Voice Controlled Car using Pyroelectric Infrared Sensor

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Abstract: In the era of emerging technology, Robotics with material handling is emerging now- a-days in our daily life. The techniques of material handling will diminish the physical efforts of humans. The count of handling tasks has been increased with the use of cost-efficient Bluetooth- controlled robot car. In this paper, for material handling we have designed and also implemented Bluetooth controlled robot car using pyroelectric infrared (PIR) sensor, Arduino, and Bluetooth module. This technique will lower the cost of the existing designs. Further, it will be beneficial to storage godowns, farmers, general public and educational organization as it will reduce the physical labor.

Keywords: Pyroelectric infrared (PIR) sensor, Arduino, Bluetooth, Robotics, PCB design

Introduction

The technology used for material handling using PIR sensor will improve various parameters such as delivery time will be reduced, customer service will improve and also reduce the physical hard work. Through robotics, this will minimize the issues of material handling. Technique of Bluetooth controller robot car is user friendly, cheap and effective.

This paper will represent the Bluetooth controlled robot car which is cost-efficient for material handling. The main purpose of this paper to lower down the efforts during the material handling. This system which has been proposed will be very effective for industrial as well as domestic purposes. So, hazardous problems will be diminished using this proposed scheme. [1]In the design which has been proposed, materials less than 6kg load are controlled and handled. The main components used for this proposed design are PIR sensor, Arduino, Motor driver and Bluetooth module. The interfacing of Arduino with Bluetooth modules will enable and establish the connectivity. Further, it is connected with motor driver so as to control the speed of the motor (Fig. 1). One of the most important module of this proposed design is PIR sensor which will sense the changes in infrared radiation within its range. Fresnel lens mainly focuses irradiation on the PIR sensor which further measures the changes in IR rate, and then creates electric potential difference with respect to the variation shown in the IR radiation.[2][3] The PIR sensor module will sense all the living objects and will generate the sound and then slowdowns the voice controlled robot car's motion in order to avoid the collision. Using the Android based app, user can control the voice controlled car using this technology. Voice controlled robot car using this technology will move as per the instructions given by the user through Android application. The model which has been proposed for this voice controlled car can move on all the types of surfaces which is an added advantage in today's era. So, if compared to the existing systems, it is one of the cost efficient and simple system which has been proposed. For modern society, this system is more suitable and effective.[9]
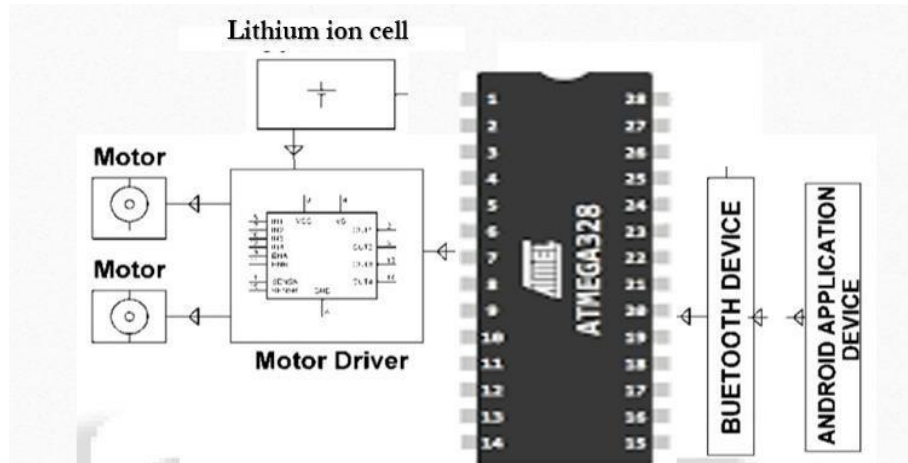
Fig.1: Block Diagram

Mechanism

Fig. 2 represents the mechanism of the design which has been proposed using PIR. Material Handling to be done properly has always been an important parameter. The Voice Controller Robot Car which has been proposed will deliver the material on time and will reduce the physical efforts of human labor. [10][11] In this paper, Bluetooth module, Arduino and PIR sensor are the core components of this design. Here, Bluetooth and Arduino has been interfaced as shown in the diagram. A connection will be established between Arduino and Android devices using Bluetooth chip. To control the speed of the motors, motor driver is connected with Arduino as shown in the diagram. Another important module in this interfacing diagram is PIR which is connected with Arduino module.[4] In order to detect the movement of living objects around or near the robot car, PIR sensors are preferred to avoid collision or accidents. Once the movement is detected then the voice controlled robot car will produce a beep sound and the indicators will blink. Firstly, power supply will be given from any power source using 14V rails to the UNO board and the motor driver. Using +5V rails from the UNO board, we have to give power to Bluetooth module and PIR sensor. The Tx and Rx pins of Bluetooth module and UNO are connected as shown in Fig.3. Also, Ground and Vcc pins are to be connected. Now, A1 pin in the UNO Board is connected with PIR Sensor Output pin. Ground and Vcc pins are connected according to Fig.3. The module of power supply of 14V, it consists of 14V 1Ampere batteries. Enable and Input pins of the motor driver are interfaced with pins of the UNO Board. ENA pin of motor driver is connected to Pin No.3 of UNO, ENB pin of motor driver is connected to Pin No.11 of UNO, IN1 pin of motor driver is connected to Pin No. 4 of UNO, IN2 pin of motor driver is connected to Pin No. 5 of UNO , IN3 pin of motor driver is connected to Pin No. 9 of UNO, IN4 of motor driver is connected to Pin No. 10 of UNO. They are also connected to ground and Vcc. The complete mechanism of the proposed model has been shown in Fig. 2 which represent the flow chart and the complete working of the Voice Controlled Robot Car including its main components such as Arduino, Bluetooth module, PIR sensor, Motor, Motor driver, Buzzer and LED.
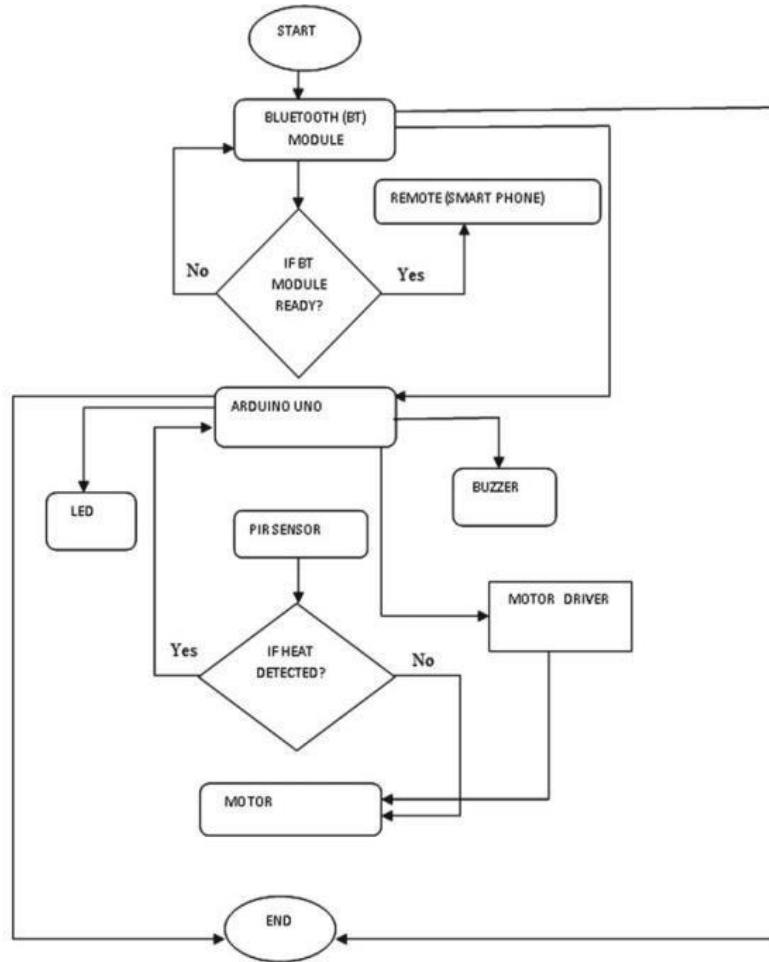
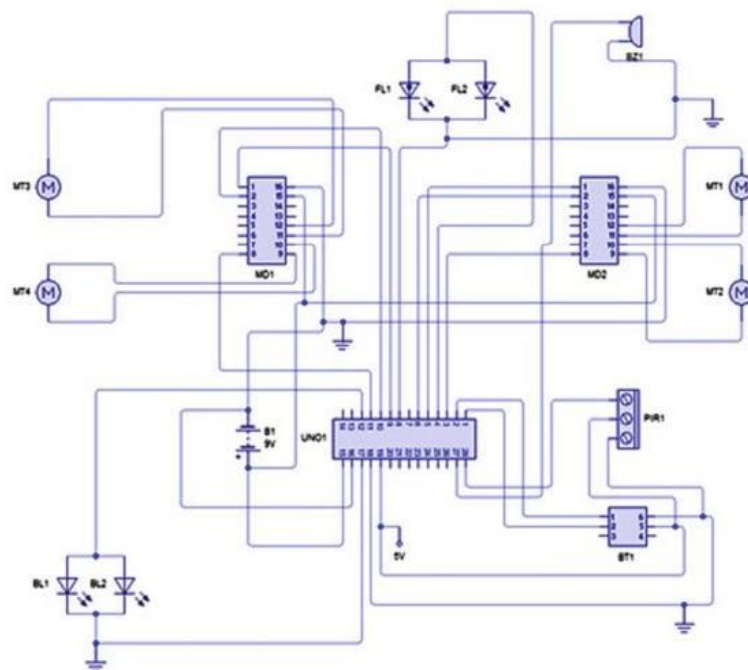Fig 2: Mechanism of proposed system

Fig 3: Circuit using PCB wizard

Components used

ATmega328

It is a 8-bit high performance popular microcontroller by Microchip. It is the core of Arduino Nano and Uno with 2KB RAM, 32KB Flash, and clock frequency with 20MHz. ATmega328 follows the RISC architecture and is commonly available in Arduino boards.

Crystal oscillator

It is an oscillator which is preferred in digital IC's for maintaining stability of clock signal. It is an electronic oscillator which has two surfaces parallel which are metalized to do the connections electrically. The thickness and physical size of quartz cut piece of oscillator affects the basic frequency of oscillations. This frequency is referred to as characteristic frequency.[5]

300 RPM DC MOTORS

It is a type of motor which converts electrical form of energy into mechanical form of energy. The dc motors which are very small are used in toys, tools and other appliances. The dc motors which are large in size are preferred in elevators, rolling mills and some electric vehicles.[6][7]

HC05

This bluetooth module can be used as serial converter of UART and transfer data through the technology of Wireless bluetooth. There are two configurations possible i.e. slave configuration or master configuration for bluetooth module. Frequency band of bluetooth module is 2.4GHz. [8]

Applications

Following are the applications of the proposed Voice Controlled Robot car:

1. Household Applications: In household applications where handling and shifting the materials is very difficult and hazardous, there it can be used like in storeroom, kitchen etc. [12]

2. Industrial Applications: In industries like where documents are to be transferred from one office to another or when files are to be placed or delivered in other department then this model or device is very helpful.

3. Educational Applications: In educational institutes like colleges or school when laboratory components are to be transferred safely like chemical components then it is very useful to use this proposed model. Also to transfer or relocate the files from one place to another, this model will reduce the physical efforts and make the work more efficient and easy.[13]

Conclusion

So, with this technology we are implementing the Bluetooth based communication between microcontroller and android phone. This model is also helpful if any person is infected with any kind of communicable disease or in COVID situation, then this autonomous robot will help to spread from any kind of infection. So, we can say that this is one of the most efficient and effective method of material handling. Moreover, this robot can also deliver the necessary items from source to destination in a limited range.

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