

SMART HUMAN TRACKING ROBOT

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Abstract— Human life safety holds its preference in comparison to any other objective in the world. Nowadays with increase in danger to their life, in the form of natural disaster and fluctuation in weather cycle, leaves their life at high risk. Human safety and their rescue holds first preference if any of these mishaps happen in any part of the world, but with lagging useful techniques to get the first information which plays a critical role in rescue team, it is essential to get these information as early as possible without any loss to human life.

The aim of the project is to make a human tracking robot which will work on the principle of wireless communication technology. Human tracking robot find's its application in various fields like flood hit areas; landslide hit zones and various military surveillance zones. Human tracking robot has the special ability to sense human beings and to send its location through global positioning system (GPS), which helps the rescuers to see directly where the people are stuck and need to be rescued. Also, this robot sends the live pictures of those areas along with the details which are mentioned above. This whole process is done through wireless communication.

We see nowadays that whenever any disaster happen there is no as such great technology or device to give the accurate update or we can call it as first information about the crash site, which make it difficult for the rescue teams to plan their rescue operation. Our robot will help those rescue teams to get the latest update, first information as well as it will cost them no loss of life to get these details.

Keywords—Human, rescue, detection, disaster, location, rescue, android, wireless, connection, robot.

INTRODUCTION

A robot is a man made machine which is designed to implement one or more tasks repeatedly, with speed, accuracy and high precision. An important aspect of robotics can be in human safety & security, where these robots can used for doing surveillance of specific location. Interesting application can be seen in as robot scanning areas to find injured humans, and find their location and sending their live images to the rescue operations team. Protection of assets and location using robots allows hands-free operation through pre-operational programming, so that it can response to external stimuli. Over all it can be said that, safety robots can be very efficient and can be cost savings also, but they can never replace a human safety personal, but the places with high level safety and places such as nuclear reactors, the robots still are not used. Due to this increasing security and safety requirements nowadays, safety managers are now turning towards the robots to help them and get their job done. These works mainly focus on perception and identification of the target body and localization of robot. Robot is a very important aspect in conditions like Earthquake, landslide, forest fire where we need to identify living human beings as early as possible, so as to save their life. In such situations, human rescuer's team must make quick decisions and actions, and try to get victims to safety even if they have to keep themselves at risk. They must be able to gather the location information and condition of victims and the stability remaining in the surrounding structures as quickly as possible so that medical teams and fire-fighters can reach the disaster area and save victims. Generally these kinds of tasks are performed usually by human rescuers and trained dogs, often in very critical & dangerous and risky and critical situations. For these reasons, self or partially controlled robots have been proposed to help these rescue teams and to perform the tasks that neither human's, dogs nor any existing tools can do.

The idea of this project is to track the location of the living being using the robot which is controlled through Wi-Fi communication with the server. If it detects any human presence in a particular location then it will takes its coordinates i.e., its longitude and latitude position through GPS and will send them to the destination server using android module. This project is applicable in military and security areas where without any presence of human's we can know the actual situation of the other side which is in dangerous

condition. This project can also be implemented to manoeuvre around the disaster location and try to find people who need help and which can be rescued. Specially made passive infrared sensor is used for human detection or presence. Infrared proximity sensor used here is for obstacle detection, so that robot moves properly. The data obtained by the sensors are displayed in the remote user using GPS technologies. Also, as we are using the android module we will get the live feed of the location through images or videos from the camera available at the android module, which will help the rescue operations team to plan out better and much efficient rescue strategy. The android module/phone will be positioned upon dummy buggy or on a quad copter so that land or air surveillance can be possible. Here we are implementing our robot on a three wheeled buggy, which will be used for the ground surveillance.

METHODOLOGY

First step of any project is to acquire the knowledge of the project i.e. what is the objective of the project and how we will apply it in real time situations. Then the next step which we moved ahead was that we researched on various standard journals/papers published related to our project topic. Based on those references we came out with much more effective yet innovative idea to develop this project and create a robot. We used many concepts based on those papers and implemented our own ideas with latest technology which we have with us today. Based on this idea a general block diagram was prepared which interpreted the basic flow model of the robot and how it will be look alike (block diagram is shown in fig. 1). Then after preparation of block diagram, we moved towards our next and most important criteria in the preparation of robot that is selection of components. The important aspect while selecting the components was that the components should fulfill all the necessary criteria of the project and must be cost effective also.

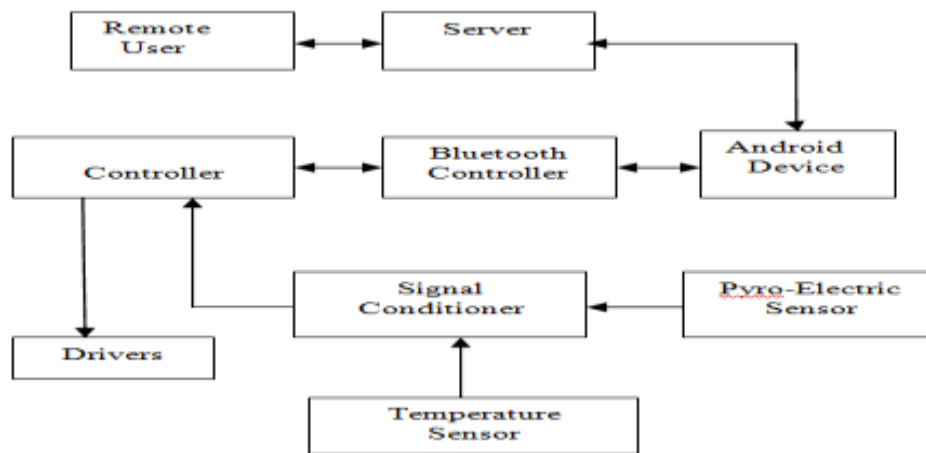


Fig. 1: Block diagram

The main component used in our project is microcontroller and there are many families of microcontrollers available in the market like 8051 family, PIC microcontroller, ARM family, AVR etc. We chose Atmega32 microcontroller which is much superior to conventional 89C51 microcontroller and fulfilled all our project needs. As our project was communication related so we are using various software platform for its functioning like Net beans, Eclipse for Java and android and Embedded C for Atmega32. The next stage is preparation of rough circuit diagram. The circuit diagram helps us to get the actual connections between every block of the robot. It also determines what should be the ideal electrical connections and how the connections should be made for the working of robot practically. Here we will be using 8 numbers of batteries with voltage range of 1.5V each, instead of designing a separate power supply. After circuit diagram we started making or prepared schematic diagram for printed circuit board (PCB). We used software named express PCB and express schematic for developing the PCB layout. After making PCB layout we got PCB etched and drilled to make practical connections and install the PCB on the robot. After getting the PCB our next aim will be mounting IC's and other analog components like resistors, capacitors etc. After mounting the IC's we will now emphasize on writing the codes and burning them into IC's. After burning the code we will go robot testing based on some semi real or dummy situation (as our project is just a prototype) and based on those testing results we will do some modifications if required.

Now here we will brief you with the basic software's and languages which we are using in our robot coding

- Embedded C:-

The Embedded C is used as coding language tool for AVR microcontroller family. The Embedded C language is an next level of the conventional C language i.e. Embedded C has all or we can say most of the features of normal C language, and have some more added features which are not there in conventional C language. It can be used for atmega8/16/32/128 and soon series of AVR family microcontroller. The coding depends on the Embedded C programming, which is done with .c extension. Embedded C uses most of the semantics as of standard C language and syntax are also similar to standard C language, for e.g., macros, data type

declaration, main function, conditional statements (if, switch, case), variable definition, functions, structures and union, loops (while, for), bit operations, arrays and strings, etc. Compiler for Embedded C which we have used is mikroC pro for AVR. The Embedded C programs requires a cross compiler to compile the code & generate HEX code from C code, which is also done by this compiler. So, we used this language to control and operate the features of microcontroller, the main commands used were DDR X, PORT X & PIN, where X is the name of the port used in the microcontroller.

- **Java:-**

The JAVA is basically used as computer programming language. It is use to transfer the data from client or host to server in the form of code. A JAVA programmed is build by a JAVA compiler (which is previously installed in a computer) which generates its own binary code. This binary code is not dependent on any hardware and operating system.

- **Eclipse:-**

Android system offers a customized plug-in for the Eclipse IDE, called Android Development Tools (ADT). This plug-in system provides a powerful, integrated environment in which we can develop Android apps. ADT helps to extends the capabilities of Eclipse so that we can quickly set up new Android applications or build up an app user interface, debug the applications, and export signed (or unsigned) applications packages (APKs) for distribution. As in our project we are using android module which will be mounted on buggy of robot so we require this software to setup the android module, so that android module can be operated.

- **NetBeans IDE:-**

NetBeans is used as the interfacing tool between the server and the android module used. It is basically used to interface our java code and the graphical user interface and creates an r.java file, which helps the server to respond to the request given to or from the android module. Here we are using tomcat apache as web server and as a servlet container. Java Servlet has the open source software implantation in the form of Apache Tomcat and glass fish. The Java Servlet and Java Server Pages specifications are developed under the [Java Community Process](#). In this project we are using Apache Tomcat for making it work as default web server. Apache Tomcat is also used as a default HTTP connector on port number 8080 in the computer network, i.e., Tomcat Apache can also be used as HTTP server. Basically Tomcat Apache is used to the run the Java code.

Now, let's see to the graphical image of the robot. Figure 2 show the graphical image of the robot, which is allowing us to visualize the overall idea behind the robot. The cuboidal shaped box can be imagined as the chassis of the robot which will include the PCB mounted with on-board integrated circuits. The microcontroller IC (Atmega 32), motor driver IC (L293D), interfacing IC between low level digital circuitry and high voltage/current circuitry (ULN2803), Bluetooth module (HC-05), sensors (IR, pyro-electric, temperature) are all mounted on the robot chassis and the two motors with 60 rpm will are used to move the robot, a caster wheel is used in the front to simplify the working of the robot related to its movement.

An android module will also be mounted on the chassis, which will be interfaced with the Bluetooth module via Bluetooth connectivity. The Bluetooth module will interact with microcontroller for the functioning of the android module. The android module will be interfaced with server through any common available internet connectivity and will send the images to it.

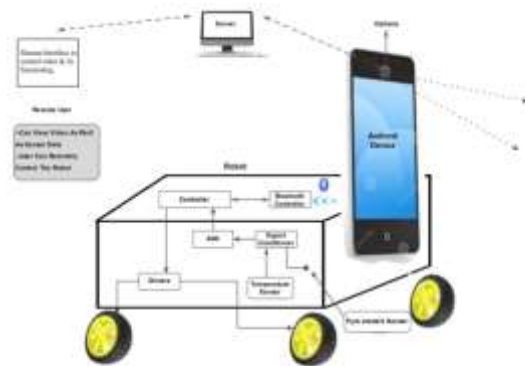


Fig. 2: Graphical image of the Robot

The server will be linked with the remote user, which will be used for controlling the whole functioning of the robot (like navigating the robot, controlling the flow of data through sensors etc).

RESULT

A human tracking robot is purposely built rescuing human when they are in disaster zone. Here we are attaching images of results which we found after making the robot. We can see that at server we are getting the information regarding the sensor output and the live feed as well as the intrusion we faced while controlling the robot. Also we are getting the latitude and longitude information of the area where the robot is located on the server. These all things will help the rescue teams and help them to plan up their acts of rescue.



Fig. 3: Image at server when human is detected



Fig. 4: Image at server when there is no human presence.



Fig. 5: Actual image of robot in human presence.

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CONCLUSION

Hence we conclude that this Robot is a suitable tool for human detection and can find various applications in many fields like flood affected areas, landslide hit zone and many other disaster prone areas. This robot is a very good for getting first information of any disaster affected area which play very crucial role in any situation of rescue operations. As, this project finds many applications in day to day life and real time operations it can be demand for many security related areas like banks, National record offices. As this robot is highly feasible with android technology we have used many inbuilt android features like GPS, camera which helped us throughout to maintain the connectivity and get the live feed.

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