

Gesture Controlled Robot Using Arduino

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Abstract— In present era of development and growth, the technology has made possible for people to operate electronic devices more conveniently. With the help of technology called Hand Gesture Recognition, we are able to operate machines without giving it a touch. In the present work, accelerometer-based wireless hand gesture controlled car robot is designed that uses microcontroller, RF transmitter and receiver to achieve human computer interaction. Transmitter detects the movement of hand and sends the command to the receiver by RF; receiver receives the command and moves the robot accordingly. Apart from conventional approach of controlling mechanism of car robots via buttons, here the developed robot is controlled by definite and effective algorithm from the identification of the gestures.

Index Terms—Gesture, RF

1. INTRODUCTION

The applications of robotics mainly involved in automobiles, medical field, construction, and defense. But, controlling the robot with a remote or a switch is quite complicated. So, a new project is developed to control by using hand gestures. A gesture Controlled robot is controlled by hand gestures not by the buttons [1,2]. By wearing a small transmitting device in the hand that includes an acceleration meter transmits an appropriate command to the robot for performing required action. The transmitting device includes an ADC for analog to digital conversion, an encoder IC to encode the four-bit data and an RF transmitter module to transmit data. At the receiving end an RF receiver module receives the encoded data and decoder IC to decode data. This data is then processed by a microcontroller and finally motor driver to control the motors. To design the gesture-controlled robot the following components were used Arduino Nano, accelerometer, jumper wires, L298N motor driver, NRF24L01, DC motor and PCB (Printed Circuit Board).

2. DATA FLOW DIAGRAM

The designed module typically includes accelerometer, arduino nano and supporting circuitry as shown in Fig.1. The RF transmitter module transmits the gesture commands wirelessly from the transmitter (Aurdino board) to the receiver (robot control unit).

The transmitter circuit captures hand gestures, processes them using the Arduino board, and transmits the corresponding commands wirelessly via the RF transmitter module. The receiver circuit captures the RF signals using the RF receiver module, decodes them using the Arduino board, and controls the robot action based on the received

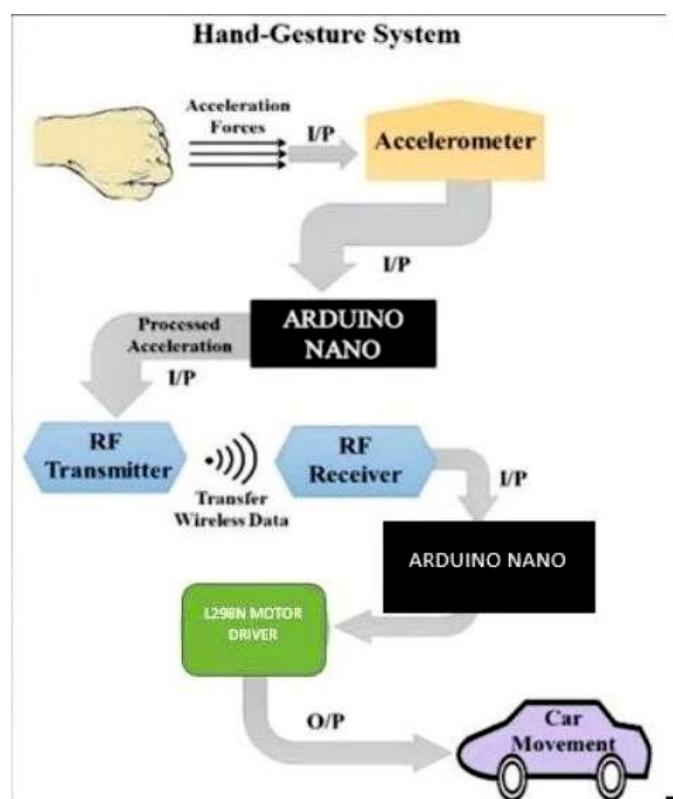


Fig 1 : Data Flow Diagram

commands [3,4]. The entire transmitter system, including the Arduino board and gesture input device are battery operated [5]. The function of each block is as follows:

1. Gesture Input Device :

The gesture input device captures the user's hand movements or gestures. It is implemented using accelerometer sensor. The sensor detects the hand gestures and converts them into electrical signals. The electrical signals from the gesture input device are processed and conditioned to remove noise and enhance the reliability of gesture detection. This stage involves amplification,

Fig.4 and Fig.5 shows the hand controller and prototype of the car respectively. Fig.6 and Fig.7 shows the forward and backward movements respectively. Fig.8 and Fig.9 shows the left and right side movements respectively.

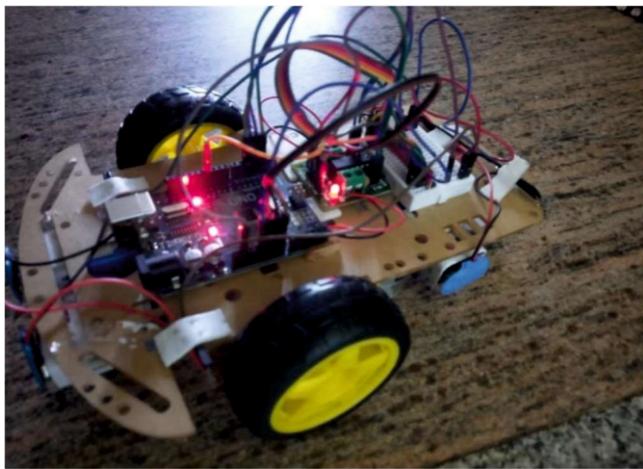


Fig.5. Prototype of car

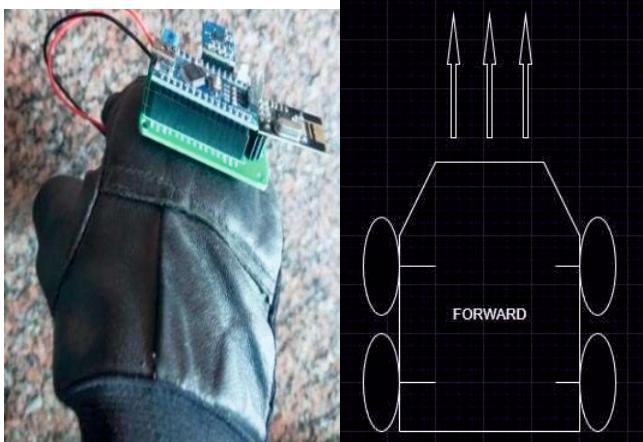


Fig.6. Forward movement

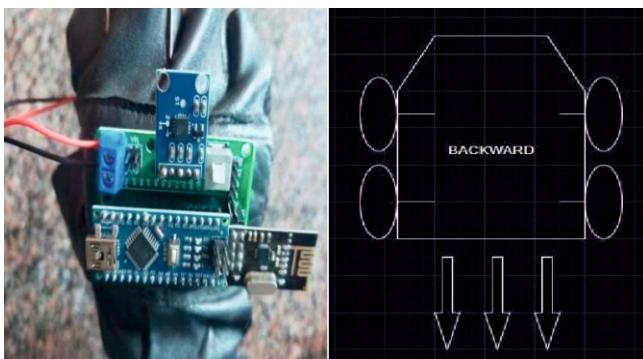


Fig.7. Backward movement

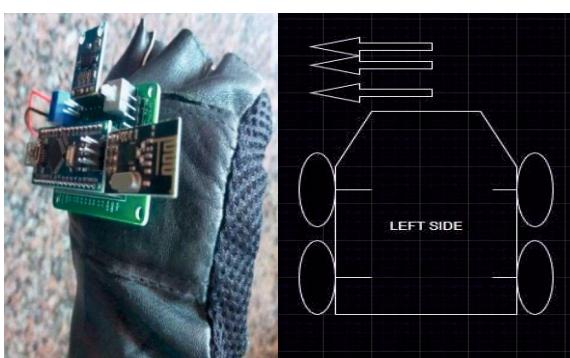


Fig 8 : Left Side Movement

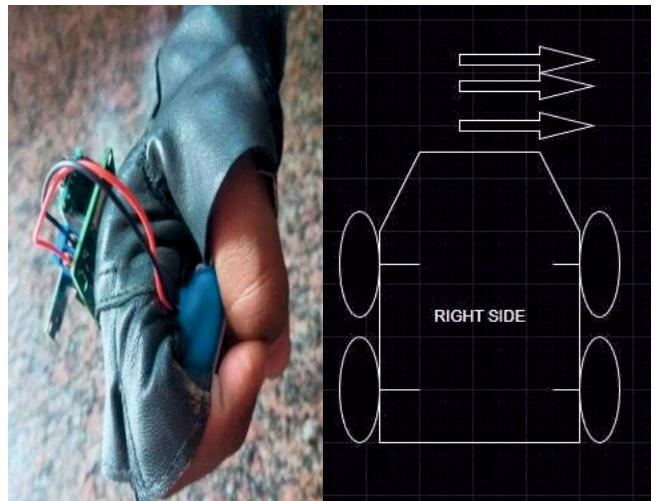


Fig 9 : Right Side Movement

5 CONCLUSION

The main goal of this project is to control the movement of the robot with hand gesture using accelerometer. Hand Gesture Controlled Robot System gives a more natural way of controlling devices. The command for the robot to navigate in specific direction in the environment is based on technique of hand gestures. The purpose of the project is to control a toy car using accelerometer sensor attached to a hand glove. The sensor is intended to replace the remote control that is generally used to run the car. It allows the control of the car control movement towards forward, backward, left and right based on the hand movements. From the experiment, about 80% of the implementation worked accordingly. The remaining was less due to background interference which is a negative marking to the implementation. Without using any external hardware support for gesture input unlike specified existing system, user can control a robot from his software station.

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