Wireless Rescue Purpose Robot Using ARDUINO UNO

Madhuri G R[1], Arvind G[2], Avyakth B S[3]
[1] *Dept of Electronics, Kuvempu University, Shimoga-577451*
[2,3]*Dept of Electronics, Kuvempu University, Shimoga-577451*

Abstract **- Robots can play vital role in rescue at the time of natural calamities or disaster happens in the country. Our project is amid at designing one such rescue robot which also can be used for defusing bombs in war fields. Our project is doing job of rescue of mining workers who are struck in mining areas due to land slide or any form disaster happens in mining fields. We have used ARDUINO UNO as main component of the robot programmed using Arduino software. This Arduino includes Atmel ATmega328 microcontroller. The robot is controlled by smartphone through "Bluetooth RC controller" android app connected via Bluetooth to move robot and to work arm for pick or hold workers who are danger in mining areas. The other necessary components are DC motor for locomotion, Bluetooth module, motor driver and 12v battery.**

Index Terms **- Wireless, Robot, ARDUINO UNO, microcontroller, ATmga 328, Bluetooth, RC controller, DC motor, etc**

INTRODUCTION

This is the Era of technology. Nearly all aspects of our life are hard to imagine without technology. A robot can be defined as a mechanical or virtual intelligent agent that can perform specific task automatically or with guidance typically by remote control. Or A robot is an autonomous system which exist in the physical world can sense its environment and can act on it to perform some specified task. [1] The second definition gives us some hints as to what a robot consists of. Especially we can know that a robot's main components are:

1. A physical body, so it can exist and do work in the physical world.
2. Sensors, so it can sense/perceive its environment.
3. Effectors and actuators, so it can take actions.
4. A controller, so it can be autonomous.

A. The robot can be classified as five types

- Stationary Robot
- Ground Robot
- Underwater Robot
- Aerial Robot
- Microgravity Robot

Use of Robotics: Robots can be employed in the frontline rescue operations.Other instances of using robots are:

- Supply of materials needed for mine workers.
- Diffusion of bombs in war fields.

Employment of the robot also ensures a great reduction in the loss of human's invaluable lives. Every nation has started working on the development of the single and multi-purpose robots for carrying out various missions that are too risky. Even our own country has started working in this regard.

B. OUR ROBOT:

As we mentioned earlier, we have designed a robot that can be employed for:

1. Rescue operations
2. Supplying of materials

We can classify the components of our robot into Hardware and Software components. Hardware refers to the various modules used for reception and locomotion. This includes the Bluetooth module, motor driver, Arduino board, DC motors, wheels etc. Software refers to the logic that is used to monitor and drive the hardware circuits in a specific manner to make the robot perform the desired task. This includes the various programs devoted to each and every module and the platform for implementing the logic (in our project we have programmed the Arduino through embedded c language in arduino.cc platform).

C. EMBODIMENT:

Having a body is a basic requirement of a robot; it allows the robot to do things: move and shake, go places and perform its task. A computer agent, no matter how realistically animated, is not a robot

because it does not exist in the physical world. Embodiment refers to having a physical body. It is necessary for a robot. [2]

D. EFFECTORS AND ACTUATORS:

Effectors enable a robot to take action, to do physical things. In fact, they are the devices on a robot that have an influence on the environment. Effectors range from legs and wheels to arms and fingers. The robot's controller sends commands to the effectors to produce the desired effect on the environment, based on the robot's task. An actuator is the mechanism that enables the effectors to execute an action or movement. [3]

Actuators are mainly of four types:

1. Electric motors
2. Hydraulics
3. Pneumatics
4. Photo-reactive materials
5. Effectors and actuators are used for two main activities;
6. Locomotion: moving around
7. Manipulation: handling objects

Degrees of freedom: The number of dimensions in which a robot's manipulator moves.

II.THE CONTROLLER:

In humans, brains take a great deal of energy relative to the rest of the body. In robots, it is the other way around, with the actuators taking more power than the processor running the controller, the 'Brain' of the robot.[4] When it comes to computation, on the other hand, like humans, even the robots need a brain in order to function properly. A well-designed robot can move about randomly when its processor is reset. But this is not a good thing. We need to ensure that the robots brain functions properly.[5] Controllers can be regarded as the 'Brain' of the robot, since they provide the hardware and/or software that makes the robot autonomous by using sensory inputs and any other information to decide what to do and then control the effectors to execute the action.

THE MECHANICAL PARTS (DC MOTOR, WHEELS):

This part is obviously one of the most difficult parts while designing the robot, as it demands a good knowledge in mechanical physics (preferably kinematics).[6] Also, the robot can react successfully to the inputs can be achieved only if the Mechanical parts are interfaced correctly. Apart from these even the locomotion of the robot depends on these parts. Care must be taken even while writing program for these parts. [7]

Motors:

Motors are the most common actuators in robotics. They are well suited for actuating wheels, since they provide rotational movement, thereby enabling wheels to turn. Compared with all other types of actuator [8]. DC motors are Simple, Inexpensive, easy to Use. They can be purchased in a wide range of sizes and packages, to accommodate different robots and tasks. [9]

MATERIALS AND METHODS

In this robot we are using mainly, Arduino, Bluetooth module, Android Smart Phone.

DC MOTOR

DC motors convert electrical energy into mechanical energy. They use magnets, loops of wires and current to generate magnetic fields whose interaction turns the motor shaft. In this way electromagnetic energy is converted to kinetic energy producing movement. [10]

- To make a motor run we need to supply electric power in the right voltage range.
- If the voltage is low, but not too low the motor will run but will have less power.
- If the voltage is too high the motor will have high speed, but the wear and tear will break it sooner.

The more current the motor uses the more torque (rotational force) is generated at the motor shaft. For the movement of the system we use DC motors, with their movement totally controlled by the microcontroller. It has 10 kg of payload capacity. As the Arduino's microcontroller unit port are the not powerful enough to drive DC motors directly. So we need some kind of drivers. Hence here we are using L298 motor driver. It has a15-pinchip. The chip controls the DC motors, the chip has enabled pins which must connect to the +5V. If it is connecting to the GND then the motor stops its operation. [11]

III.DESIGN AND WORKING OF A ROBOT

Figure 1 is block diagram of the design robot. The robot consists of 4 wheels to move front and back and they are connected to separate motors. The maximum payload the robot can handle is 10kg, when powered by a 12V battery. The battery used here is 12V lead acid battery, which can deliver a maximum amount of current to drive the current to drive the motors. The robot consists of an Arduino, Bluetooth module, two motor drivers, battery, dc motors. The proposed robot has been interfaced with Arduino. Figure 2 is the circuit diagram of the proposed robot. It works on the principle that to communicate between module and mobile through Bluetooth HC05 module. The module is controlled by the android application named as "BLUETOOTH RC CONTROLLER" which is installed in our smartphone, then it connects Bluetooth module with indication light blinks. The app has 6 symbols which are used to control the robot, such as move forward, backward, rotate right, rotate left and other symbol used to control the arm for move upward and downward and to picking and releasing of the objects. When the commands sent to microcontroller which is inbuilt in Arduino Uno board then it controls the movement of wheels and arms of the robot. The motor driver drives the motor of the wheels and arms and the battery connected to the Arduino board to provide power supply to the model to work properly. The Arduino IDE software is used for programming; the embedded C language is used in the software to write a program [12-17].

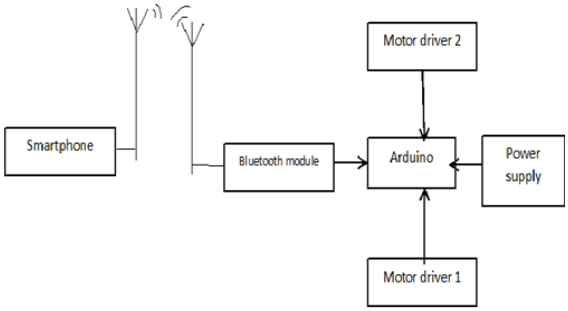

Fig. 1 Block diagram of Rescue Purpose Robot

RESULT AND DISCUSSION

It Consist of both transmitter part and receiver part. The transmitter part consists only smartphone which sends signal through a app via Bluetooth and the receiver part receives the signal by Bluetooth module from the transmitter section are fed to the Arduino Uno, this information is processed by the Arduino and based on what commands we are given to the mobile weather which is move towards right, left, forward, backward, up and down their arm and picking up the object these command taken as input in android mobile and then which is received the Arduino performs dedicated function.

IVAPPLICATION

1. Can be used in rescue an operation during the any disaster happens.
2. To be used for supply of materials or equipment to workers in the mining fields.
3. Used in industries for carry of materials.
4. It can be used to dispose a bomb.

VI.CONCLUSION

This system is designed to develop wireless mine rescue robot which will help to save life of workers working in mining areas and at the time of other disaster occurs. This system has been designed in such way that it can center to the need of rescue squad, the military, the police and for handling hazardous or radioactive materials.

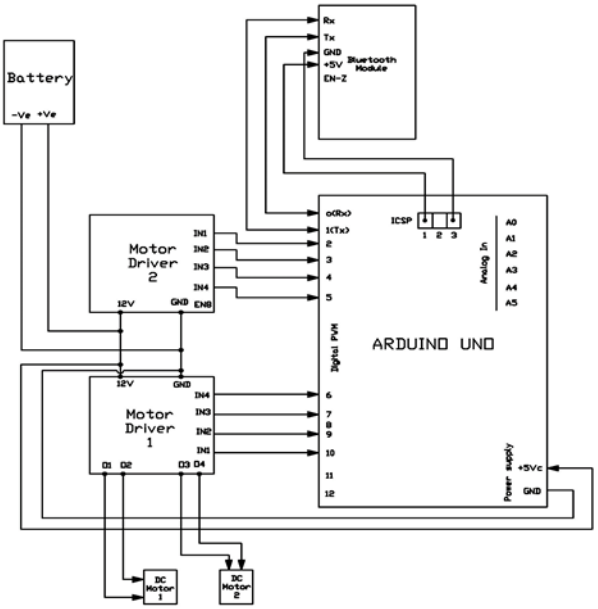

Fig. 2 Circuit diagram of Rescue Purpose Robot

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