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CAMOUFLAGE TECHNIQUE BASED MULTIFUNCTIONAL ARMY ROBOT

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ABSTRACT:

Nowadays, many expenses are made in the field of defense in adopting primitive security measures to protect the border from the trespassers. Some military organizations take the help of robot in the risk prone areas which are not that effective when done by army men. These army robots are confining with the camera, sensors, metal detector and video screen. The main objective of our system is to get camouflaged including PIR sensor to trace the intruders. Thus the proposed system also uses IR sensor for obstacle detection.

INTRODUCTION:

A robot is an automatic mechanical device often resembling a human or animal. Modern robots are usually a guided by a computer program or electronic circuitry. Robots have replaced humans in performing repetitive and dangerous tasks. The use of robots in military combat raises ethical concerns. The possibilities of robot autonomy and potential repercussions have been addressed in fiction and may be a realistic concern in the upcoming days.

Basically Army Robot is capable of performing tasks such as locomotion, sensing the harmful gas, sensing the humans beneath the surface, metal detection. Army robot is an autonomous robot comprising of wireless camera which can be used as a spy and Bluetooth used to control it wireless.

This army robot is more efficient compared to the soldiers. Excellency of this robot is in being operated wireless from re- mote which offers no risk to the soldier lives. Robots are enhanced to be robust and sturdier giving the guarantee of success in the risk prone environment. The main aim of the paper is to implement a Camouflaged technology based Wireless multifunctional Army Robot which can be controlled through smart phone using Blue-tooth.

Science is developing new technologies to ease human life. One such invention of this technology is specialized robots in the field of Artificial

Intelligence. The word robot means "A machine capable of carrying out a complex series of actions automatically, especially one programmable by a computer". These robots help to make human life much easier especially in dangerous areas & works. One of the concern areas of today is the military. Military robots are specially used to take the risky job which is difficult to be handled manually by humans. These robots act as the assistant of a soldier. Today, many military organizations take the help of military robots to perform risky jobs due to their accuracy of performing the jobs .These robots used in military are usually employed with the integrated system, including video screens, sensors, gripper and cameras. The main motive behind Camouflage Robot is to reduce human losses in military operations or terrorist attacks. Camouflage Robot acts as a virtual spy and can be sent into the strategic locations of military importance for observation and warfare purpose. Since it's very hard to detect it by a naked human eye, the Camouflage robot can be also used to test the various security systems developed in the market and act as a measure to evaluate its efficiency. The main objective of the Camouflage Robot is to enhance the machinery of the defense system. Secondary objective is to work in the field of Zoology for wildlife photography. The idea of the Camouflage Robot is based on the chameleon's camouflage techniques. The aim of the project is to design, manufacture and operate a robot via PC, used as remote control device, a small mobile robot which can duplicate the colors where it moves on, hence being camouflaged to the outside world. To achieve these goals, we used a LED matrix (RGB) which can diffuse uniform colors. Initially, the robot can camouflage itself in red, green and blue color. The main application of our robot is to camouflage and pilot from afar an object, no matter what its size is. So, in the Defense sector, such a system would allow large sized vehicles (e.g. armored vehicles) to be much more camouflaged: indeed, the camouflage in the army has become necessary to army missions, to move into an enemy land without being seen and protect soldiers since they can act from afar. Besides, in the Intelligence sector, we could use spying robots like drones. As a last example, in the area of wildlife Photography, hidden picture or video systems would allow totally new shots with the principle of our robot.

LITERATURE SURVEY

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2017 2nd IEEE International Conference on Recent Trends In Electronics Information & Communication Technology,
May 19-20, 2017, India

Implementation of Spy Robot for A Surveillance System using Internet Protocol of Raspberry Pi

ABSTRACT

At present the surveillance of International border areas is a difficult task. The border guarding forces are patrolling the border seriously, but it is not possible to watch the border at each and every moment. An essential requirement of this situation is a robot which automatically detects trespasser in the border and report nearby board security control unit. Many of the military departments now utilize the robots to carry out risky jobs that cannot be done by the soldiers. In this present work, a Raspbian operating system based spy robot platform with remote monitoring and control algorithm through Internet of Things (IoT)has been developed which will save human live, reduces manual error and protect the country from enemies. The spy robot system comprises the Raspberry Pi (small single-board computer), night vision pi camera and sensors. The information regarding the detection of living objects by PIR sensor is sent to the users through the web server and pi camera capture the moving object which is posted inside the webpage simultaneously. The user in control room able to access the robot with wheel drive control buttons on the webpage. The movement of a robot is also controlled automatically through obstacle detecting sensors to avoiding the collision. This surveillance system using spy robot can be customized for various fields like industries, banks and shopping malls.

SYSTEM OVERVIEW

Basically, two gear motors are sufficient to produce the movement of spy robot and the motor driver module is used to supply enough current to drive two gear motors which protects the Raspberry-pi module from the damage. The major advantage of using the minimum number of gear

motor is minimizing the power consumption. Robot has two infrared sensors which are used to sense the obstacles coming on both sides of robot path. It will move in a particular direction and when the obstacle coming in its path, it will turn to the opposite direction. Besides, the PIR sensor is used to detect the presence of living object in the robotic environment, which in turn to triggers the visual sensor (pi camera) then capture the image or video and store it in the web server. An autonomous platform for the spy robot is a machine that can be operated from human-made environment by using control buttons available on client web page. Now-a-days the Raspberry-pi has been widely used to make projects in various fields like medical, defense, agriculture and industries. The spy robot is designed with Raspberry-pi 3 module which having an inbuilt wireless controller, Bluetooth controller and pi camera support. It continuously monitors the surrounding areas for the presence of unauthorized people and to detect the presence of enemies at the border. The user will be observing this image data on the web page at the control room. User unit communicates with spy robotic unit with the help of Internet. This IoT application is developed by python, HTML and JavaScript. The proposed system has limitation which is more suitable for almost flat surface on which the robot can operate. This design would not be suitable for rough terrain environments like rocky or hilly terrain due to their wheeled mechanisms. Figure 1 shows the block diagram of the spy robot for a surveillance system.

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2018 9th IEEE Control and System Graduate Research Colloquium (ICSGRC 2018), 3 - 4 August 2018, Shah Alam, Malaysia

An Autonomous Robot for Intelligent Security Systems

ABSTRACT

Today scientific knowledge relentlessly bringing change and comfort in day to day life. In Present generation, an autonomous robot has been a popular technology which is widely used in many areas. Robots are used to share the work and act more autonomously in performing the jobs faster than humans. Usually, Robots are more intelligent with endless energy levels and more precise in handling the jobs perfectly. However, the proposed robot design is about researching and investigating hazardous environments, exploration, remote assistance and Military services. In the given system design, a robot system is built to monitor and identify the motion in achieving better security and surveillance of indoor environments. This autonomous system is built by using an embedded system to perform specific tasks and function as defined. This robotic system has five different systems such as robotic arms for pick and place of the objects from conveyor belts, an ultrasonic sensor for distance calculation, a visionary system for recording the motion of invader and sending the pictures through video transmission system through a network. Fire sensor is used for detection of fire and a giving alarm in the environment. The location of the robotic system is defined with GPS longitude and latitude values. This information is sent through a network using things speak and the same information is displayed on the LCD. A GSM message is sent through mobile for giving an alert about the operation. The robot designed has two modes of operation. One is the autonomous mode, and the other is the manual mode using a remote supervisory system. The deigned work combines the sensory and remote supervising system for better robotic security. The path planning is also carried out in a robotic system for achieving the motion in real time and obstacle avoidance.

MAJOR ISSUES

In the present world, there are various problems associated towards autonomous robotics. One of the major problems is towards decision making and intelligence system. Another problem is a sudden shutdown of the robot due to power failure. The robots are designed to perform specific functions and tasks for security services like navigation, detection and supervision of the premises through camera vision by a network. Some of the major difficulties in the robotics are towards decision making and locomotion of the robot. The machine learning and its own intelligence is still a challenge for the scientists in face recognition and language processing, path planning, optimal gait and pick and place of the object in unstructured environments. The robotic system's problems are broadly classified in applications such as localization and mapping in unknown environments and cognition behaviour change depending on the environmental conditions and robot and human interaction are the most interesting applications in sensing and locomotion tasks.

SYSTEM OVERVIEW

SYSTEM DESIGN

System design is the process of defining the architecture, components, modules, interfaces, and data for a system to satisfy specified requirements. Systems design could be seen as the application of systems theory to product development.

Architectural Design

System architecture is a conceptual model that defines the structure and behaviour of the system. It comprises of the system components and the relationships describing how they work together to implement the overall system.

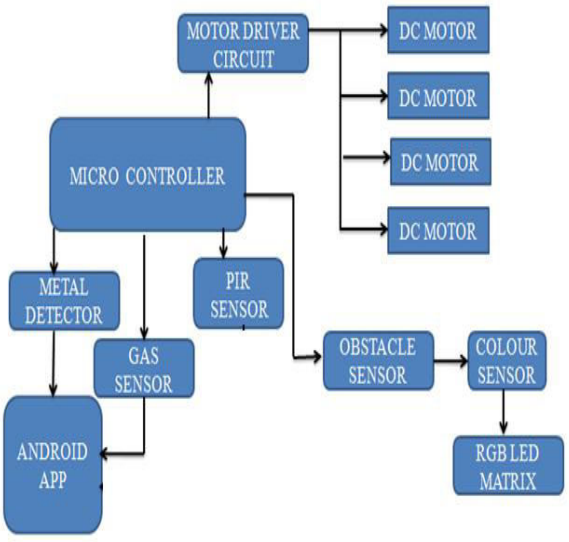


Figure:Architectural diagram of Camouflage Army Robot

Data Flow Diagram

A data flow diagram is a graphical representation of the "flow" of data through an information system, modelling its process aspects. A DFD is often used as a preliminary step to create an overview of the system without going into great detail, which can later be elaborated. DFDs can also be used for the visualization of data processing.

A DFD shows what kind of information will be input to and output from the system, how the data will advance through the system, and where the data will be stored. It does not show information about the timing of process or information about whether processes will operate in sequence or in parallel unlike a flowchart which also shows this information

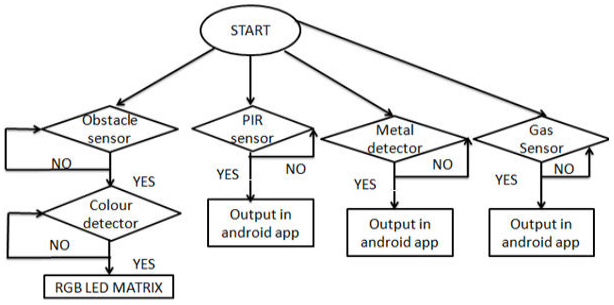


Figure :Data flow diagram

Fig 5.2 represents the data flow diagram of the camouflage army robot. It contains four sensors. An obstacle sensor, PIR sensor, Colour sensor, Metal detector and a gas sensor.

Class Diagram

Class diagram is a static diagram. It represents the static view of an application. Class diagram is not only used for visualizing, describing, and documenting different aspects of a system but also for constructing executable code of the software application.

Class diagram shows a collection of classes, interfaces, associations, collaborations, and constraints. It is also known as a structural diagram.

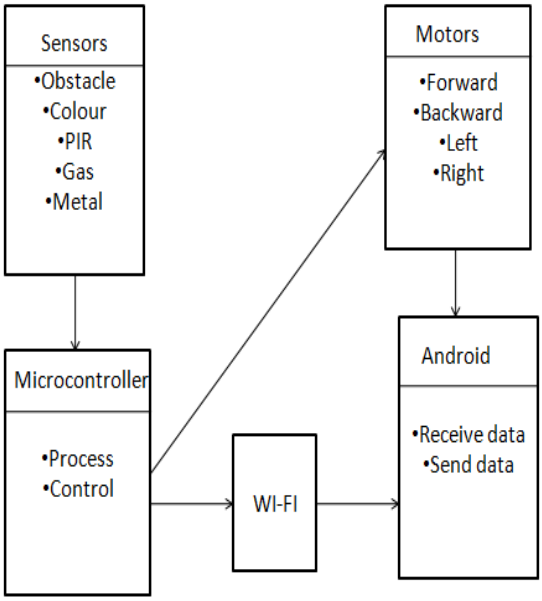


Figure:Class diagram

Sequence Diagram

Use Case Diagrams

A use case diagram at its simplest is a representation of a user's interaction with the system that shows the relationship between the user and the different use cases in which the user is involved. A use case diagram can identify the different types of users of a system and the different use cases and will often be accompanied by other types of diagrams as well.

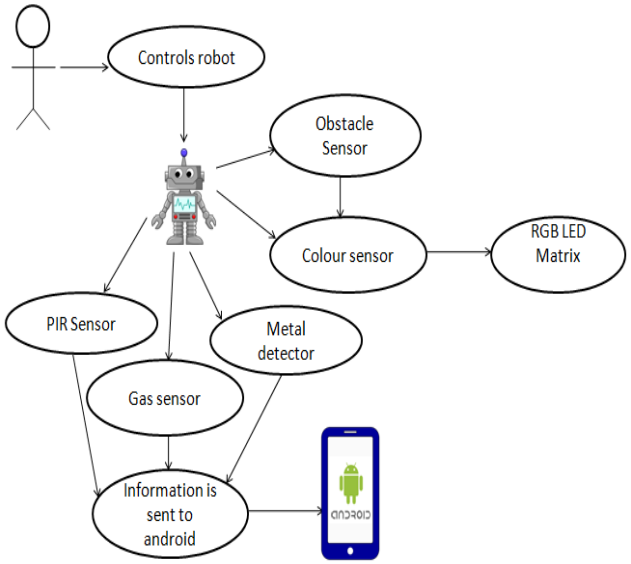
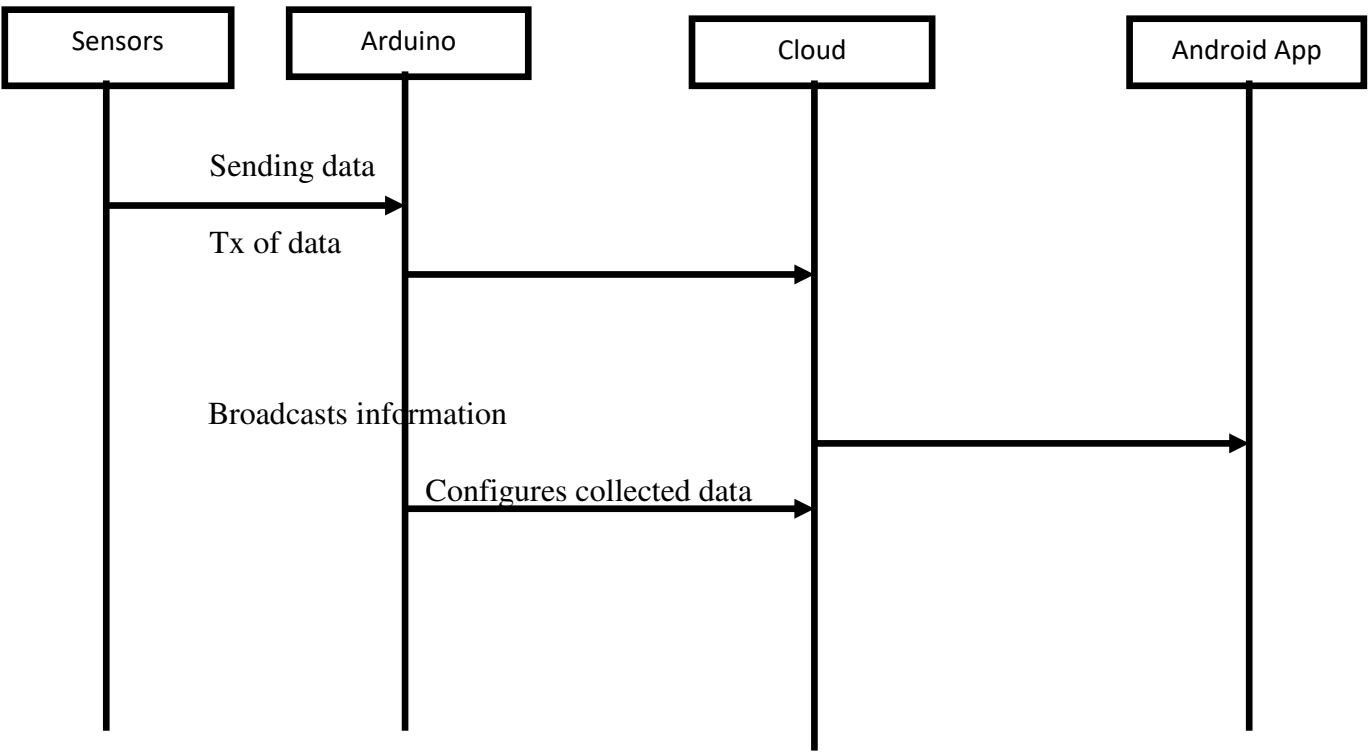


Figure:Use Case diagram

While a use case itself might drill into a lot of detail about every possibility, a use-case diagram can help provide a higher-level view of the system. It has been said before that "Use case diagrams are the blueprints for your system". They provide the simplified and graphical representation of what the system must actually do.

A sequence diagram shows object interactions arranged in time sequence. It depicts the objects and classes involved in the scenario and the sequence of messages exchanged between the objects needed to carry out the functionality of the scenario. Sequence diagrams are typically associated with use case realizations in the Logical View of the system under development. Sequence diagrams are sometimes called event diagrams or event scenarios.

A sequence diagram shows, as parallel vertical lines (lifelines), different processes or objects that live simultaneously, and, as horizontal arrows, the messages exchanged between them, in the order in which they occur. This allows the specification of simple runtime scenarios in a graphical manner.



HARDWARE IMPLIEMENTATION

System Implementation uses the structure created during architectural design and the results of system analysis to construct system elements that meet the stakeholder requirements and system requirements developed in the early life cycle phases. These system elements are then integrated to form intermediate aggregates and finally the complete system-of-interest (SoI).Implementation is the process that actually yields the lowest-level system elements in the system hierarchy (system breakdown structure). System elements are made, bought, or reused. Production involves the hardware fabrication processes of forming, removing, joining, and finishing, the software realization processes of coding and testing, or the operational procedures development processes for operators' roles.

Modular Description

Modular design, or "modularity in design", is a design approach that subdivides a system into smaller parts called modules or skids, that can be independently created and then used in different systems. A modular system can be characterized by functional partitioning into discrete scalable, reusable modules; rigorous use of well-defined modular interfaces; and making use of industry standards for interfaces.

Arduino

The Arduino Mega 2560 is a microcontroller board based on the ATmega2560 (datasheet). It has 54 digital input/output pins (of which 14 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Mega is compatible with most shields designed for the ArduinoDuemilanove or Diecimila.

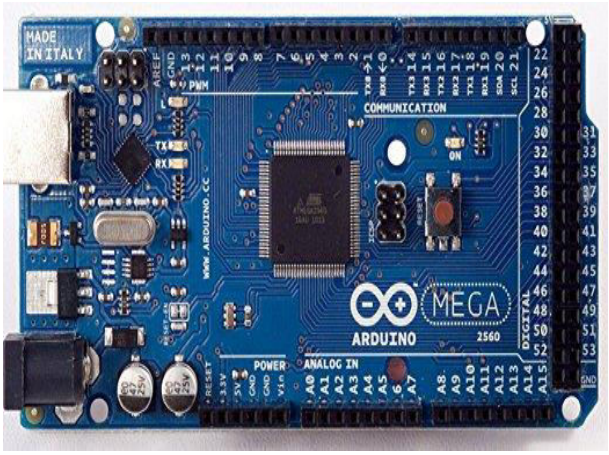


Figure: Arduino Mega Board

Power:

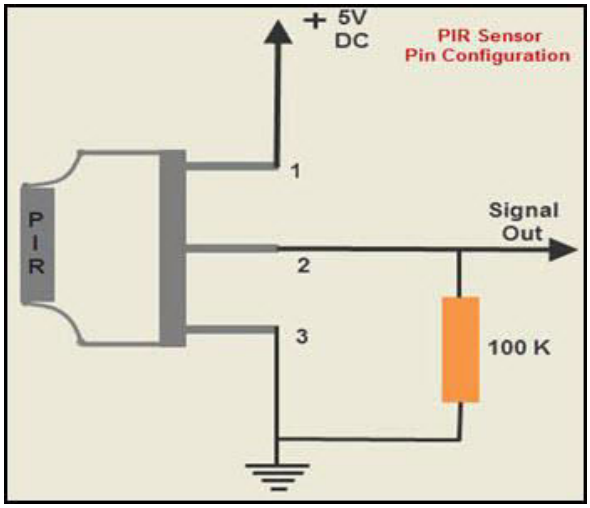
The Arduino Mega can be powered via the USB connection or with an external power supply. The power source is selected automatically. External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and Vin pin headers of the POWER connector.

The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts. The Mega2560 differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega8U2 programmed as a USB-to-serial converter.

PIR SENSOR:

The PIRsensor used to detect the movement of human being within a certain range of the sensor is called as PIR sensor or passive infrared sensor (approximately have an average value of 10m, but 5m to 12m is the actual detection range of the sensor). Fundamentally, pyroelectric sensors that detect the levels of infrared radiation are used to make PIR sensors. The PIR sensor circuit is used in numerous electronics projects which are used to discover a human being entering or leaving the particular area or room. These passive infrared sensors are flat control, consists of a wide range of lens, and PIR sensors can be easily interfaced with electronics circuits. sensor and here let us discuss about PIR sensor with dome shaped Fresnel lens.The PIR sensor circuit consists of three pins, power supply pin, output signal pin, and ground pin. The PIR sensor circuit is having ceramic substrate and filter window as shown in the figure and also having dome like structure called as Fresnel lens.

PIR sensor Pin configuration:



The pin configuration of the PIR sensor is shown in the figure.

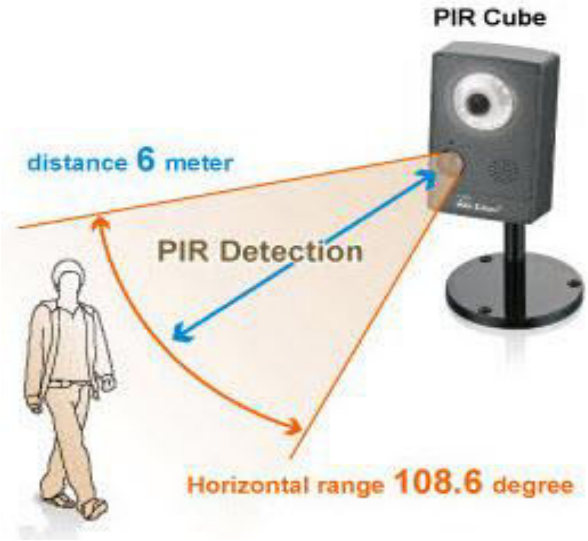
PIR sensor consists of three pins, ground, signal, and power at the side or bottom.

Generally, the PIR sensor power is up to 5V, but, the large size PIR modules operate a relay instead of direct output.

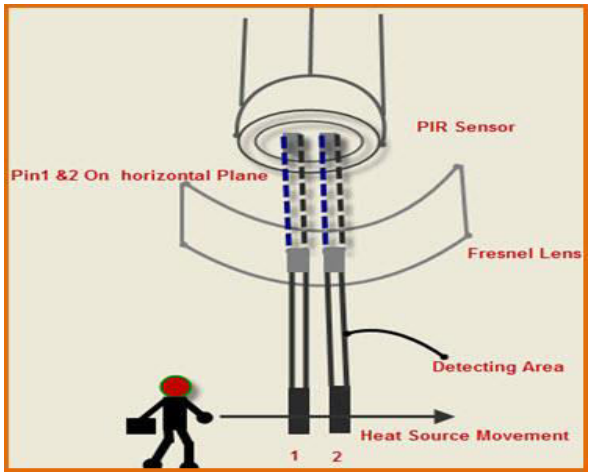
It is very simple and easy to interface the sensor with a microcontroller.

The output of the PIR is (usually digital output) either low or high.

PIR Sensor Working:



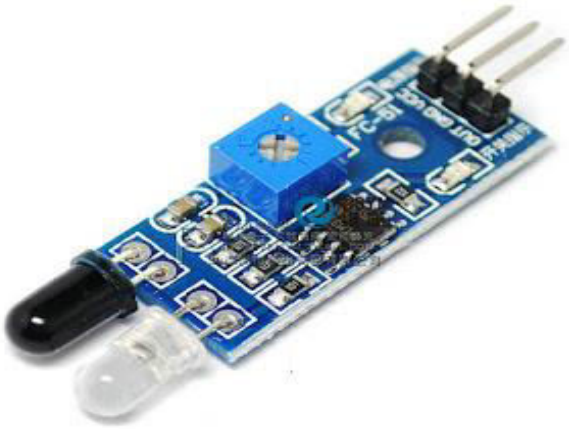
Whenever, human being (even a warm body or object with some temperature) passes through the field of view of PIR sensor,then it detects the infrared radiation emitted by a hot body motion. Thus, the infrared radiation detected by the sensor generates an electrical signal that can be used to activate an alert system or buzzer or alarm sound.

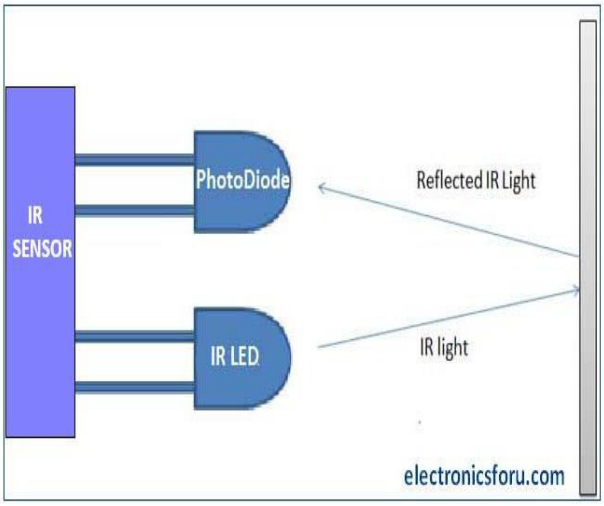


The PIR sensor internally is split into two halves, one half is positive and the other is considered as negative. Thus, one half generates one signal by detecting the motion of a hot body and other half generates another signal. The difference between these two signals is generated as output signal. Primarily, this sensor consists of Fresnel lens which are bifurcated to detect the infrared radiation produced by the motion of hot body over a wide range or specific area.

If once the sensor gets warmed up, then the output remains low until it detects motion. If once it detects the motion, then the output goes high for a couple of seconds and then returns to a normal state or low. This sensor requires settling time, which is characteristically in the range of 10 to 60 seconds.

IR SENSOR:

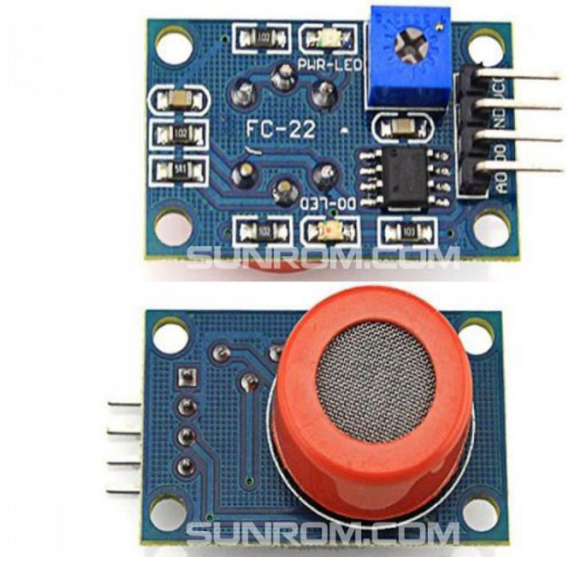




Advantages

- Speed
- Lack of Interference
- Ability to measure in high temperature -Up to 3000 ° C
- Long lasting measurement, no mechanical wear
- Optimization of manufacturing processes
- Fever inspection of patients or travelers
- Line scanning in glass toughening lines
- Checking mechanical or electrical equipment for temperature and hot spots
- Checking heater or oven temperature, for calibration and control
- Checking for hot spots in fire-fighting
- Food Processing

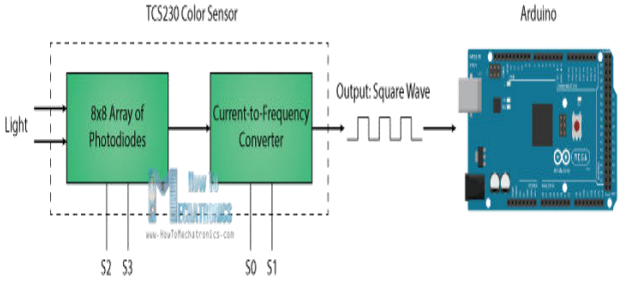
GAS SENSOR:



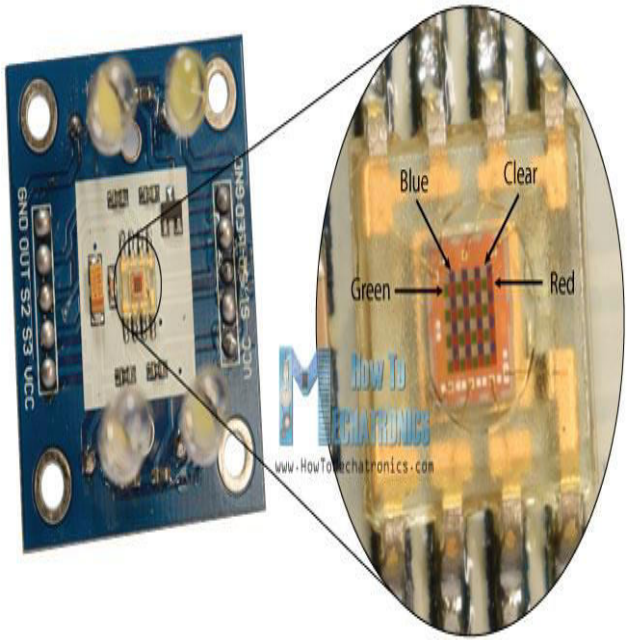
- This module is made using Alcohol Gas Sensor MQ3.
- It is a low cost semiconductor sensor which can detect the presence of alcohol gases at concentrations from 0.05 mg/L to 10 mg/L.
- The sensitive material used for this sensor is SnO2, whose conductivity is lower in clean air. It's conductivity increases as the concentration of alcohol gases increases.
- It has high sensitivity to alcohol and has a good resistance to disturbances due to smoke, vapor and gasoline. This module provides both digital and analog outputs.

Colour Sensor:

The TCS230 senses color light with the help of an 8 x 8 array of photodiodes. Then using a Current-to-Frequency Converter the readings from the photodiodes are converted into a square wave with a frequency directly proportional to the light intensity. Finally, using the Arduino Board we can read the square wave output and get the results for the color.



If we take a closer look at the sensor we can see how it detects various colors. The photodiodes have three different color filters. Sixteen of them have red filters, another 16 have green filters, another 16 have blue filters and the other 16 photodiodes are clear with no filters.



Each 16 photodiodes are connected in parallel, so using the two control pins S2 and S3 we can select which of them will be read. So for example, if we want to detect red color, we can just use the 16 red filtered photodiodes by setting the two pins to low logic level according to the table.

S0	S1	Output Frequency Scaling
L	L	Power down
L	H	2%
H	L	20%
H	H	100%

S2	S3	Photodiode Type
L	L	Red
L	H	Blue
H	L	Clear (no filter)
H	H	Green

The sensor has two more control pins, S0 and S1 which are used for scaling the output frequency. The frequency can be scaled to three different preset values of 100 %, 20 % or 2%. This frequency-scaling function allows the output of the sensor to be optimized for various frequency counters or microcontrollers.

SOFTWARE IMPLEMENTATION

Language : Embedded C++

IDE : Arduino IDE

ArduinoIDE:

The Arduino Integrated Development Environment (IDE) is a cross-platform application (for Windows, macOS, Linux) that is written in the programming language Java. It is used to write and upload programs to Arduino compatible boards, but also, with the help of 3rd party cores, other vendor development boards.

Embedded C/C++:

Embedded C++ is a dialect of the C++ programming language for embedded systems. It was defined by an industry group led by major Japanese central processing unit manufacturers, including NEC, Hitachi, Fujitsu, and Toshiba, to address the shortcomings of C++ for embedded applications.

CONCULSION

The proposed system provides a helping hand to our security forces in detection of intruders. The robot can also be used in high altitude areas where human cannot survive. Moreover, the camouflaging feature makes it difficult to detect the robot by naked human eye. There is scope to improve the system by configuring it with multicolor camouflaging.

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