Voice Controlled Robotic System using Arduino Microcontroller

Mr. Vedant Chikhale, Mr. Raviraj Gharat, Ms. Shamika Gogate, Mr. Roshan Amireddy

Abstract— Voice controlled robotic system is very beneficial in areas where there is high risk for humans to enter. Voice controlled robotic system is controlled through voice commands received via android device. The integration of control unit with Bluetooth device is achieved using a Bluetooth module to capture and read the voice commands. The robotic vehicle operates as per the command received via android device, for this Arduino is integrated in the system. The controlling device may be any smart phone having an Android OS. The transmitter uses an android application required for transmitting the data. The receiver end reads these commands and interprets them into controlling the robotic vehicle. The android device sends commands to move the vehicle in forward, backward, right and left directions. After receiving the commands, Arduino operates the motors in order to move the vehicle in four directions. The communication between android device and receiver is sent as serial communication data. Arduino program is designed to move the motor through a motor driver circuit as per the commands sent by android device. The wireless camera is interfaced with Arduino to record forward movement of the robotic system which also includes wireless night vision camera which will not only allow viewing whatever will be recorded in day time but also during night. A robotic arm is mounted at the front of the system to make changes in the environment along with a lcd screen to view the received commands. An obstacle detector is added to protect the system from obstacles on the way by using an ultrasonic sensor.

Index Terms—Bluetooth module, Arduino, wireless night vision camera, robotic arm.

I. INTRODUCTION

Voice controlled robotic system aims at achieving successful surveillance at places where human intervention is at high risk such as hot or sub zero temperature environment, war fields, disaster affected zone, etc. It also aims to fulfill the task assigned to the user through various commands.
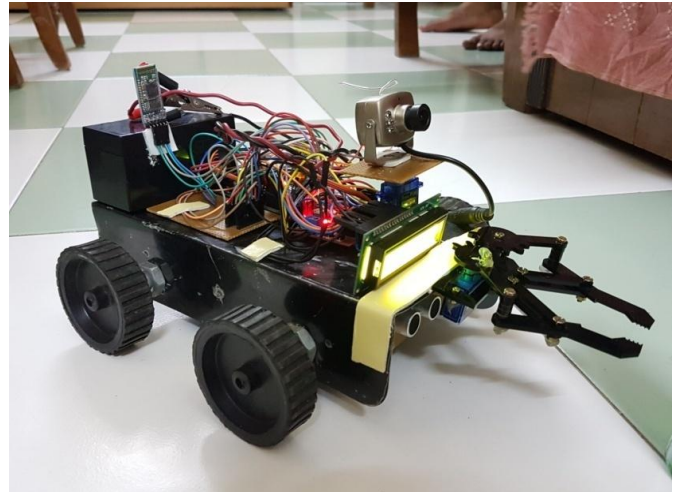
Mr. Vedant Chikhale, Student of 3rd Year Engineering, Department of Electronics and Telecommunications Engineering, FCRIT, Vashi, Navi Mumbai, India
Mr. Raviraj Gharat, Student of 3rd Year Engineering, Department of Electronics and Telecommunications Engineering, FCRIT, Vashi, Navi Mumbai, India
Ms. Shamika Gogate, Student of 3rd Year Engineering, Department of Electronics and Telecommunications Engineering, FCRIT, Vashi, Navi Mumbai, India
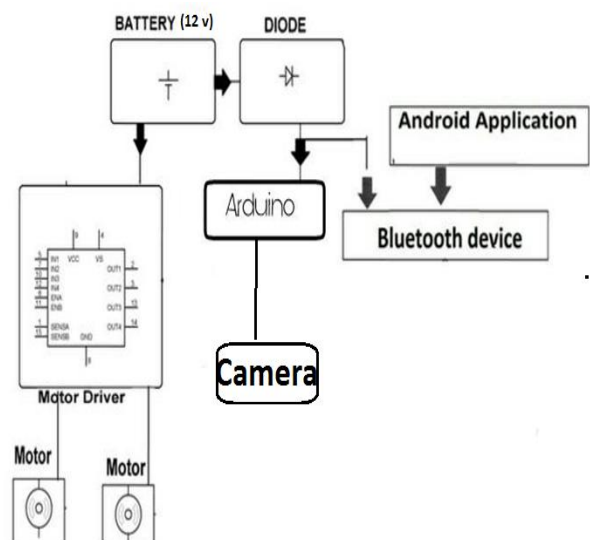**Mr. Roshan Amireddy**, Student of 2rd Year Engineering, Department of Electronics and Telecommunications Engineering, FCRIT, Vashi, Navi Mumbai, India

A. Construction and Working

The voice commands to the robotic system are sent through Bluetooth via an Android device. These commands are received on the robotic system via Bluetooth module mounted on it. The surveillance is carried on using a wireless camera with night vision mounted on a servo motor to view 180°. A robotic arm is mounted at the front of the system to make changes in the environment along with an lcd screen to view the received commands. The motor driver circuit is used to control the speed of robotic system. An obstacle detector is added to protect the system from obstacles on the way by using an ultrasonic sensor. The whole circuitry is powered using a 12V rechargeable battery mounted on the system.
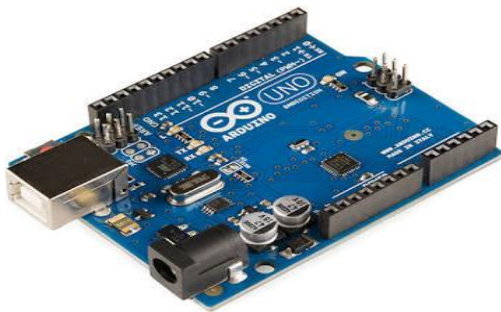
B. Block Diagram

II. COMPONENTS

1. Arduino Uno
2. Wireless Camera
3. LCD Screen
4. Motor Driver
5. Ultrasonic Sensor
6. Servo Motor
7. Bluetooth Module
8. Robotic Arm

1. ARDUINO UNO

Arduino uno a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs). It also has 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It is the most widely used and user friendly microcontroller. Simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. [1]

2. WIRELESS CAMERA

The wireless camera has a night vision which enables no light or low light usage. It performs high-quality picture transmitting and receiving. It can transmit distance up to 200ft. It supports both NTSC and PAL systems. It has output power of 50mW. Its power consumption is less than 400mW with bandwidth of 1.2 GHz and current rating of 500mA and voltage rating of +9V. [8]
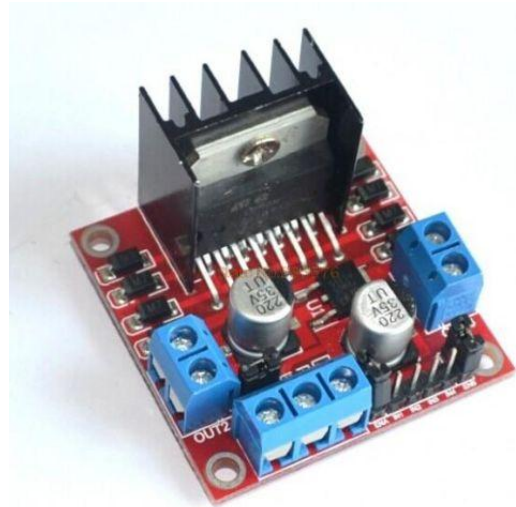
3. LCD SCREEN

LCD screen is a flat-panel display, electronic visual display that uses the light-modulating properties of liquid

crystals and the liquid crystals do not emit light directly. LCDs are available to display arbitrary images. It displays preset words, digits, and 7-segment displays. It has a wide range of applications including computer monitors, televisions, instrument panels, aircraft cockpit displays.[2]

4. MOTOR DRIVER

Motor driver is a double H bridge drive chip - L298N with voltage range of 5V-35V and current range of 0-36mA. Maximum power consumption is 25W, dimensions: 43 x 43 x 26mm, weight: 26g and a built-in 5v power supply, when the driving voltage is 7v-35v. [5]

5. ULTRASONIC SENSOR

HC-SR04 is the ultrasonic ranging sensor. This economical sensor provides 2cm to 400cm of non-contact measurement functionality with a ranging accuracy that can reach up to 3mm. Each HC-SR04 module includes an ultrasonic transmitter, a receiver and a control circuit. There are only four pins on the HC-SR04: VCC (Power), Trig (Trigger), Echo (Receive), and GND (Ground). [6]

6. SERVO MOTOR

A servo motor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration. Servo can rotate approximately 180°. It has an operating voltage of 5V and operating speed of 0.12sec/60° with torque of 1.8 Kg-cm. [7]

7. BLUETOOTH MODULE

Bluetooth module has a typical -80dBm sensitivity and up to +4dBm RF transmit power. It has a PIO control, UART interface with programmable baud rate, integrated antenna and an edge connector. Its auto-pairing pin is"0000" as default pin and it auto-reconnect in 30 min when disconnected as a result of beyond the range of connection. [3]

8. ROBOTIC ARM

The robotic arm is an excellent robotic gripper for development of any robotic arm project without spending a lot of money. It is best suitable for pick and place type robots and it can also be used for other robotic and IoT projects. It has a wide operating voltage range 5-12V. It is best suitable for object size up-to 11 cm. It has low power consumption and high torque. [4]

III. COMMANDS

1. Forward – moves the vehicle in forward direction.
2. Backward - moves the vehicle in backward direction.
3. Left – moves the vehicle towards left.
4. Right – moves the vehicle towards right.
5. Stop – stops the vehicle.
6. Camera – rotates the camera in 180° direction.
7. Hold – makes the robotic arm hold the object.
8. Drop – makes the robotic arm drop the object.

IV. ADVANTAGES

Voice commands are transmitted and received through wireless serial communication with the help of Bluetooth technology. Live streaming of the operation is possible due to wireless camera. Changes in the environment are done using robotic arm. System is protected against any hindrances by an obstacle detector using ultrasonic sensor. The system has very less power consumption (upto 30W).

V. DISADVANTAGES

Range of Bluetooth technology is upto 10 meters only. Delay in transmission and reception of commands is high. The Bluetooth connection gets dropped frequently. The cost of project is high. Noise signals are added during reception of video signals which give rise to flicker. Maintenance of the system is difficult. There is need for more number of obstacle detector sensors. Location of the system can be tracked using GPS/GSM modules.

VI. RESULTS AND CONCLUSION

The voice controlling commands are successfully transmitted via Bluetooth technology and on reception; the desired operations successfully take place. This project reduces human efforts at places or situations where human interventions are difficult. Such systems can be brought into use at places such as industries, military and defense, research purposes, etc.

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[8] https://www.google.co.in/wirelessspycamera/