smart society using IoT technology. The main objective of the system is to save the electricity, to reduce use of manpower, to develop security system, to reduce wastage of water, to control growth of plants by monitoring weather conditions.

2. METHODS AND MATERIAL

2.1 Raspberry PI

Raspberry Pi becoming a cost-effective solution for managing the smart products around your home. As raspberry pi is of small size and it provides energy saving environment and cheaper in rate it is the better solution for home automation. Raspberry pi can fruitfully handle the web server which is required to host a website in the network. As raspberry pi is having various GPIO pins it is useful for controlling various devices. Raspberry pi based home automation is better than any other methods in several ways. [2]

2.2 Relay Switch

A Relay is electrically operated switches, which permit low power circuits to modify a comparatively high voltage or current on/off. For a relay to work an appropriate pull in and holding current should be skilled its coil. Relay coils are designed to work from a specific voltage often its 5V or 12V.

The function of relay driver circuit is to supply the required current energize the relay coil, when a LOGIC 1 is written on the PORT PIN thus turning on the relay. The relay is close up by writing LOGIC 0 on the port pin. In this system four relays switch board is being used for controlling device.



Fig -1: Smart building hardware [5]

2.3 Home Appliances

Home appliances are basic, generally, electric machines which helps to perform some household actions. These includes fans, lights, bulbs, hooters and so on.

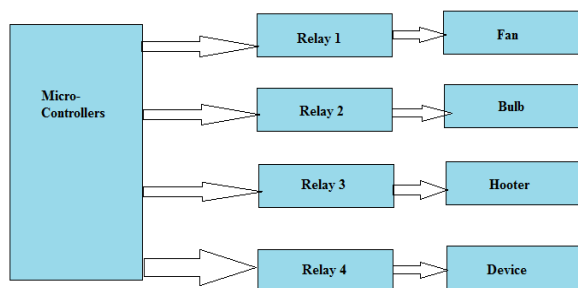


Fig -2: Block Diagram for the configuration of home automation system

2.4 Conceptual Framework of Building and Smart Irrigation

This section describes the conceptual framework and therefore the methodology adopted for this work including the systematically organized different stages of the research in conjunction with the detailed implementation features of the proposed system. In addition, it clarifies the structural components of the proposed system and their integration to achieve the research aim. The flowchart in Figure 3 illustrates the research stages followed in the present study.

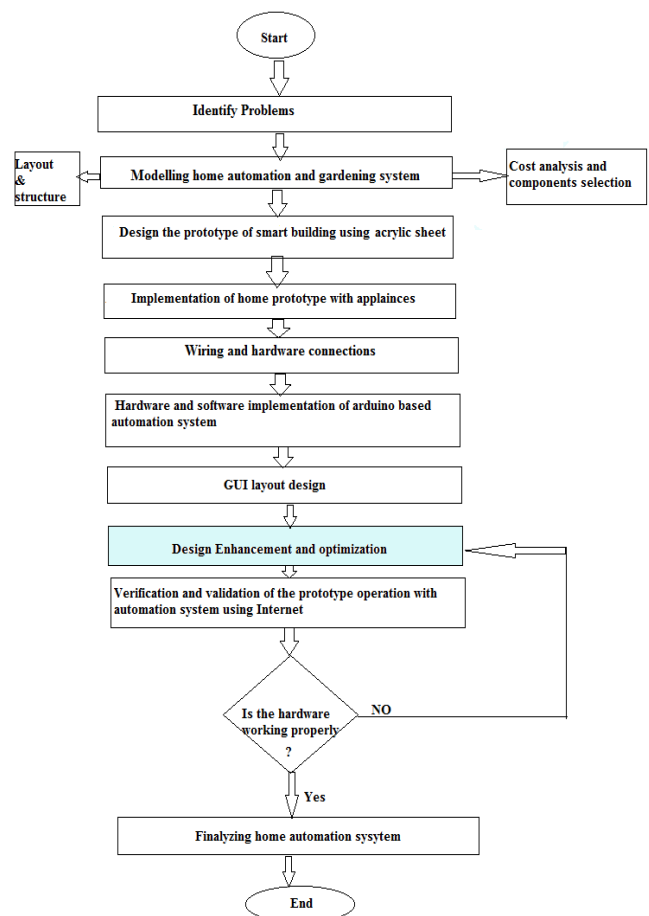


Fig -3: Working of smart home system

The flowchart in figure 4 illustrates the working of smart irrigation system. The program from PC is deployed into the microcontroller for the specified procedure through the USB port on the kit.[3] If the power button of the kit is turn ON, then system is activate. And the TFT display on the kit will ON. The sensors used in the system collects the data from soil and environment. The analog output of all sensors is given to the microcontroller if the system is activate. The microcontroller predicts this data and takes required action for irrigation. System first checks whether it's a day or night using the solar radiation sensor which detects the presence of light. If it's a night then the system waits until it becomes a day and if it is a day then it checks for other sensor values. If soil temperature is high and soil is dry, then system will check the leaf wetness value. And if leaf wetness is below a certain threshold value, then system will switch ON the relay which turns ON the motor. The water is then flowing through the high pressure water pump to which sprinklers are directly connected. In this system flow sensors connected between the motor and the sprinklers, measures the flow rate of water flowing through it. Once the motor is ON, the system checks the flow sensor value. And if it is less than or greater than the real requirement of the water in a

garden, then user have to control the speed of sprinkles manually via a valve connected on the water pump.

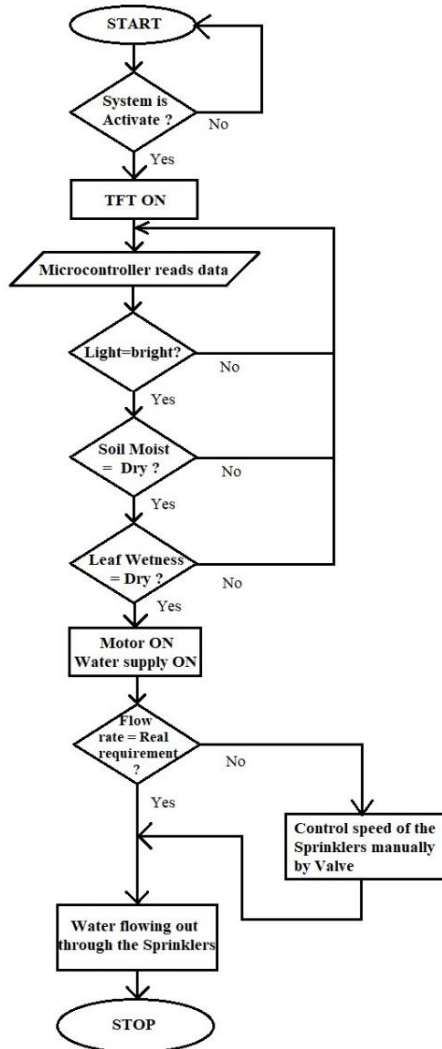


Fig -4: Working of smart irrigation system

This system uses sensors like soil moisture sensor and soil temperature sensor to monitor soil condition, leaf wetness sensor to determine presence of moisture on leaf, flow sensor to determine the flow rate of water and solar radiation sensor to monitor the sunlight. In this system, we are using a node on which the TFT is mounted to display the sensor value. It also includes arduino mega2560 which we are using as a microcontroller in the system, zigbee module for wireless communication and esp8266 Wi-Fi module.

In node, the TFT, esp8266, zigbee are internally connected to arduino mega 2560. Soil moisture sensor and Soil temperature sensor measures the soil moisture and soil temperature of the soil respectively. Solar radiation sensor measures intensity of light and gives a sensor value

accordingly and the leaf wetness sensor measures whether the leaf is wet or dry and gives the message which is then displayed on TFT. All the sensors are connected to arduino. These sensors give the output data to the arduino in which the programs for interfacing of these sensors with arduino mega 2560, displaying that data on TFT is deployed using arduino IDE software. The sensor data is then displayed on TFT.

While working with arduino mega 2560, we are selecting the board arduino mega 2560, Atmega2560 as processor and AVRISP mkII as a programmer. We are creating a hex code for an image to display it on TFT using software named as lcd image converter And use this code into the program in a separate header file.

By monitoring data on TFT, we can control the irrigation process. We are using a motor to which an AC power supply and a water supply is given. The motor is then connected to the water pump connected to sprinklers. The flow sensor is connected between the water pump and the sprinklers measures the flow rate of the water flowing through the water pump into the sprinklers. As per our purpose and by monitoring the data displayed on TFT and flow rate measurement, we can control the speed of sprinklers manually by moving the valve connected to the motor.



Fig -5: Irrigation sprinklers

3. RESULT AND DISCUSSION

The Raspberry pi is programmed using python. Figure 6 shows the GUI which is designed using QT Designer. Here, GUI has been created to continuously monitored the sensor data that will displayed to the user PC Shown in Figure 6. Using this GUI, user interacts with the system to regulate devices. In the system, bulb intensity can be controlled using touch panel. If passive infrared sensor (PIR sensor) sense movement of people, animal or any object it control lightning

in the room. If RFID sense the RFID tag, it sends status to GUI i.e. access or access denied. Hooter is used in fire alarm system to alert people in case of fire detection. An Internet Protocol camera or IP camera is the digital video camera that receives control data and sends image data. This IP camera is used for security purpose. The live streaming can be monitored on the GUI when the button gets pressed.

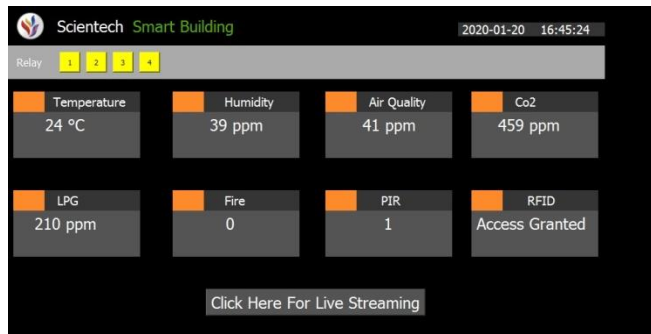


Fig -6: Graphical User Interface [5]

The Arduino Mega 2560 is programmed using Arduino id. The outputs of sensors are displayed on the TFT and by monitoring that values the control action will be taken for the irrigation. The sprinklers speed is varied accordingly. Different sensors are interfaced with the Arduino mega 2560 and their values are displayed on the ST7735 TFT color LCD which is 1.8-inch-long and having a resolution of 128*160 pixels. The output values of sensors used in smart irrigation, like soil moisture sensor, soil temperature sensor & leaf wetness sensor values are displayed on TFT. We also displayed the logo which is helpful for people to better understanding. According to the sensor's data displayed on the TFT, the system works. When all the values of sensors are below a certain threshold, system will switch on the motor through relay. And the water get flow out through the sprinklers which are buried into soil in garden. The flow rate of water is get measured by flow sensor, connected to sprinklers through pipe. There is a pressure valve, controls the speed of sprinklers depending upon the real requirement of water in a garden. When the soil needs more water the sprinkler speed is fastest and when the soil needs less water the sprinkler speed is lowest. The sprinkler covers the area of 3 to 3.5 meter, which is sufficient for gardening purpose. As the relay is connected to motor pump and microcontroller, after analyzing the sensor data by the microcontroller, required action will be taken. The kit which we have used is not only for monitoring or observing purpose but also for analyzing the data and take action.



Fig -7: Sensor's data on LCD [5]

3. CONCLUSIONS

The Internet of things based smart society system is one big advantage of IoT. The rapid climb of IoT devices brings concerns and benefits. The use of Raspberry pi board, Arduino Mega 2560 board has consuming the less power which ultimately reduces the wastage of electricity. This two boards are the important parts of the system which handles the process and working. In this project, the use of IP camera might help the user in taking decision whether to welcome the guest after receiving the captured live streaming or picture of the guest. If the user identifies he is an unknown person then the user can further forward the same photograph to the police station by explaining his situation. The designed system not only monitors the sensor data, like temperature, gas, light, motion sensors, but also actuates a process consistent with the need, for instance switching on the light when it gets dark. Smart society needs less manpower and saves energy as well as water. The output of the sensors are displayed on the ST7735 color LCD and the node or kit is construct in such a way that it not only store the value but also examine it and according to that it takes a required action. The sprinkler's speed depends on the value of sensors and its threshold. It will cover the area of 3 to 3.7 meter which is sufficient for gardening irrigation. The use different sensors like soil moisture sensor measures the moisture of the soil, soil temperature sensor measures the temperature of a soil and leaf wetness sensor gives us the information about whether the leaf is wet or dry etc. With multiple sensors installed in a Smart society we can achieve a better monitoring system of the whole society by storing the sensor data in real time. The use of smart sensor act as a bridge which fills the gap between physical and electronic world. This will help the user to analyze the condition of various parameters in the society anytime anywhere. As we know that technology is getting advanced and everything is becoming smart and automated in our day to day usage. So, the need of IoT based technologies will be increases in the upcoming years. This project is not only for reducing the manpower but also reduces the wastage of water and other natural resources. By using this technology, the human life becomes more reliable and livable.

ACKNOWLEDGEMENT

The authors would like to acknowledge the support provided by "Scientech Technologies Pvt Ltd". A special gratitude we give to **Rajeev Karothia (Asst. Manager R&D)**, for providing sponsored project and time to time encouragement. Authors express their deep sense of gratitude to our guide, **Prof P. D. Kale** whose contribution in stimulating suggestions and encouragement, helped us to coordinate especially in writing this paper. We are highly indebted to him for his guidance and constant supervision as well as for providing necessary information from time to time. We owe our deep gratitude to **Dr G. S. Gawande**, HOD of Dept. of Electronics Engineering, and **Dr. S. B. Somani**, Principal, Shri Sant Gajanan Maharaj College of Engineering, Shegaon for their encouragement and more over for their timely support and guidance. We express our sincere esteems to our colleagues who helped willingly in completion of this system.

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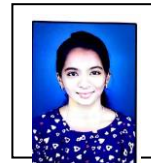
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