Human Detection Robot

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Abstract: Natural impact do occur and they are unstoppable. During the natural impact like earthquakes, it is hard to rescue the human beings under the buildings. But Humans have being become increasingly aware in the concept of intelligent rescue operations in such calamities so that precious life and material can be saved though calamities cannot be control. So the robotic vehicle that moves in the earthquake prone area and helps in identifying the alive people and rescue operations. Earthquakes create a devastating effect and they see no difference between human and material.Detection by rescue workers becomes time consuming and due to the vast area that gets strike it becomes more difficult. A timely rescue can only save the people who are buried and injured. Human detection robot isn't a new technology. Many types of robots were designed depending on the application. A simple Robot is designed to detect and to inform the presence of human with a new approach. In response to this need, a low-cost robot equipped with PIR sensor, accelerometer, camera and wireless communication module is developed. Robot can move in all direction to increase the range of detection. The robot move in left, right, forward and backward directions based on the obstacles it encounters. A wireless remote controlled robot which employs a PIR sensor, detects the presence of human being and shows it to the user. The robot can navigate autonomously between damaged areas to look for living body heat and can send back audio and video information to allow the operator to determine if the found object is a living human. It sends the signal from the transmitter side to the receiver side continuously to notify the user. A program has been written and executed for the said purpose using Arduino UNO. The experiments are observed deeply and the results show that the system provides an efficient way for the said purpose. The hardware implementation is made quite simply and cost effectively.

Keywords-Arduino UNO, wireless camera, PIR sensor, motor driver, control software, Wi-Fi, Zigbee.

I. INTRODUCTION

The advent of new high-speed technology and the growing computer Capacity provided realistic opportunity for new robot controls and realization of new methods of control theory. This technical improvement together with the need for high performance robots created faster, more accurate and more intelligent robots using new robots control devices, new drivers and advanced control algorithms. A mobile robot is a machine that is basically place or mounted on a movable platform and can be with the help of certain instructions. In todayâTMs world a lot of fields use mobile robots. Many of the complex robots that we now see have originated from the simpler mobile robots. His technology has increased many new applications in the industry. The combination of mobile devices and robots are leading to new ideas in lots of fields. The mobile devices are now being used in many of the industrial applications this is mainly because of the reason that they are portable and have a longer battery life as compared to a laptop. Also they have a data plan through a cell phone carrier which is convenient as we can interact with the mobile robot once the connection is established.

Mobile Robots:

The mobile robots can be classified into different types. The track robot is the robot that uses tracks to move around. However such robots are costly to build. Also they are not as flexible as the wheeled robots. The wheeled robots are the robots which use wheels for moving. Such robots can move only on smooth flat surfaces. The third type is the legged robots which are based on human form. They have legs which helps them to move around. These robots are very difficult to design Robots are being used in variety of industrial applications for various activities like pick and place, painting, assembling of subsystems and in hazardous places for material handling etc. Robots are becoming more and more intelligent as technology advances in the areas of CPU speed, sensors, memories etc. And there is ever demanding applications even in defense. With the rapid growth of the Internet, more and more intelligent devices or systems have been embedded into it for service, security and entertainment, including distributed computer systems, surveillance cameras, telescopes, manipulators and mobile robots.

Although the notion of Internet robotics or web-based robotics is relatively new and still in its infancy, it has captured the huge interest of many researchers worldwide. Except for operating in hazardous environments that are traditional telerobotic areas, Internet robotics has opened up a completely new range of real-world applications, namely tele-manufacturing, tele-training, tele-surgery, museum guide, traffic control, space exploration, disaster rescue, house cleaning, and health care. Automated video surveillance is an important research area in the commercial sector as well.

Technology has reached a stage where mounting cameras to capture video imagery is cheap, but finding available human resources to sit and watch that imagery is expensive. Surveillance cameras are already prevalent in commercial establishments, with camera output being recorded to tapes that are either rewritten periodically or stored in video archives. In this implementation of robotic system, when a person enters a monitored area, PIR motion detectors are commonly used in conjunction with different parts of the war field. When someone enters secured places, immediately it will send an indication to the control room section through wireless communication and is indicated to the control room through alarm.

The concerned people can understand that an eventuality has happened in the host section. At the same time web camera connected to the microcontroller keeps on capturing what is going on there at the host place and saves it into the computer. When the security people in supervisory room, get an indication to the host section by alarm, they log into the host section computer through internet, and view all information of the war field section videos by PC.In these days there are lot of robberies happening, so we need more security.The security system commonly used is ordinary surveillance camera it provides visual images but the ordinary surveillance camera cannot notify the user instantly about unauthorized presence. To overcome robbery and to notify the user as quickly as possible we developed a robot that can detect human. As the robot can detect the human it is named Human Detection Robot.This robot can be used in jewelry stores, banks, etc. to provide security after hours. It can also be used in earthquake areas to find victims and also in army to detect the opponent.

II. USING THE SOURCES

Arduino

Arduino is a computer hardware and software company, project, and user community that designs manufactures microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical world. Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (*shields*) and other circuits. The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, which are also used for loading programs from personal computers. The microcontrollers are typically programmed using a dialect of features from the programming languages C and C++.

LCD display

LCD (liquid crystal display) is the technology used for displays in notebook and other smaller computers. Like light-emitting diode (LED) and gas-plasma technologies, LCDs allow displays to be much thinner than cathode ray tube (CRT) technology. LCDs consume much less power than LED and gas-display displays because they work on the principle of blocking light rather than emitting it.An LCD is made with either a passive matrix or an active matrix display display grid. The active matrix LCD is also known as a thin film transistor (TFT) display. The passive matrix LCD has a grid of conductors with pixels located at each intersection in the grid. A current is sent across two conductors on the grid to control the light for any pixel. An active matrix has a transistor located at each pixel intersection, requiring less current to control the luminance of a pixel. For this reason, the current in an active matrix display can be switched on and off more frequently, improving the screen refresh time (your mouse will appear to move more smoothly across the screen, for example).

ULN2003

ULN2003 is a high voltage and high current Darlington array IC. It contains seven open collector darlington pairs with common emitters. A darlington pair is an arrangement of two bipolar transistors.**ULN2003** belongs to the family of ULN200X series of ICs. Different versions of this family interface to different logic families. ULN2003 is for 5V TTL, CMOS logic devices. These ICs are used when driving a wide range of loads and are used as relay drivers, display drivers, line drivers etc. ULN2003 is also commonly used while driving Stepper Motors. Refer Stepper Motor interfacing using ULN2003.Each channel or Darlington pair in **ULN2003** is rated at 500mA and can withstand peak current of 600mA. The inputs and outputs are provided opposite to each other in the pin layout. Each driver also contains a suppression diode to dissipate voltage spikes while driving inductive loads.

Relay

A **relay** is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits as amplifiers: they repeated the signal coming in from one circuit and re-transmitted it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations. Here ULN 2003 Relay driver IC is used. It is a high voltage and current Darlington pair array based IC. It is used to control a high-voltage circuit with a low-voltage signal. It is used to control a high-current circuit with a low-current signal. E.g.(starter). To detect and isolate faults on transmission and distribution lines by opening and closing circuit breakers (protection relays).

Gear Motor

Geared DC motors can be defined as an extension of DC motor which already had its Insight details demystified here. A geared DC Motor has a gear assembly attached to the motor. The speed of motor is counted in terms of rotations of the shaft per minute and is termed as RPM .The gear assembly helps in increasing the torque and reducing the speed. Using the correct combination of gears in a gear motor, its speed can be reduced to any desirable figure. This concept where gears reduce the speed of the vehicle but increase its torque is known as gear reduction. This Insight will explore all the minor and major details that make the gear head and hence the working of geared DC motor.

PIR sensor

PIR sensors are used to detect any object that radiates heat.It can detect humans, animals and other objects. Fresnel lenses are used in PIR sensors which increase the range of detection. These lenses are made up of translucent which capture the radiation from visible spectrum of light.

Radio frequency transmitter

The Radio frequency transmitters transmit the radio frequency signals.

Radio frequency receivers

The RF Receivers receives the radio frequency signals and demodulates it

Batteries

Battery is used to power the robot. The batteries used are 9 volts of battery.

DC motor

DC motor is an electric motor which converts the electrical energy into mechanical energy.

RF module

An **RF module** (radio frequency module) is a (usually) small electronic device used to transmit and/or receive radio signals between two devices. In an embedded system it is often desirable to communicate with another device wirelessly. This wireless communication may be accomplished through optical communication or through radio frequency (RF) communication. For many applications the medium of choice is RF since it does not require line of sight. RF communications incorporate a transmitter and a receiver. They are of various types and ranges. Some can transmit up to 500 feet. RF modules are widely used in electronic design owing to the difficulty of designing radio circuitry. Good electronic radio design is notoriously complex because of the sensitivity of radio circuits and the accuracy of components and layouts required to achieve operation on a specific frequency.

Obstacle detection sensors

The robot has obstacle sensor which can detect obstacles and helps in navigating without crashing. These sensors produce Infrared signals, if these signals hit any obstacles, the signals bounces back to the IR receiver, indicating it has found an obstacle.

Wireless camera

Wireless security cameras are closed-circuit television (CCTV) cameras that transmit a video and audio signal to a wireless receiver through a radio band. Many wireless security cameras require at least one cable or wire for power; "wireless" refers to the transmission of video/audio. However, some wireless security cameras are battery-powered, making the cameras truly wireless from top to bottom. Wireless cameras are proving very popular among modern security consumers due to their low installation costs (there is no need to run expensive video extension cables) and flexible mounting options; wireless cameras can be mounted/installed in locations previously unavailable to standard wired cameras. In addition to the ease of use and convenience of access, wireless security camera allows users to leverage broadband wireless internet to provide seamless video streaming over-internet.

III. SOFTWARE REQUIRED

Arduino ide

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 board. The source code for the IDE is released under the GNU General Public License, version 2. The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures. User-written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub *main()* into an executable cyclic executive program with the GNU toolchain, also included with the IDE distribution. The Arduino IDE employs the program *avrdude* to convert the executable code into a text file in hexadecimal encoding that is loaded into the Arduino board by a loader program in the board's firmware

Proteus Design Suite

The **Proteus Design Suite** is a proprietary software tool suite used primarily for electronic design automation. The software is used mainly by electronic design engineers and electronic technicians to create electronic schematics and electronic prints for manufacturing printed circuit boards.The Proteus Design Suite is a Windows application for schematic capture, simulation, and PCB layout design. It can be purchased in many configurations, depending on the size of designs being produced and the requirements for microcontroller simulation.

IV. PROBLEM DESCRIPTION

Existing system

The existing system suffered many problems like high cost to set up communication between robot and rescue control unit, noisy wireless communication link between robot and control unit which ultimately stopped robot to function etc. The proposed system is able to solve all these problems. The field of surveillance robots is very popular. A lot of work was done in the algorithms and the navigation control System wireless surveillance robots. A common subject is also the use of a camera on the robot to receive live feedback of the video. As seen in all documents and previous research they use webcams. Web cams requires Internet, one of our application is under the supervision of the tragedies and terrorist attacks. Internet system or communication fails these situations because of traffic so there is no use of webcam so here we use AV camera that does not depend on third party network but depends on its own network. For a long distance communication according to previous documents, they used the Internet or Bluetooth control, but Bluetooth has only 10 meters range. So instead of Bluetooth, ZigBee is the best solution. The first surveillance robot which is to be used for security purpose was "Mobile Detection Assessment and Response System (MDARS)" From then there has been tremendous improvement in the research and development in surveillance robots. Now surveillance robots are used in all military and security applications. Basically surveillance robot is nothing but the ordinary robot with the navigation mechanism along with some cameras, thermal sensors, and the communication devices likeGSM, GPS modules. These robots can be navigated using servo motors to get the accurate navigation.

PROPOSED SYSTEM

The new age of technology such as Android, GSM has redefined communication. Most people nowadays have access to mobile phones and thus the world indeed has become a global village. At any given moment, any particular individual can be contacted with the mobile phone. New innovations and ideas can be generated from it that can further enhance its capabilities. Technologies such as Infra-red, Bluetooth, Wi-Fi which has developed in recent years goes to show the very fact that improvements are in fact possible and these improvements have eased our life and the way we live. Remote management of several home and office appliances is a subject of growing interest and in recent years we have seen many systems providing such controls. Mobile robots are robots which have the ability to move around and interact with their environment and not just hinged to a particular place. There are many labs and research groups from various universities and industries which are completely dedicated on researching mobile robots, because of their immense potential and varied application in industry, military, security, and entertainment. The robot is specially designed for surveillance purpose. The control mechanism is provided along with video transmission facility.

The below figure is shown in the block diagram of the rescue robot.

Transmitter side
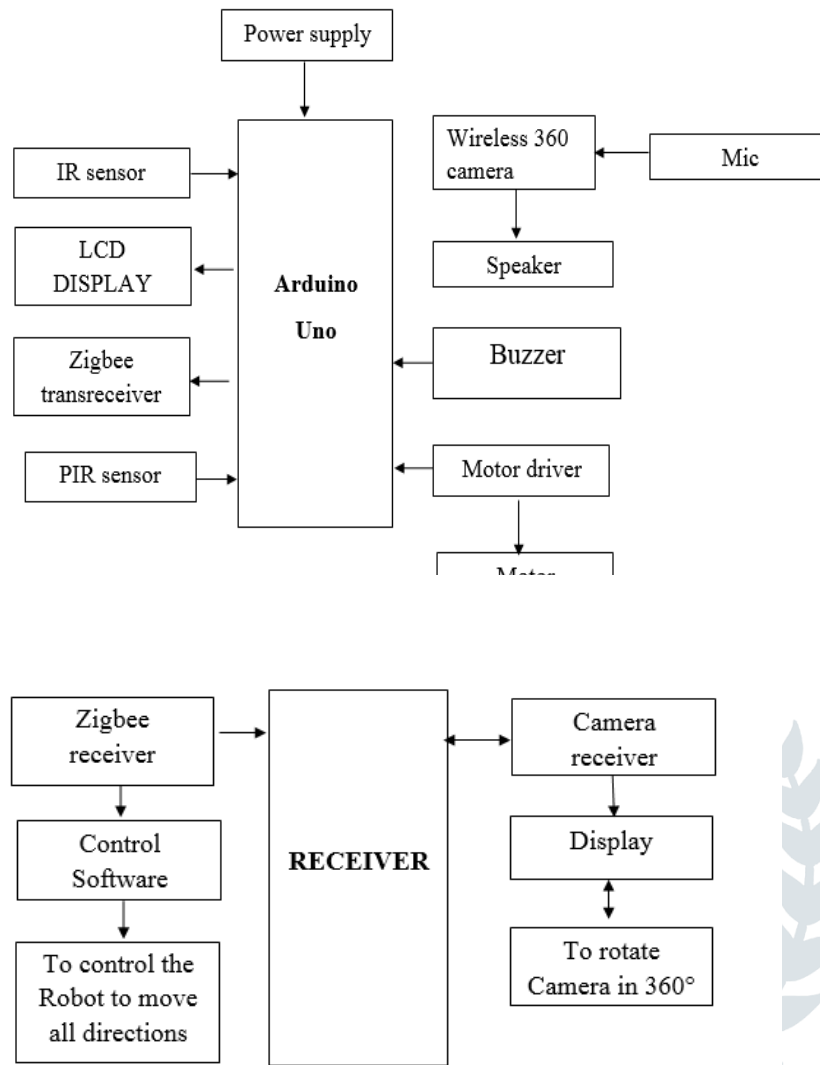
The video transmission is practically achieved through high speed image transmission. Initially, the robot will be equipped with an Android smartphone which will capture the scenario in front of it will transfer the images to the server on which the user will be controlling and watching the live feed. This project describes a new economical solution of robot control systems .In general; the robots are controlled through wired network. The programming of the robot takes time if there is any change in the project the reprogramming has to be done. Thus they are not user friendly and worked along with the user preferences. To make a robot user-friendly and to get the multimedia tone in the control of the robot, they are designed to make user commanded work.

The modern technology has to be implemented to do this. For implementing the modern technology it should be known by all the users to make use of it. To reach and to full-fill all these needs we are using android mobile as a multimedia, user friendly device to control the robot. This idea is the motivation for this project and the main theme of the project. In this modern environment everybody uses smart phones which are a part of their day-to-day life. They use all their daily uses like newspaper reading, daily updates, social networking, and all the apps like home automation control, vehicle security, human body anatomy, health maintenance, etc has been designed in the form of applications which can be easily installed in their hand held smart phones.

This project approached a robotic movement control trough the smart phones. The proposed architecture, by making use of location-based service, offers a solution to those problems. That is, for customers there is no need to visits many e-commerce websites for buying the desire the product. A user can buy desired product without visiting many e-commerce website as well as without wasting of time in visiting of e-commerce website. Location-Based Smart Shopping using Android provides a stage to the customer where the user can get information of a particular product available in stores nearby. Moreover, a user is also

provided navigation facility which will direct him to the shop he wants to buy the product from the proposed embedded robotic system detects alive human body in the catastrophic environments which is very helpful for rescue operations.

Robotic unit is consisting of PIR sensor and camera which is movable around its axis and also vertically. PIC16F877A is used for controlling the dc motors which used for robot wheels and also for the camera movement. PIC16F877A is also used for collecting data from the PIR sensor for detection of living body. Raspberry Pi is used for video processing and sending the video to the user through the internet. MAX232IC is used for communication between PIC16F877A (Microcontroller) and ZigBee. Motor driving circuits are used for operating motors. LCD screen is used for the testing purpose i.e. to test the communication between hand unit and robotic unit. User unit consists of a PC with internet connection. A software GUI is designed having options of controlling the dc motors and stepper motors. It shows the live video streaming of the environment.

Also there is provision of alerting the User when PIR sensor detects any living body around the robot. Methodology: In this project, control of robotic unit is from remote end with the use of Internet and also we are able to get the videos from the robot end for the purpose of surveillance. At the user PC, we will have videos on the web browser and also we are able to control the robotic movement and also the camera movement in vertical direction and horizontal direction. DC motors are being used for the movement of robotic wheels and stepper motor is used for camera movement i.e. for vertical movement and horizontal movement. The PIR sensor on the robotic unit gives us the information about the Living bodies. Motors and PIR sensor are being interfaced to PIC microcontroller. The use of Internet does not bring the limitation of range into consideration as if we have the internet access, we can control the robot from anywhere.

V. RESULT

The Robot has to be tested under closed environment where the presence of sunlight is less, so the test was performed inside a room. The testing phase had two parts, the first one is testing for detecting a human and the second test is detecting any obstacle. To test the robot for detection of human, it has to succeed the test conditions. The Robot was tested for its range by placing 5ft away from the human and the robot detected the presence of the human. Hence the first test was successful. The second test was checking the boundary conditions by placing the robot at 11ft and 12ft away from the human. It detected the presence of human being in both the ranges.

The final test was to place the robot 13ft away from the human, where detecting is not possible and the Robot didn't detect it. Hence the phase of checking the range was successful. Second phase was to test the obstacle sensor. The robot was made to move in a room. If it sensed any obstacle in front of it, it robot moves in backward direction about 1ft and chooses to move in left or right direction. If any obstacle is sensed in right side then the robot changes its direction to left side and vice versa. The robot worked perfectly, without crashing itself. A land-roving robotic vehicle with multi sensor interface Wireless connectivity to the controller and the monitoring device. Live video streaming on the television. Human detection and alarming through RF device.

VI. CONCLUSION

Human detection Robot is to provide more security for the users to protect their belongings from robbers. The robot can move in all the directions automatically without controlling it, which makes the system more effective to use. As the Robot can move, it covers lot of distance that reduces the use of many sensors or many robots. When the Robot finds a human it can notify the users by producing continuous beeps. The Robot can be modified further by attaching visual camera where the image of the intruder can be notified. If the robot is attached with SONAR (Sound Navigation and Ranging) it can determine the distance between the human and can detect the IR image of the object.A land-roving robotic vehicle with multi sensor interfaceWireless connectivity to the controller and the monitoring device. Live video streaming on the television. Human detection and alarming through RF device

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