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International Journal of Innovative Research in Computer and Communication Engineering (IJIRCCE)

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Home Defence System with Zigbee Sensors and Node MCU for Real-Time Intrusion Alerts

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ABSTRACT: This undertaking presents a far reaching home protection framework intended to upgrade security by identifying and making property holders aware of expected dangers progressively. For the purpose of monitoring various environmental conditions and intrusion events, the system incorporates a number of sensors, including gas, fire, and infrared (IR) sensors. The central NodeMCU controller and the sensors communicate wirelessly using Zigbee technology, allowing for efficient data transmission throughout the home environment.

I. INTRODUCTION

In this day and age, home security is a first concern for guaranteeing the wellbeing of our friends and family and effects. The Home Guard Framework is a savvy security arrangement intended to give continuous cautions in the event of interruptions, gas holes, or fire dangers. To provide trustworthy and immediate notifications, this system makes use of a combination of wireless communication technologies and sensorsThe system integrates a gas sensor to detect hazardous gases, a fire sensor to identify potential fire outbreaks, and an IR sensor to detect motion. Arduino serves as the system's central controller. These sensors constantly look for any oddities in the environment.

II. EXISTING SYSTEM

The existing home defense system is intended to provide a comprehensive security solution for residential properties and includes Zigbee sensors, gas sensors, fire sensors, IR sensors, Zigbee pairs, ESP8266, and LCD for real-time intrusion alerts. The framework depends on different sensors to screen ecological circumstances and distinguish any inconsistencies that could demonstrate possible dangers or crises.Gas sensors are used to look for harmful gases like methane or LPG that could indicate a gas leak. Smoke or rapid temperature rises can be detected by fire sensors, which indicate the possibility of a fire. IR sensors are introduced at vital areas, like entryways and windows, to recognize unapproved movement or section. Zigbee, a wireless communication technology known for its low power consumption and dependable data transmission over a mesh network, connects these sensors to the main control unit.

2.1DISADVANTAGES

•Intricacy of Reconciliation
•Restricted Scope of Zigbee
•Impedance and Dependability
•Support and Updates

III. PROPOSED SYSTEM

Various sensors are used by the Home Defense System to detect fire, gas leaks, and intruders. Arduino microcontrollers read information from these sensors, which is then communicated remotely through Zigbee modules. A NodeMCU gets this information and cycles it to decide whether there are any expected dangers.The NodeMCU uses an ESP8266 module to send a real-time alert to the user via a messaging service if an abnormal condition is detected. Furthermore, a LCD show associated with the NodeMCU shows the situation with all sensors and any cautions, giving quick visual criticism.

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3.1ADVANTAGES

- Low power consumption
- reliable communication
- real-time alerts
- automated responses

IV. LITRATURE SURVEY

[4.1] An iot-based smart home automation system by C. Stolojescu-Crisan, C. Crisan, and B. P. Butunoi, Sensors, vol. 21, no. 11, pp. 1–23, May 2021. doi: https://doi.org/10.3390/s21113784

ABSTRACT

Lately, the progression of Web of Things (IoT) innovations has altogether influenced savvy home robotization frameworks, improving their usefulness and client experience. An IoT-based smart home automation system is the focus of this study, which is written by Stolojescu-Crisan, Crisan, and Butunoi. The proposed framework coordinates different IoT parts to empower controller and checking of home gadgets, including lighting, warming, and security frameworks. The system provides real-time data access and control through a user-friendly interface by utilizing a combination of sensors, communication protocols, and cloud computing. The study shows that Internet of Things (IoT) technologies can make home automation more efficient, reliable, and user-friendly. The paper provides insights into the practical advantages and challenges of implementing IoT-based solutions in smart home environments through performance evaluations and experimental results.

[4.2] Internet of things based integrated smart home automation system by U. Pujari, D. Patil, D. Bahadure, and M. Asnodkar, to be presented at the 2020 2nd International Conference on Communication & Information Processing (ICCIP). doi: 10.2139/ssrn.3645458

ABSTRACT

The quick development of Web of Things (IoT) innovations has made ready for cutting edge home computerization frameworks that incorporate different gadgets and sensors to upgrade the productivity and comfort of private administration. This paper by Pujari, Patil, Bahadure, and Asnodkar presents a coordinated shrewd home robotization framework in light of IoT, point by point at the second Worldwide Meeting on Correspondence and Data Handling (ICCIP) in 2020. Multiple home automation functions, including lighting, temperature regulation, security, and appliance management, are unified and controlled by the system, which makes use of Internet of Things (IoT) technologies. By utilizing an organization of sensors and actuators associated by means of IoT conventions, the framework gives consistent control and ongoing checking through an incorporated connection point. The system's responsiveness, dependability, and user experience are evaluated in the study, demonstrating its potential to significantly enhance home automation capabilities. The paper likewise talks about the specialized difficulties experienced and the arrangements executed to guarantee strong and adaptable reconciliation of brilliant home parts.

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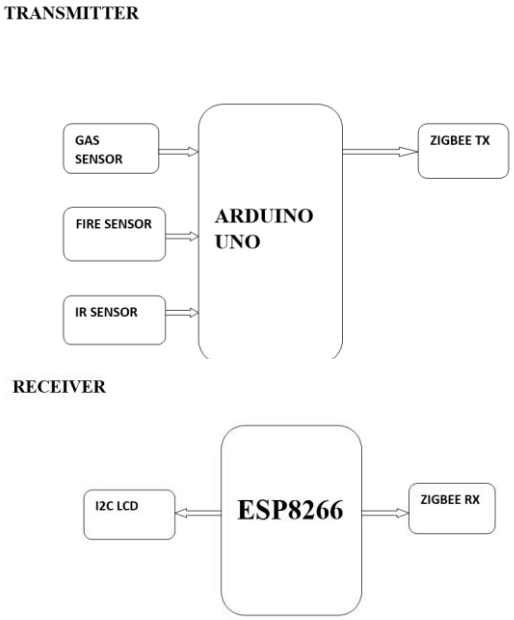
V. BLOCK DIGRAM



VI. HARDWARE REQUIREMENTS

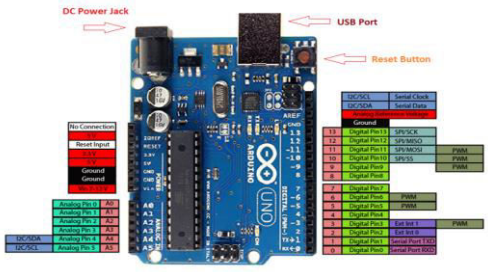
- ARDUINO UNO
- ESP8266
- ZIGBEE
- GAS
- FIR
- IR
- I2C LCD

VII. SOFTWARE REQUIREMENT

- ARDUINO IDE

VIII. HARDWARE DESCRIPTION

8.1ARDUINO UNO



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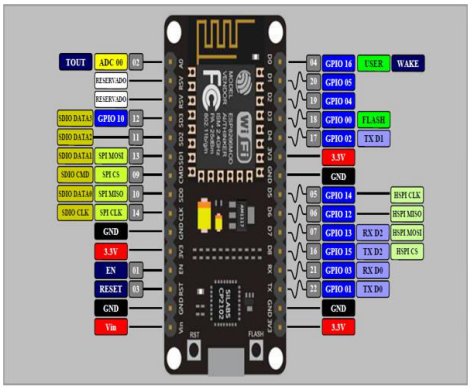
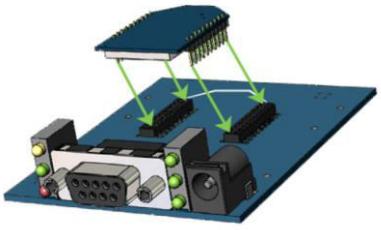
Based on the Microchip ATmega328P microcontroller, Arduino.cc developed the open-source microcontroller board known as the Arduino Uno. Sets of digital and analog input/output (I/O) pins are provided on the board, allowing it to interface with various expansion boards (shields) and other circuits. The board is programmable using the Arduino IDE (Integrated Development Environment) via a type B USB cable and has 14 digital and 6 analog pins. It accepts voltages between 7 and 20 volts and can be powered by the USB cable or an external 9-volt battery. Additionally, it is comparable to the Leonardo and Arduino Nano. By sending a set of instructions to the board's microcontroller, you can instruct your board on what to do. The Arduino Software (IDE), which is based on Processing, and the Arduino programming language are used to accomplish this.

8.2 ESP8266



NodeMCU Advancement unit gives admittance to these GPIOs of ESP8266. The only thing to keep in mind is that the pins in the NodeMCU Dev kit are numbered differently than the ESP8266's internal GPIO notations, as shown in the figure and table below. For instance, the D0 nail to the NodeMCU Dev pack is planned to the inside GPIO pin 16 of ESP8266.The Web of Things (IoT) has been a moving field in the realm of innovation. It has altered our working practices. More than ever before, digital and physical worlds are connected. In light of this, Expressive Systems, a semiconductor company based in Shanghai, has released the adorable ESP8266 microcontroller, which is capable of monitoring and controlling things from anywhere in the world and is equipped with Wi-Fi.

8.3 ZIGBEE



The XBee/XBee-PRO RF Modules are made to work with the ZigBee protocol and meet the particular requirements of wireless sensor networks that use little power and are inexpensive. The modules require insignificant power and give dependable conveyance of information between distant gadgets.

On XBee modules, the XBee/XBee-PRO ZB firmware release can be installed. While the ZNet 2.5 firmware is based on Ember's proprietary "designed for ZigBee" mesh stack (EmberZNet 2.5), this firmware is compatible with the ZigBee 2007 specification. The nature of the ZB and ZNet 2.5 firmwares is similar, but they are not over-the-air compatible. Gadgets running ZNet 2.5 firmware can't converse with gadgets running the ZB firmware

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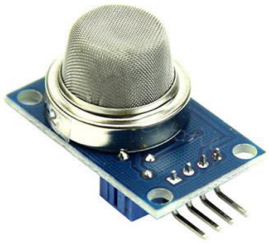
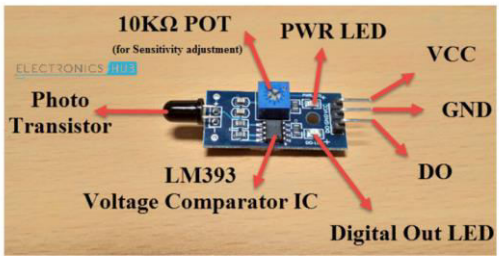
8.4 GAS SENSOR



Gas Sensor

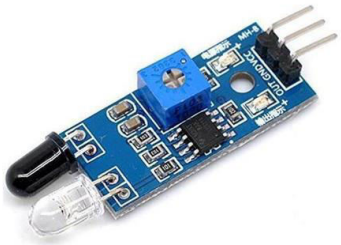
A Run of the mill human nose has 400 sorts of fragrance receptors empowering us to smell around 1 trillion distinct scents. However, many of us are still unable to determine the type or concentration of gases in our atmosphere. This is where sensors come in. There are many different kinds of sensors that can measure different parameters. For example, a gas sensor is useful in situations where we need to find changes in the concentration of toxic gases to keep the system safe and avoid or warn of any unexpected dangers. To detect gases like oxygen, carbon monoxide, nitrogen, methane, and others, a variety of gas sensors are available. They are also frequently present in devices that, among other things, are used to monitor the quality of the air in workplaces and factories and detect gas leaks.

8.5 FIR SENSOR



A flame sensor is a type of sensor that is most sensitive to a normal light. That is the reason this sensor module is utilized in fire alerts. This sensor distinguishes fire in any case frequency inside the scope of 760 nm - 1100 nm from the light source. This sensor can be effortlessly harmed to high temperature. so that this sensor can be positioned away from the flame at a certain distance. The fire identification should be possible from a 100cm distance and the recognition point will be 600. This sensor produces either an analog or digital signal as its output. As a flame alarm, these sensors are utilized in fire fighting robots.

8.6 IR SENSOR SENSOR



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An electronic device that emits in order to detect some aspects of the environment is known as an infrared sensor. In addition to detecting motion, an IR sensor can also measure an object's heat. A passive IR sensor, on the other hand, measures only infrared radiation rather than emitting it. In most cases, all objects emit some kind of thermal radiation in the infrared spectrum. An infrared sensor can pick up these kinds of radiations, which aren't visible to our eyes but can be detected. The detector is merely an IR photodiode that is sensitive to IR light of the same wavelength as the IR LED. The emitter is merely an IR LED (Light Emitting Diode). The photodiode's resistances and output voltages will change in proportion to the magnitude of the received IR light when IR light hits it.

8.7 I2C LCD

This is an extremely short model. How to use i2c communication to connect an 16x2 LCD to the Arduino, then display text, numbers, special characters, and custom icons byte by byte. The necessary schematic and an example of the code are provided below. Make sure to introduce the i2c lyquid precious stone library. For more information, read the code's comments or ask a question down below. First, ensure that you solder an i2c module like the one shown here to the LCD's pins. This module had some control over the 16x2 LCD

IX. SOFTWARE DISCRIPTION

9.1 ARDUINO IDE

Programs composed utilizing Arduino Programming (IDE) are called draws. The file extension.ino is used to save these sketches, which were written in the text editor. The editor has tools for searching and replacing text as well as cutting and pasting. The message region gives input while saving and trading and furthermore shows blunders. The Arduino Software (IDE) outputs text to the console, which includes all of the information, including complete error messages. The base righthand corner of the window shows the designed board and sequential port. You can open the serial monitor, create, open, and verify programs, and upload and upload programs using the toolbar buttons.

ArduinoSoftware(IDE)

X. CONCLUSTION

By providing real-time intrusion alerts, the Home Defense System made with Zigbee sensors, a NodeMCU, and a variety of detection modules effectively enhances home security. The system is capable of identifying potential dangers and unauthorized access by integrating Arduino with gas, fire, and infrared (IR) sensors. The ESP8266 module enables

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seamless remote monitoring and alerts, and Zigbee communication between sensors and the NodeMCU ensures data transmission that is both reliable and effective.Users will find it simpler to keep an eye on the security of their home at a glance thanks to the LCD display's clear user interface for instant status updates. A comprehensive approach to home safety is ensured by this system, which not only informs users of potential intrusions but also of environmental dangers such as fires and gas leaks.

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