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PIR Based Enhanced Safety System in Automobiles

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ABSTRACT: A PIR based safety system is developed to work as an active safety system in automobiles. Passive Infrared Radiation (PIR) sensor detects the change in infrared radiation emitted by the moving objects in its detection range. The change in the radiation results in activation of the camera through relay. The camera captures the image of the object which is in the detecting range and displays in screen. So PIR sensor has made it possible to detect the infrared emitting objects on road at the night time with the help of night vision camera. This system can be used in both day and night time. The importance of this project is that the animal vehicle collisions occurring during the night time can be mitigated.

KEYWORDS: PIR sensor, Ultrasonic sensor, ATmega 328p.

I. INTRODUCTION

Passenger safety occupies a prime spot in the automobile industry. Trying to prevent crashes is one part of motor vehicle safety. Automobile Safety is very important to reduce the occurrence of accidents. Today automobiles are packed with safety features that help protect drivers, passengers and pedestrians. Even so, car accidents statistics continue to be alarming.

It is easy to assume that the number of car crashes would be higher during times when there are more vehicles on the road, however it is not always the case. Night-time driving presents more hazards due to a number of reasons. The common cause of accidents are fatigue, inclement weather, speeding, distracted driving and many. More than 40 percent of all fatal car accidents occur at night.

Night driving is a top cause of car accident since our ability to perceive and judge distance is severely impaired at night. Due to this lack of vision several animal related collision and also human crashes occurs. Speed is one of the most common factors in vehicle collisions. By the time when driver encounters any movement on the road it will be too late to avoid crash

II. RELATED WORK

Human tracking system based on pir sensor network

To detect and locate the human target motion precisely, this paper intends to present a tracking algorithm based on pyroelectric sensor network and video analysis technologies. According to the advantages of pyroelectric sensor network system and video system, this paper uses weighted least squares to fuse the data which is collected by multiple heterogeneous sensor nodes to realize human target real-time tracking. Moreover, the data can also be collected by pyroelectric sensor network system and video cameras. Through simulation, the error of tracking results is analyzed. The results shows that the method using homogeneous and heterogeneous sensors to fuse the measured vector obtain better human target real-time tracking effect.

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Motion detection using pir sensor

This paper shows that Pyroelectric Infrared Sensor(PIR) are the sensors which are most widely used for cheap surveillance. Due to their high ended sensitivity and area of detection PIR sensors are popular in security. PIR sensors are excellent in human and animal detection. They are mostly used in triggering an intruder alarm and activate household appliances upon the presence of a human. However, the output from the sensor is proportional to several temporal relationships between an object in the field of view of the sensor, the sensitivity of the sensor, PIR lens features, and the environmental heat conditions.

Development of pir sensor based indoor location detection system for smart home

Smart home is expected to offer various intelligent services by recognizing residents along with their life style and feelings. One of the key issues for realizing the smart home is how to detect the locations of residents. Currently, this research effort is focused on two approaches: terminal-based and non-terminal-based method. The terminal-based method employs a type of device that should be carried by the resident while the non-terminal-based method requires no such device. This paper presents a novel non-terminal-based approach using an array of pyroelectric infrared sensors (PIR sensors) that can detect residents. The feasibility of the system is evaluated experimentally on a test bed.

III. PROPOSED SOLUTION

Introduction

This project is designed and implemented as an active system to minimize the occurrence of accidental crash. This system warns the driver that the obstacle is ahead in the path well before the driver himself notice using his eyes. These crashes can be avoided only if the driver drives the car defensively and uses active safety system. The active system plays a preventive role in mitigating crashes and accidents by providing warning or by providing the driver with additional assistance.

Description

In this project, we are using Multi Integration On Single Chip (MISC) which consists of ATmega 328p. A PIR sensor is connected to the MISC. Whenever the PIR sensor detects infrared emitting object in its range the buzzer activates and digital output from PIR will be given to MISC. The MISC gives the trigger required for the relay to supply the required power to turn ON the camera. The camera captures the image of object and displays it on the screen or mobile phone. A stepdown transformer is used to decrease the input supply to a suitable value such that the MISC can able to perform well. In case the driver didn't notice the image on display, automatically the car slows down if the object is too close to the vehicle using ultrasonic sensor.

IV. ACTIVE LIFE SAVING SYSTEM

Working Principle

Drivers during the night will face several challenges while driving due to the poor visibility. At the night crashes occurs either due to man made errors or accidental causes. This project is designed and implemented as an active system to minimize the occurrence of accidental crash. The proposed system has a great flexibility by using the Wi-Fi camera for capturing the images, such that those images can be displayed on LCD screen or in any mobile phone.

The proposed system consists of MISC (Multi Integration On Single Chip), PIR sensor, relay, stepdown transformer, ultrasonic sensor. The PIR sensor detects the object which is in its range and sends signal to the MISC. The supply for the PIR is given from the MISC, which in turn connected with the stepdown transformer. The MISC which consists of microcontroller (ATMEGA 328P) process the input according to the program and sends triggering signal to single channel relay. At the same time the buzzer sounds so as to indicate driver something is about to come in his way.

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Block Diagram

The system consists of Microcontroller (ATmega328p), PIR sensor, Ultrasonic sensor, Relay, WiFi Camera, LCD display.

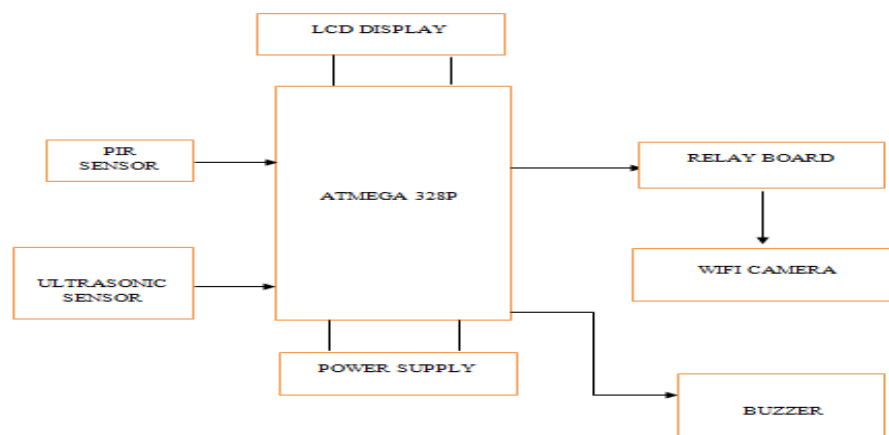


Fig 1: Block Diagram of Active Life Saving System

V. HARDWARE DESCRIPTION

PIR Sensor

A Pyroelectric detector is an infrared sensitive optoelectronic component which are specifically used for detecting electromagnetic radiation in a wavelength range from (2 to 14) μm . The pyroelectric sensor is made of a crystalline material that generates a surface electric charge when exposed to heat in the form of infrared radiation. When the amount of radiation striking the crystal changes, the amount of charge also changes and can then be measured with a sensitive FET device built into the sensor.

The sensor elements are sensitive to radiation over a wide range so a filter window is added to the TO5 package to limit incoming radiation to the 8 to 14m range which is most sensitive to human body radiation. The PIR325 sensor has two sensing elements connected in a voltage bucking configuration. This arrangement cancels signals caused by vibration, temperature changes and sunlight. A body passing in front of the sensor will activate first one and then the other element

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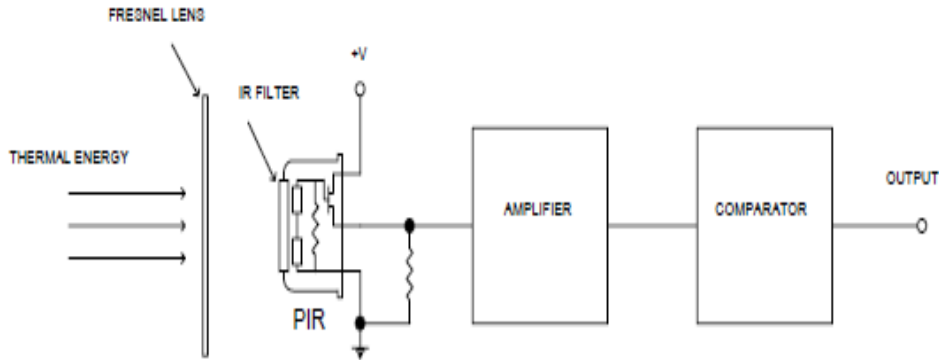


Fig 2: Typical configuration of PIR sensor

Microcontroller

ATmega 328p has 1KB Electrically Erasable Programmable Read Only Memory (EEPROM). ATMEGA-328 has 2KB Static Random Access Memory (SRAM). ATMEGA 328 has several different features which make it the most popular device in today's market. These features consist of advanced RISC architecture, good performance, low power consumption, real timer counter having separate oscillator, 6 PWM pins, programmable Serial USART, programming lock for software security, throughput up to 20 MIPS etc. ATmega-328 is mostly used in Arduino.

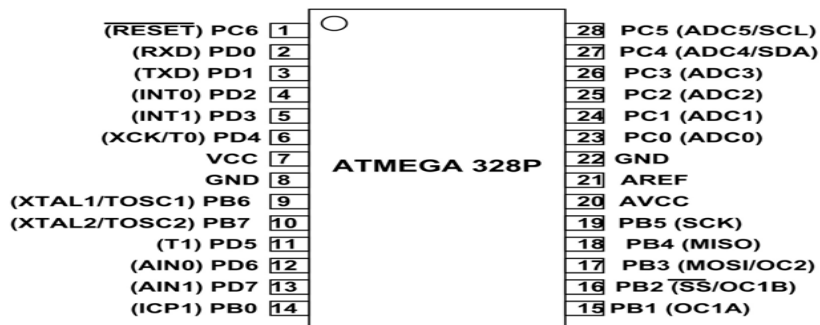


Fig 3: Pinout Diagram of ATmega 328p

Ultrasonic Sensor

An ultrasonic sensor houses a transducer that emits high-frequency, inaudible acoustic waves in one direction when the transducer element vibrates. If the waves strike and bounce off an object, the transducer receives the echoed signal. The sensor then determines its distance from the object based on the length of time between the initial sound burst and the echo's return. Ultrasonic sensors (also known as transceivers when they both send and receive) work on a principle, which evaluate attributes of a target by interpreting the echoes from radio or sound waves respectively. Ultrasonic sensors generate high frequency sound waves and evaluate the echo which is received back by the sensor. Sensors calculate the time interval between sending the signal and receiving the echo to determine the distance to an object.

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Circuitry part

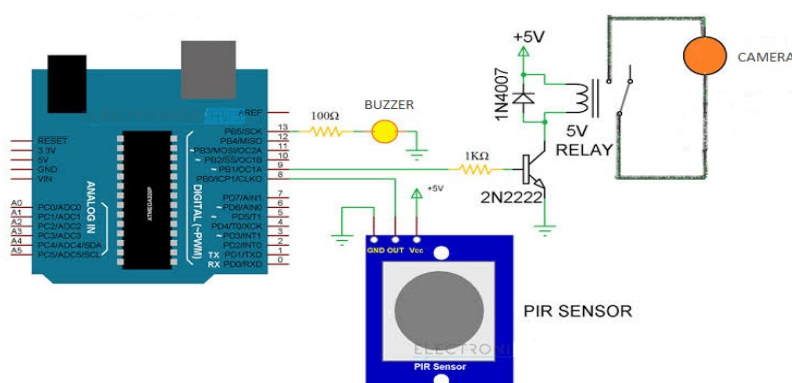


Fig 4: Circuit diagram for object detection and image capturing

VI. SOFTWARE DESCRIPTION

Arduino IDE

- Arduino IDE is an open source software that is mainly used for writing and compiling the code into the MISC Module.
- It is an official Arduino software, making code compilation too easy that even a common person with no prior technical knowledge can get their feet wet with the learning process.
- It is easily available for operating systems like MAC, Windows, Linux and runs on the Java Platform that comes with inbuilt functions and commands that play a vital role for debugging, editing and compiling the code in the environment.
- Each of them contains a microcontroller on the board that is actually programmed and accepts the information in the form of code.
- The main code, also known as a sketch, created on the IDE platform will ultimately generate a Hex File which is then transferred and uploaded in the controller on the board.

VII. RESULT

PIR based enhanced safety system in automobiles has been experimentally proven to work satisfactorily by connecting simple components such as night vision camera, buzzer, ultrasonic sensor, DC motor and more. The designed system not only displays the obstacles to the driver, it also automatically slows down the vehicle if the obstacle is too close using ultrasonic sensor.

VIII. CONCLUSION

Thus the unnecessary accidents occurring due to high beam glare can be avoided with this project. For the last 20 or 30 years, most of the focus on making vehicles safer was on protection that is reducing the risk of being injured, given that crashes are going to occur. At present technologies are developing rapidly in such a way that it helps to avoid the accidents. Our project helps in reducing the number of accidents and in future it can be incorporated in the driverless vehicle. Using this system as framework, the system can be expanded to include various other options which could ensure the safety in vehicles. This project will play a vital role in developing driverless cars by helping in calculating the distance of the obstacle and to take necessary actions autonomously.

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