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EMPOWERING LIVING SPACES: SMART HOME AUTOMATION SYSTEM LEVERAGING ARDUINO AND IOT TECHNOLOGIES

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ABSTRACT: The pursuit of intelligent individuals to execute intelligent tasks is supported by an ever-evolving technological landscape. Many individuals are striving to ascertain the most efficient means of completing the current duties within the allotted time. An Internet of Things-enabled solution for managing commercial and residential applications will be the end result. The article "Embedded Technologies and the Internet of Things (IOT) with Arduino: Sensing and Controlling the Environment Around You" provides further details on these topics. Embedded blocks and Arduino and sensor scripting are implemented. Residential automation is the focus of this paper. This automation system incorporates intelligent management of both the water system and household appliances.To accomplish these goals, sensors including fire and flow detectors are implemented. Arduino can establish communication with the devices. The integration of a wireless module will enable our household appliances to establish communications with the cloud in order to exchange status updates. It is imperative that our computer and phone establish a connection through the identical WiFi network. The user possesses the capability to activate or deactivate our sensors. The devices will be operated in accordance with finger movements via the flex sensor. All users have access to the information via a cloud-based application, including THINKSPEAK. This paper exemplifies a potential way in which Internet of Things applications could streamline our daily lives.

KEYWORDS:Arduino,FlexSensor,WirelessModule,FlameSensor,Internetofthings(IOT), ThinkSpeak

1.INTRODUCTION

The need for internet services is rising, which means that data needs to be collected and shared quickly. Through the internet and electronic sensors, the Internet of Things (IoT) lets real devices talk to each other. This makes it easier to store and send data. The Internet of Things (IoT) has amazingly become an important part of everyday life and has completely changed societies around the world. A number of sensors and the basic ideas behind Arduino are used in this paper to make it easier to control our home machines. This goal is reached by combining microcontroller-based devices, like the Arduino UNO, with different sensors, like flex, gyroscope, magnetic, and flame detectors. The values recorded by the sensors show that the cloud platform gives us real-time updates on the status of our tools.

ComponentsandSoftwareUsed

The Arduino Integrated Development Environment (IDE), a 7805 power source, a DC motor, relays, a WiFi module, an accelerometer, a flame sensor, and a motor driver integrated circuit are some of the parts.

Block Diagram

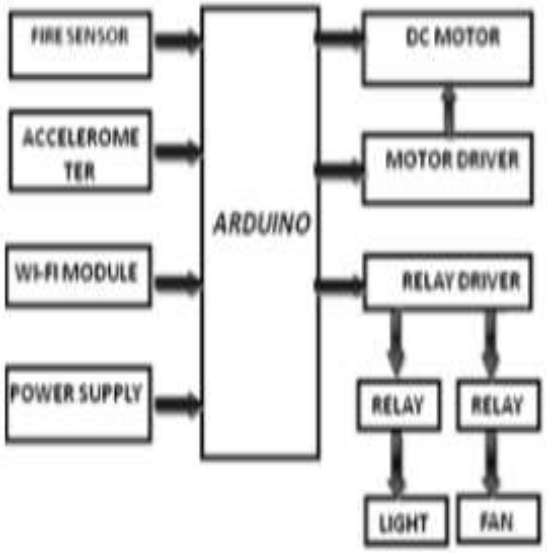

Figure1:Block Diagram of experiment

2. SPECIFICATION OF COMPONENTS

Arduino UNO Board

The manual for the ATmega328 microcontroller shows how to build the Arduino Uno, which is a microcontroller board. There is a 16 MHz ceramic resonator in the package, along with six analog inputs and fourteen digital input/output ports, six of which can make PWM outputs.

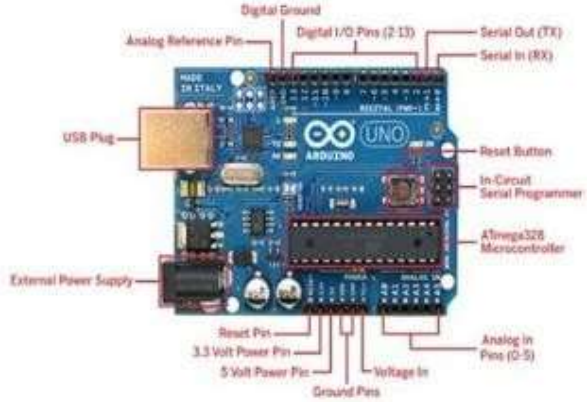

Figure2:ArduinoUNOBoard

A USB port, a power jack, a stop button, and an ICSP header are all parts. The open-source Arduino electronics platform is made with hardware and software that are easy for users to understand and use. Many inputs can be turned into outputs on Arduino boards, like turning on an LED or starting a motor. Some examples of these are a monitor picking up a light, a button being pressed, or a tweet being sent.

5V Relays

One of the most useful things about Arduino is that it can handle things that need more voltage (120–240V), like fans, lights, heaters, and other home appliances. Even though the Arduino can only work with 5 volts, it can still manage a 5 volt switch that controls power between 120 and 240 volts.An electrical switch is called an arelay. Usually, electromagnetic fields are used to make relays mechanically activate, but other working principles, such as solid-state relays, are also used. When only one weak signal needs to control a single circuit or when several circuits need to be controlled by a single signal, relays are used.

Figure3:5v Relay

You can set the Arduino to turn on relays when certain conditions are met, like when the photoresistor's resistance drops below 400 Ohms or when the thermistor's temperature rises above 30°C. Almost any kind of sensor can be used to set the relay to either turn on or off.

FireSensor

Figure4:Firesensor

A flame sensor picks up a weak direct current (DC) signal from the alternating current (AC) power that is sent to the ignitor through the flame rectification process. This changes the direction of the electricity flowing through the flame from alternating current to direct current.The goal of adding this sensor to our experiment is to set off an audible warning in the event of a house fire, which will alert people nearby.

WI-FI Module

The SOC ESP8266 Wi-Fi module is a self-contained unit that has an integrated TCP/IP protocol stack that lets any microcontroller join to a Wi-Fi network.It's possible for the ESP 8266 to host an application or take care of all Wi-Fi networking jobs for another application processor.

Figure5:Wi-Fimodule

Accelero Meter

The rate at which an object's speed changes is called acceleration, and accelerometers are used to measure it.g or meters per second squared (m/s2) are the numbers used to measure G-forces. These are the X, Y, and Z coordinates that show the numbers. These choices control how fast the motor spins.

Figure6:Accelero meter

The accelerometer sensor is made up of a mass that is connected to a spring that can only move in one direction and plates that stay in place around the outside. Because of this, any motion in either direction will change the capacitance between the mass and the plates. The acceleration number will be equal to the change in capacitance that the accelerometer sensor reports.

DC Motor

DC engines are pretty easy to understand. A simple DC motor is made up of two wires that can be linked right away to a battery or other power source that can handle the load. Find the power source terminal that is connected to the positive charge. This tells you which way the motor is turning. We are going to add an H-Bridge motor driver to move the process along.

By using logic level data from a microcontroller, this new technology lets us change the direction of a motor's rotation without having to unplug it. It is possible for the motor to work in either way. The microcontroller can handle most of the work when there is a straight connection between the Arduino and the DC motor.

Figure7:DCMotor

Motor Driver

Automobiles don't put limits on the people who drive them. Usually found in gadgets that use 50 mA or more of power.The microprocessor can only send out 10 to 20 mA of current, which is not enough to power a motor coil. If you connect a motor straight to the microcontroller's output transistor, you could damage it. Integrated Development Environment (IDE) that works with Arduino

The open-source Arduino Software (IDE) makes it easy to write code and send it to the Arduino board. Microsoft Windows, Apple Mac OS X, and Linux can all use this program. Processing and other open-source tools were used to make the Java-based platform.It works on your computer and lets you write code and post it to the board.

Experimental Setup of Home Automation Setup

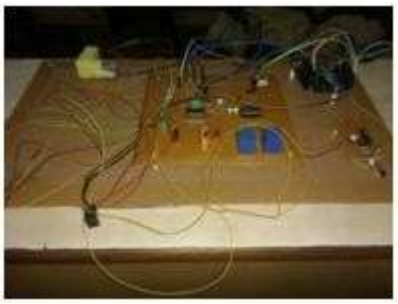

Figure8:ExperimentalSetup

There are three main parts to this work: tools for sensing, monitoring, and controlling. Flex sensors and accelerometers are used as monitors in the early stages of tracking.The tracking is handled by the cloud platform, and the control is handled by our Arduino UNO microcontroller unit.

The Wi-Fi module, sensors, and gadgets all talk to each other through the Arduino UNO.Our appliances' states change based on the information their sensors send us. To control the machines, you use your fingers on the flex sensor. The device that opens and closes the door is controlled by the accelerometer.The magnetic monitor will let us know if the door lock doesn't work. In the event of a house fire, our attention will be on the flame monitor.Once the data is uploaded to the cloud platform, it can be viewed from both the user's computer and smartphone to check on all four appliances. Using information from sensors, the Arduino UNO figures out the best way to run the appliances.

3.CONCLUSION

The Internet of Things (IoT) makes many good things possible for people. Through our article, we show how IoT can help set up a common public platform and offer services that can be used to create many apps.This design gives us a useful and inexpensive way to use IoT in tracking, controlling, and sensing systems in homes and

businesses.

It's clear that the Internet of Things will eventually be a part of everything we do.This post will be very useful in our daily lives and will bring important improvements to the technology industry, which is growing very quickly. People want to be able to move things around with their phones to make everyday tasks easier.

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