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MULTIFUNCTIONAL SMART SENSING SLIDABLE WINDOW WITH TRANSPARENCY CONTROLLING

PARTHIPAN P [1], SENTHIL SARAN S [2], THRIVIKRAM M [3], VENKATESAN E[4], VIJAYENDRAR B[5]

Student, Electrical and Electronics engineering, K Ramakrishnan College of Technology, Trichy, India[1-5]

Abstract: We have designed an IoT based fire detection system using Wi-Fi module, temperature sensor, vibration sensor, gas sensor, LDR sensor, rain sensor, motor driver and buzzer. 12-volt power supply is given to Wi-Fi module. Temperature sensor is used to detect the atmospheric temperature value. Rain sensor is used to detect the rainfall. Gas sensor is used to detect the leakage of gas. Vibration sensor is used to detect the vibration value. This device is placed inside the house. If there is fire in the house then the PDLC glass will be changed from transparent to black colour. This message will be sent to android app through firebase server. Then the relay will be switched on then the water pump will be turned on and the water flows on the fire occurred area. If there is nobody in the house if someone tries to open the door then the vibration sensor will send the message to the house owner. Motor driver is used to operate the windows. If there is fire then the outside window will be opened. If the temperature sensor value is high then the water pump will be turned on.

Keywords: smart window, smart glass, home automation, IOT home automation**.**

I.INTRODUCTION

Internet of Things (IoT) is nothing but the devices (things) communicating with each other by using the internet. IoT applications vary on a large scale. European Research Cluster on the Internet of Things classifies major IoT applications as smart buildings, smart transportation, Smart energy, smart industry, smart health and the smart city as major areas. IoT is a trend- setting innovation in which all the data from sensors is stored in the cloud where it can be easily accessed from the cloud. Sensors and actuators for gathering the data and sending across the internet are also included in this advancement. We use cloud not only to store data but also for data analysis, gathering, visualization. Such an emerging technology can be used in various IoT applications like agriculture, health, smart home etc., to make the already existing systems more efficient. The key characteristics of the cloud include on- demand service provision, ubiquitous access, resource pooling and, elasticity.

The internet of things (IoT) is a computing concept that describes a scenario where every day physical objects are connected to the internet and can identify themselves to other devices or processes, via an IP address. The IoT is significant because an object that can represent itself digitally becomes something greater than the object by itself. No longer does the object just relate to the process; it now connects to surrounding objects and database data, permitting “big data” analytics and insights. In particular, “things” might communicate autonomously with other things and other devices, such as sensors in manufacturing environments or an activity tracker with a smartphone.

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II.BLOCK DIAGRAM

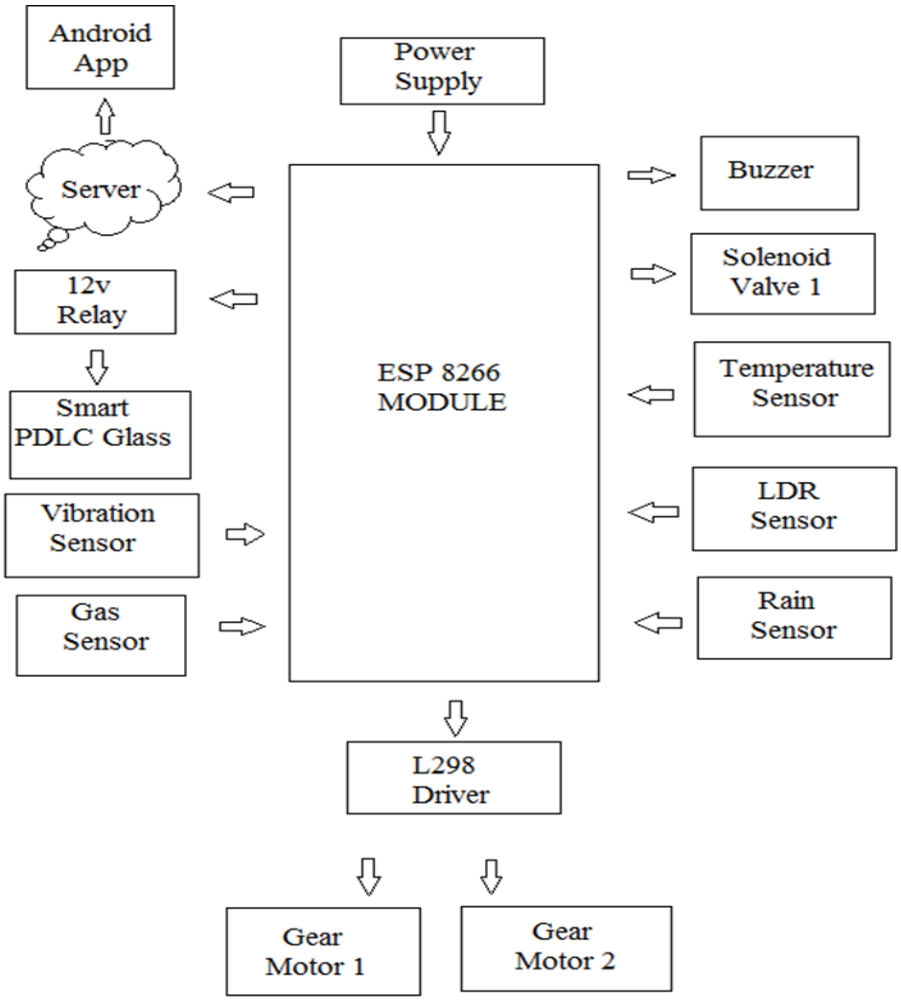

Figure 1 : BLOCK DIAGRAM

HARDWARE

A. *NODE MCU*

Figure 2 : NODE MCU

The ESP8266 is a low-cost Wi-Fi microchip, with a full TCP/IP stack and microcontroller capability, produced by Express if Systems in Shanghai, China. The chip first came to the attention of Western makers in August 2014 with the ESP-01 module, made by a third-party manufacturer Ai-Thinker. This small module allows microcontrollers to connect to a Wi-Fi network and make simple TCP/IP connections using Hayes-style commands. However, at first there was almost no English-language documentation on the chip and the commands it accepted. The very low price and the fact that there were very few external components on the module, which suggested that it could eventually be very inexpensive in volume, attracted many hackers to explore the module, the chip, and the software on it, as well as to translate the

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Chinese documentation. The ESP8285 is an ESP8266 with 1 MB of built-in flash, allowing the building of single-chip devices capable of connecting to Wi-Fi. These microcontroller chips have been succeeded by the ESP32 family of devices, including the pin-compatible ESP32-C3.

B. *TEMPERATURE SENSOR*

Figure 3 : TEMPERATURE SENSOR

A temperature sensor is an electronic device that measures the temperature of its environment and converts the input data into electronic data to record, monitor, or signal temperature changes. There are many different types of temperature sensors. Some temperature sensors require direct contact with the physical object that is being monitored (contact temperature sensors), while others indirectly measure the temperature of an object (non-contact temperature sensors).

C. *RAIN DROP SENSOR*

Raindrop Sensor is a tool used for sensing rain. It consists of two modules, a rain board that detects the rain and a control module, which compares the analogy value, and converts it to a digital value. The raindrop sensors can be used in the automobile sector to control the windshield wipers automatically, in the agriculture sector to sense rain and it is also used in home automation systems

D. *GAS SENSOR*

The Grove - Gas Sensor (MQ2) module is useful for gas leakage detection (home and industry). It is suitable for detecting H2, LPG, CH4, CO, Alcohol, Smoke or Propane. Due to its high sensitivity and fast response time, measurement can be taken as soon as possible. The sensitivity of the sensor can be adjusted by potentiometer.

Figure 4 : GAS SENSOR

E. *VIBRATION SENSOR*

The vibration sensor is also called a piezoelectric sensor. These sensors are flexible devices which are used for measuring various processes. This sensor uses the piezoelectric effects while measuring the changes within acceleration, pressure, temperature, force otherwise strain by changing to an electrical charge. This sensor is also used for deciding fragrances within the air by immediately measuring capacitance as well as quality.

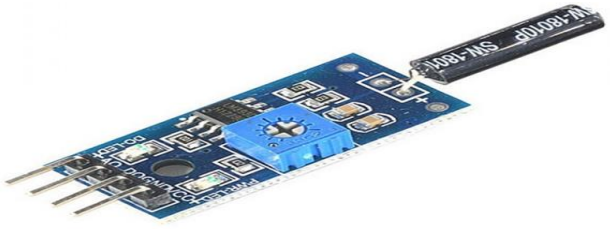

Figure 5 : VIBRATION SENSOR

F. *LDR SENSOR*

Photo resistors, also known as light dependent resistors (LDR), are light sensitive devices most often used to indicate the presence or absence of light, or to measure the light intensity. In the dark, their resistance is very high, sometimes up to 1MΩ, but when the LDR sensor is exposed to light, the resistance drops dramatically, even down to a few ohms, depending on the light intensity. LDRs have a sensitivity that varies with the wavelength of the light applied and are

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nonlinear devices. They are used in many applications but are sometimes made obsolete by other devices such as photodiodes and phototransistors.

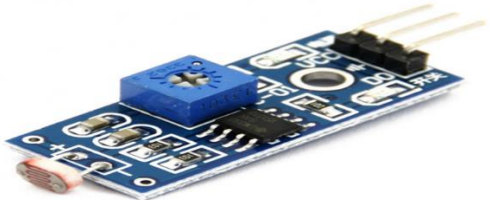

Figure 6 : LDR SENSOR

G. *RELAY*

A relay is an electrically operated switch. It consists of a set of input terminals for a single or multiple control signals, and a set of operating contact terminals. The switch may have any number of contacts in multiple contact forms, such as make contacts, break contacts, or combinations thereof.

Figure 7: RELAY

H. *BUZZER*

A buzzer or beeper is an audio signalling device, which may be mechanical, electromechanical, or piezoelectric (piezo for short). Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke.

I. *L298 DRIVER*

The L298 Driver is a high voltage, high current dual full bridge driver designed to accept standard TTL logic levels and drive inductive loads such relays, solenoids, DC and stepping motors. Two enable inputs are provided to enable or disable the device independently of the input signals. The emitters of the lower transistors of each bridge are connected together the corresponding external terminal can be used for the connection of an external sensing resistor.

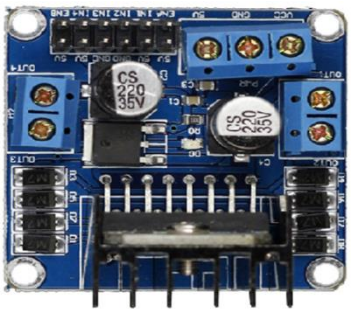

Figure 8 : L298 DRIVER

J. *SOLENOID VALVE*

Solenoid valves differ in the characteristics of the electric current they use, the strength of the magnetic field they generate, the mechanism they use to regulate the fluid, and the type and characteristics of fluid they control. The mechanism varies from linear action, plunger-type actuators to pivoted-armature actuators and rocker actuators. The valve can use a two-port design to regulate a flow or use a three or more port design to switch flows between ports. Multiple solenoid valves can be placed together on a manifold.

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Figure 9 : SOLENOID VALVE

K. *SMART PDLC GLASS*

PDLC is an active smart glass technology meaning it needs electricity to turn on and off. When a low voltage is applied (the ON state), the molecules align into a formed manner, allowing light to pass straight through, and making the glass transparent. As electricity is turned off, the LC molecules scatter randomly again, breaking the passage of light and turning the glass opaque.

Though PDLC controls the way light passes through the glass, it doesn't affect visible light transmission, as opposed to Suspended Particle Device (SPD) technology. Thus, the space will not be shaded or dimmed, but whatever or whoever is behind the glass will simply not be seen, hence the name: privacy glass. In this way, PDLC glass has a clear advantage – providing privacy while allowing the passage of natural light at the same time.

L. *DC GEAR MOTOR*

A gear motor is an all-in-one combination of a motor and gearbox. The addition of a gear head to a motor reduces the speed while increasing the torque output. The most important parameters in regards to gear motors are speed (rpm), torque (lb-in) and efficiency (%). In order to select the most suitable gear motor for your application you must first compute the load, speed and torque requirements for your application. ISL Products offers a variety of Spur Gear Motors, Planetary Gear Motors and Worm Gear Motors to meet all application requirements. Most of our DC motors can be complimented with one of our unique gearheads, providing you with a highly efficient gear motor solution.

Figure 10: DC GEAR MOTOR

III.WORKING

This project involves variety of components to bring an accurate measure of quantities with an enhanced output. Our project uses ESP8266 Node MCU to give an instruction to the components. It has a built in Wi-Fi feature with a TCP/IP capability. This is going to establish a connection with an external device to produce outcomes to intimate, alert and counteract the unavoidable circumstances. This system is going to be an essential one in future. The setup of our project is as follows

The first part is that the ESP8266 module is connected with a Rain drop sensor, Temperature sensor, LDR, Vibration sensor, Gas sensors. These sensors play a vital role in our project. The gas sensor which is going to sense the gas leakage from kitchen (in case of household) as well as detect flame when an outburst occurs. The gas leakage can be eradicated by sucking out the gases using fans via pipes. We are also planning to close the valve of a cylinder (in case of domestic) when the gas leaks out. Similarly, for fire breakouts. We are decided to extinguish the fire via fire extinguisher/sprinkling water through solenoid valves and later the information regarding the fire breakout will be provided to nearby fire stations through an APP For that purpose, MQ (2,135,7) sensors are used.

Next, Temperature sensor is used here because of variation in temperature in an environment. The measured temperature can be used for various aspects such as switching on/off the A.C., opening and closing the windows and more. To do this, DHT11 sensor has been equipped. Then, Rain drop sensor is used to calculate the presence of rainfall. The action done by microcontroller to smart glass is to simply close the doors to avoid entering rainfall inside the room. For that, we are going to use LM393 OP-AMP. Vibration sensor is used to alert the users on unwanted indulging. LDR is used to obtain an input as light, based on the intensity of light the resistance will be varied. LDR sensor is used to utilize the light from sources such as led or sunlight to turn on the transparency controlling.

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The Transparency controlling enables privacy and blocks sunlight too. This transparency turns into opaque mode if a user needs privacy. These sensors obtain an input from a various quantity. Actually, these components are acting as an instructor to the microcontroller (ESP8266). Based on the information (input) provided by these components the ESP8266 module will produce a data which helps in alerting and making counteract or safety measures by users.
Next part is the outcomes and instructions by microcontroller to counteract the obtained inputs. The components which are going to produce outcomes for users are Smart PDLC glass, Buzzer, Solenoid valve, Drivers and Motors. These are the main components which is going to be counteracted and secure users from indulgers and making privacy for the users.

IV.CONCLUSION

With the development of sensor technology, with all components, we have given the hardware connections successfully. We try our best to produce an exact data on our surroundings. Then software and hardware also interfaced effectively. We executed the hardware and we got the required output.

In future, more advanced features (add a voice recognition system to make the way easier and more secured, to provide an alert message when the firebreaks out) will be integrated with this system which will provide users with more safety and relaxation. This technology will be very helpful for humans. This technology can levitate the home automation sector. This brings a secured home with future implements, advanced technologies and platforms. With this helpful system, we can track our home and monitor remotely and takes action based on user's decision.

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