Theft Detection and Control System with Photosensitive Technology Using Internet of Things

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Abstract - This article provides the build and implementation of a theft prevention system for houses, bank lockers, jewelry stores, security lockers, etc. The suggested system comprises of a signaling method based on SMS utilizing GSM (Global Systems for Mobile communications) technology and an LDR (Light Dependent Resistor) based sensor that serves as an electronic eye for detecting the theft or attempt. The owner and the relevant authorities can prevent theft by taking prompt and appropriate action with the use of GSM-based communication. Relays are used to connect an Arduino microcontroller board to the LDR circuit. The suggested system's prompt notification of the occurrence demonstrates its effectiveness. The suggested method is reasonably priced and incredibly efficient.

Keywords: ArduinoUno microcontroller, GSM 900 Module, LDR Sensor, Photosensitive, Security system.

I. INTRODUCTION

The internet of things (IOT) is a global network of interconnected sensors, computers, and digital devices that may communicate with one another to exchange and transmit information. These devices are all issued unique identifiers, or UIDs (Unique Identifiers).Automation of these spaces is becoming increasingly important as diverse business spaces and civilizations expand. A better and more dependable electrical control system is being pursued by all parties as a result of the increasing traffic chaos in urban areas. Here, increased energy saving and early issue detection resolution are achieved via the employment of an intuitive web application and a mobile-based monitoring and control system linked to an IOT cloud server.

Using clearly defined technology and technical skills is necessary to maintain control in this day and age of automation. Over time, sensors have been used in conjunction with other technical disciplines such as computer science, electronics, instrumentation technology, and communication to provide better products and outcomes. It is evidently a compelling reality that successful interdisciplinary endeavors would surpass the constraints of each respective profession. Thus, using this as inspiration, an effort is made to create a different approach to security here. By employing LDR and GSM technology to deliver SMS, among many other features, this provides theft control design for bank locker systems and many other applications.

II. LITERATURE SURVEY

Through the use of voltage drop across the coil, this project has introduced the construction of the induction sensor. The sensor's construction involves looping a coil around a plastic gate to save costs without sacrificing system performance. The appropriate voltage limit was found by using a number of development phases [1]. This article offers a research on a novel autonomous visual search and pursue surveillance system that uses networks to cover an entire region for designated items. The system is able to search for, identify, and track the designated item by using picture sequence processes based on the attributes of the object, such as color, form (vehicle), height, and movement (pedestrian). The system makes use of many cameras, and each camera is equipped with a suite of software. This paper presents an explanation of the integrated software system, along with an experimental setup and findings [2]. The system is inexpensive, built on the ARM architecture, and equipped with features like motion detection, remote monitoring, and GPRS alert functionality. It can be used for both local and distant video monitoring sites, and it's particularly good for anti-theft situations like unattended banks, gold shops, supermarkets, industrial storage, and so on.It may also be employed as an anti-theft measure while no one is home, which applies to every family[3]. The

safety of the occupants of the hijacked car must be maintained while a novel radio frequency identification (RFID) based vehicle immobilizer system with a low hacking chance is offered. The immobilizer makes use of active RFID technology, which generates tags with a sizable character set. The vehicle's power control unit, automated gear shifting system, and ignition circuit are the three control circuits that the receiving unit is cleverly incorporated into. This allows the vehicle to safely reduce its speed to zero over time. The suggested anti-theft vehicle security system was put to the test in a variety of weather scenarios and potential signal distortion scenarios to ensure its dependability[4]. A design method and a hardware circuit of burglar alarm circuit based on the magnetic field sensor, which can be used to achieve the protection of valuables. The circuit design is ingenious, and has the characteristics of simple structure, light weight, small size, timeliness, high sensitivity and low cost. It has been proved to have a stable and reliable performance by experiment[5]. A novel approach, utilizing a complex programmable logic device (CPLD) as the central controller, is put forth to build a reconfigurable smart sensor interface for industrial WSN in an Internet of Things setting. As a result, it can quickly and concurrently receive data from several sensors in real time. This design adheres to the IEEE 1451.2 standard for intelligent sensor interface specifications. In order to achieve intelligent acquisition for common sensors, it fully specifies the smart sensor hardware and software design architecture as well as the pertinent interface protocol. A novel approach is offered for the conventional sensor data collections. The gadget combines the most recent CPLD programmable technology with the IEEE 1451.2 intelligent sensor specification standard[6]. The state of IoT research at the moment through a review of the literature, trends analysis, descriptions of obstacles to IoT dissemination, open research issues, and future directions, as well as the creation of an extensive reference list to help scientists. Our suggested classification approach has six main categories: business models, technology, applications, difficulties, overview/survey, and future directions. Using this technique, we categorized the 127 articles that made up the literature pool[7]. A telemonitoring and alarm system design technique has to be introduced. Even though the system is intended for diapers that are disposable, it may also be utilized in similar situations where temperature or humidity readings are needed so that alerts can be sent [8]. Since most car anti-theft systems now employ static real-time detection and alarm, we designed an automotive anti-theft system based on a GSM and GPS module in this study. The system uses a vibration sensor to identify vehicles that have been stolen from their owner and is built around the high-speed mixed type single-chip C8051F120[9]. ATmega16A is chosen as the micro controller. SIM900A is chosen as the GSM Module. SHT11 is chosen as the sensor. After that, the hardware circuit is designed. At last, the paper introduces a detailed method of collecting data by SHT11 and sending message by SIM900A[10].

III. PROPOSED SYSTEM

The power supply section, the Arduino UNO board, the GSM SIM900 Module, the LDR with relay circuit, and the MAX 232 driver are all shown in the block diagram. The GSM modem is powered by a 9–12 volt AC–to–DC converter, and the relay circuit is fed by a step-down transformer. To make outgoing calls or send messages, the modem has to be inserted with a SIM card that is genuine and has enough recharge left on it.

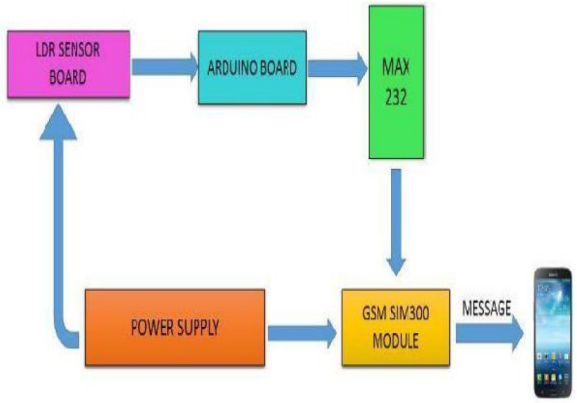

Fig. 1 Block Diagram of proposed design

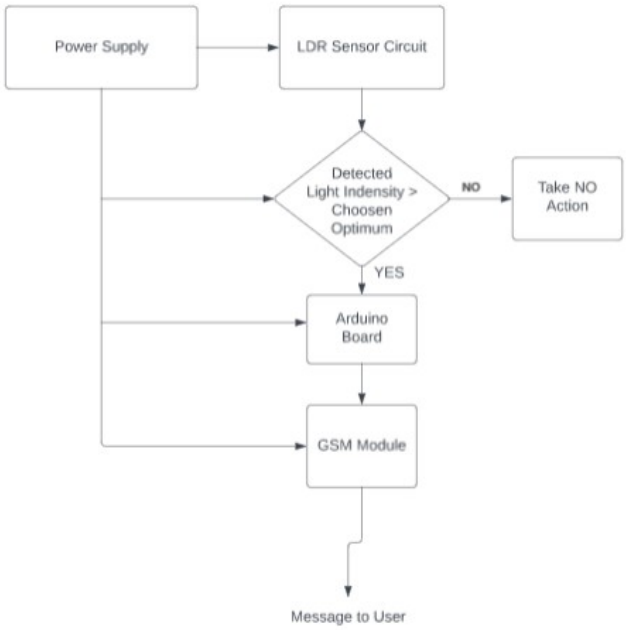

Fig. 2 Work flow chat for proposed design

VI. Details of the hardware components used:

1. *Light Dependent Resistor(LDR Sensor):*

The resistance of the LDR resistor fluctuates inversely with the amount of light that strikes it. For 1000 lux of light, its resistance is 400 Ω, and for 10 lux of light, it may go as high as 107 Ω. As a result, even with a little variation in the incident light intensity, the resistance changes significantly, ensuring the measurement's reliability. It is available on board to interface the board using the parameter of the actual light intensity in the real environment. It is coupled to a 10K ohm resistor in the bottom half of a potential divider setup, such that the voltage at the resistor-LDR junction is inversely proportional to the quantity of light projected on it.

Fig 3: LDR Sensor

2.Relay:

The electromechanical 230V/2A relay that is being utilized is in use. A +12V DC excitation voltage is needed. The relay driver IC ULN2003 /VLN 2003A is used to drive it. The gadget is turned on when the relay is engaged by applying 12V DC, which excites it.

Fig 4: Relay

3.GSM SIMM900A:

Dual Band GSM/GPRS based SIM900A modem from SIMCOM is used in the construction of this modem. It operates between 900 and 1800 MHz. The SIM900A has automated band scanning capabilities. AT commands can also be used to adjust the frequency bands. The AT command allows you to configure the baud rate between 1200 and 11200. The internal TCP/IP stack of the GSM/GPRS modem allows you to establish a GPRS internet connection. SIM900A is a dependable and incredibly small wireless module. With its SMT design and very potent single-chip CPU that integrates the AMR926EJ-S core, this full GSM/GPRS module offers you cost-effective options and modest dimensions.

Fig 5. GSM SIM900 A Module

4.Arduino Uno Board

Arduino is a microcontroller based on the ATmega328. It has a 16 MHz ceramic resonator, 6 analog inputs, 14 digital input/output pins (six of which may be used as PWM outputs), a USB port, a power connector, an ICSP header, and a reset button. It may be powered by a battery or an AC-to-DC adapter or linked to a computer via a USB cable to get started. It comes with everything required to support the microcontroller.

Fig 6: Arduino Uno Board

V. PROPOSED CIRCUIT DESCRIPTION

A. Power Supply:

The circuit comprises of a typical power supply with four diodes acting as a bridge rectifier and a step-down transformer that converts 230V to 12V. This produces dc that pulses, which is filtered by an electrolytic capacitor with a capacity between 470 and 1000 µF. The IC LM7805 is utilized to obtain a 5V DC constant at pin number 3, regardless of input DC range from 7V to 15V, because the filtered DC is unregulated. Due to the AC voltage fluctuation from 160V to 270V, the regulator's input voltage fluctuates from roughly 8V to 15V. At 5V, the regulator output will not change. A 10µF tiny electrolytic capacitor filters the regulated 5V DC further to remove any noise produced by the circuit. This 5V point has one LED wired in series with a 330Ω current-limiting resistor to ground.

B. Proposed Circuit Diagram:

To make the circuitry easier to grasp, it can be divided into three components. The LDR-based circuit is explained in the first section, the GSM modem connection with the Arduino is covered in the second, and the LDR device's interface with the Arduino Board is covered in the third.

First Part: The binary ripple counter, IC CD4060, is the main component of the LDR-based circuit. A 6V voltage is generated by a step-down transformer and is coupled with a push button. The supply voltage for the 16th pin of the CD4060 is obtained from the push button. A piezo buzzer is linked to the transistor. One side supply of the relay is linked to the emitter terminal, and the other supply terminal is fed to the cathode of diode 1N4001. Relays' NC, NO, and COM (Common) terminals are linked to a load and the transformer's negative terminal

Second Part: A MAX 232 interface connects the Arduino board to a GSM modem. The pins 9 (R2OUT) and 10 (T2IN) of the MAX 232 driver are linked to pins 0 (RX) and 1 (TX) on the Arduino board.

Fig 7: LDR Sensor Circuit.

The 5V and GND pins of the Arduino are linked to the pins of MAX232, 16 (VCC- +5V), and 15 (GND), respectively. RX, TX, and ground are used to link the GSM modem with pins 7 (T2OUT), 8 (R2IN), and GND (Ground) of MAX 232. The Arduino board is interfaced with GSM in this manner. To interface an Arduino with a GSM modem, a straightforward program is built in the Arduino IDE (Integrated Development Environment) software. The application sends a message to the user immediately the Arduino is turned on.

Third Part: The Arduino board is interfaced with the relay's NC, NO, and COM pins in an LDR-based circuit. Consequently, when the LDR detects a change in light intensity, the Arduino board is turned on.

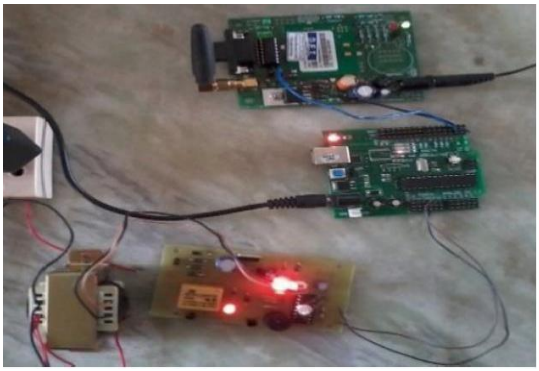

Fig 8: Proposed Design Implementation

VI. SOFTWARE TOOLS USED

The Java-coded cross-platform Arduino Integrated Development Environment (IDE) is modeled after the Processing IDE for wiring projects and programming languages. It is intended to introduce artists who are not familiar with software development to programming. It comes with a code editor that has functions like automatic indentation, brace matching, and index highlighting. With only one click, it can also compile programs and publish them to the board. Programs for Arduino are written in C or C++. A software library named "Wiring" from the original wiring project is included with the Arduino IDE and greatly simplifies a number of input/output activities. The user can create a cyclic executive program that is executable by simply defining two functions. Since Atmel microcontrollers are used in the Arduino platform, software can be developed for Arduino using either the more recent Atmel studio or AVR studio, Atmel's development environment.

VII. CONCLUSION

With the increasing need for theft control and security systems in today's environment, this research has real-world applications. This suggested system's viability is confirmed. The results of the tests and experiments that were carried out have been positive. This system overcomes several practical limits because it is small and affordable. There are also little operating and maintenance expenses. An easily accessible optical sensor is the LDR. Geographical restrictions are removed because GSM technology ensures that information will be provided to the owner as long as they are linked to any GSM network.

The suggested approach may be further improved in many of ways by utilizing existing security techniques. For example, the individual who was trying stealing can be caught using a camera that has a high resolution. To improve performance in this area, data communications and networking is another emerging discipline that may be utilized. For instance, a PC-based computer network may be set up to accomplish effective communication in place of GSM technology. Computer networks and cybernetics can also be utilized to promptly provide information to the relevant authorities.

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