International Journal of Innovative Technology and Exploring Engineering (IJITEE)
ISSN: 2278-3075 (Online), Volume-9 Issue-6, April 2020

Mobile Controlled Robot for Waste Handling

Vanitha.V, Santhosh.R, Nikhil Adithya.M, Praveen.G, Priyanka.R

Abstract*: Globally, the waste management is becoming a challenging problem because of garbage accumulation due to poor urban planning, overcrowding, etc. In last few years, robotic research is drawing more attention due to its effectiveness in helping humans to bring the waste-free environment as many waste material may cause healthy problems to human beings. This work aims to design and fabricate a robotic arm with four servomotors, which are controlled by a mobile app and Arduino microcontroller. Android based Mobile app is created to control the robotic movements. Two servomotors guide the robot for backward and forward movement and remaining two servomotors for picking and placing the garbages.

***Keywords* : Android app, Arduino, Servomotors, Robotic arm**

I. INTRODUCTION

Most robots in the world are designed to handle tasks that are dangerous, difficult or boring to human beings. Applications of robots in a lot of fields are found in literatures[2][3][4][5] because of its higher efficiency compared to human beings irrespective of time duration and they are so precise. The links of the robot are interconnected by many joints thereby allowing rotational motion or linear displacement. Design parameters of robots which decide their performance are degree of freedom, number of axes, speed, accuracy and power supply and drives[6]. [1] proposes a smart intelligent garbage alert system which utilizes RFID and ultrasonic sensor for a proper garbage management and informs the municipal web server for cleaning of dustbin. [7] explains Arduino based garbage collector robot, which will move in the programmed path and picks up the garbage at public places.[8] discusses about a robotic vacuum cleaner, that is programmed to clean a specific area. In another paper, The robotic arm is constituted of five revolute joints which is controlled by Arduino and the actuator used is a servo motor. This arm can replace garbage pickers and help them to maintain health and increase lifespans.

Revised Manuscript Received on April 30, 2020.
***** Correspondence Author
Vanitha.V*, Dept. of Electrical and Electronics Engineering, Sri Krishna College of Technology, Coimbatore, India. Email: vvanitha55@gmail.com
Santhosh.R, Dept. of Electrical and Electronics Engineering, Sri Krishna College of Technology, Coimbatore, India.
Nikhil Adithya.M, Dept. of Electrical and Electronics Engineering, Sri Krishna College of Technology, Coimbatore, India.
Praveen.G , Dept. of Electrical and Electronics Engineering, Sri Krishna College of Technology, Coimbatore, India.
Priyanka.R, Dept. of Electrical and Electronics Engineering, Sri Krishna College of Technology, Coimbatore, India.

II. SYSTEM UNDER STUDY

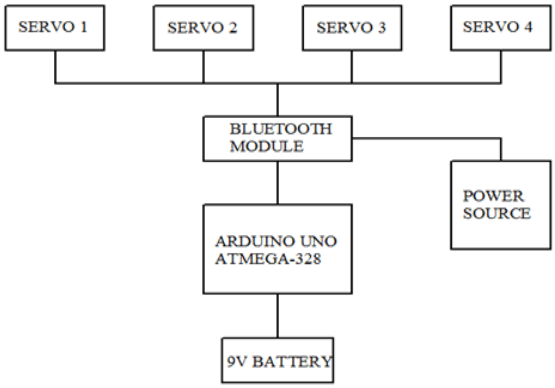

Fig. 1 Block diagram of the proposed system

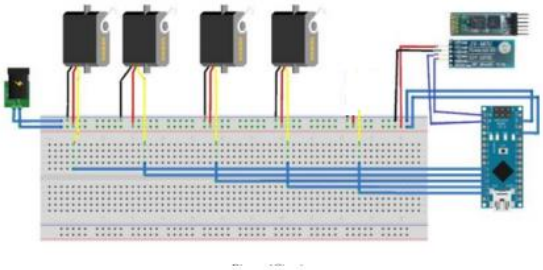

Fig. 2 Servomotor inputs, Arduino pin inputs, and HC-05 Bluetooth module inputs

Fig. 1 shows the block diagram of the proposed system. It consists of Arduino microcontroller, Bluetooth module and four servomeotors with the driver circuits. In this work, a robotic arm is constructed to collect garbage on the way. Arduino (UNO) is used to interface the components. Four servomotors are used for the working of the robotic arm. Two motor driver ICs are used to operate two wheels of robot and two motor driver ICs for picking and placing the garbage. HC-05 Bluetooth is used for wireless transmission. The operating voltage of this module varies from 4V-6V, the operating current is 30mA and range is 100m. Arduino Uno is used for controlling the robotic arm movement.

Servomotors are actuated as shown in Fig. 2 by bluetooth and power supply connections. Servomotors are preferred as it operates accurately and can handle high torque. The robotic arm consists of four servomotors which is mounted on a metallic base and these motors are fed from a lead acid battery and controlled by Arduino.

III. METHODOLOGY

For the design of mechanical parts, the robot arm is drawn with the SolidWorks software and the dimensions of the robot arm are fixed.

Movement of robot arm depends on the relationship between the robot endpoint and the total displacement of robot arm links. The steps followed in this work are as follows:

(i)Fabrication of mechanical parts required for the robotic platform and robot arm assembly

(ii) Selection of servomotors

(iii)Arduino microcontroller programming

(iv)Development of Mobile App for operating the robotic arm

(v)Testing the hardware system

IV. DEVELOPMENT OF MOBILE APP

The android app interface is employed as an intermediate to access the hardware components such as Arduino, servomotor etc. The intermediates used here is Bluetooth module, HC-05 which uses a serial communication protocol. The Android app is developed with the help of App Inventor, developed by Google and Massachusetts Institute of Technology (MIT). Fig.3 shows the Android blocks used for the development of Android App. Fig. 4 shows the view of Android App. The robot used in the work can move in 4 axes directions (left and right, up and down).

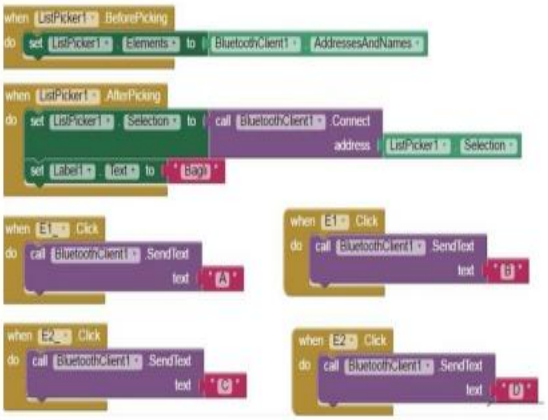

Fig. 3 Android blocks

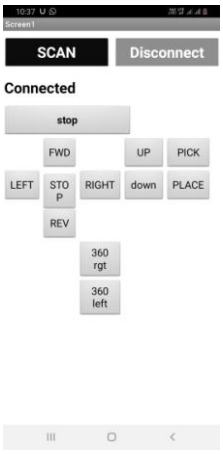

Fig.4 Android APP

V. HARDWARE RESULTS OF ROBOTIC ARM

Fig. 5 shows the whole hardware setup of the robotic arm with necessary bolts and nuts. Fig. 6 shows the battery energising the four servomotors from the driver circuits. Fig. 7 show the froward and backward movement of robot fed by two servomotor drive circuits. Fig. 8 shows the upward and downward movement of robotic arm fed by one servomotor to pick the wastes. Fig. 9 show the picking action of robot, where the robot is picking the plastic bottle.All the servomotor operations are controlled using a android app and Arduino microcontroller.

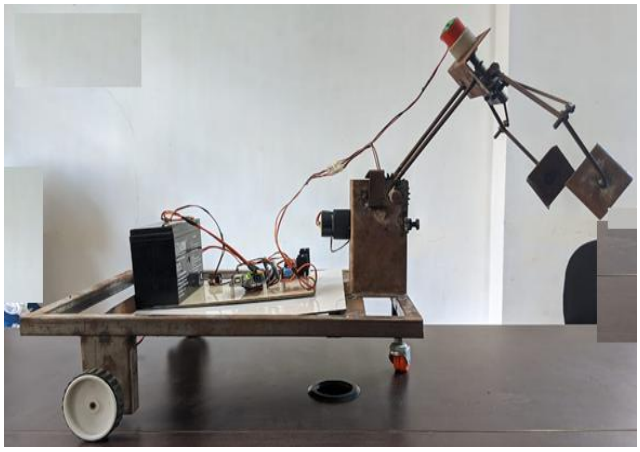

Fig. 5 Robotic arm with necessary bolts and nuts

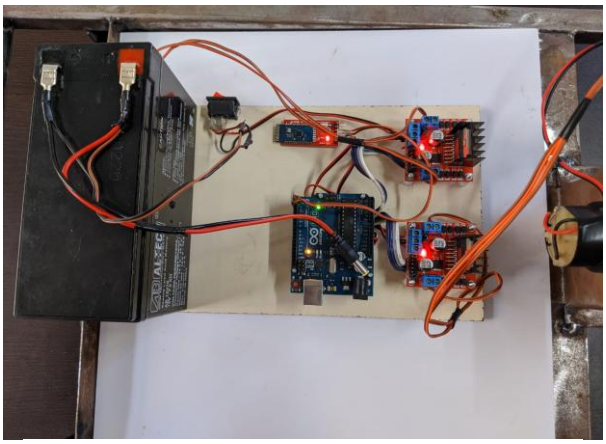

Fig. 6 Battery with servomotor driver circuit and Arduino

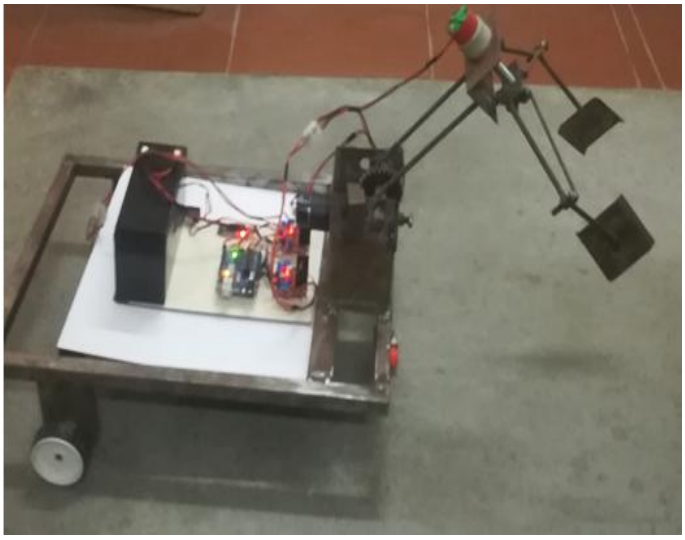

Fig. 7 Forward and backward movement of robot platform

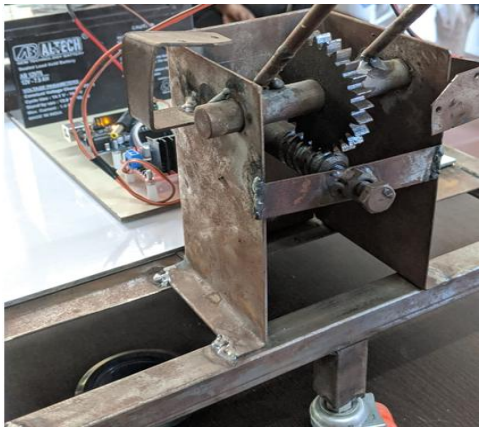

Fig. 8 Up and down movement of robotic arm

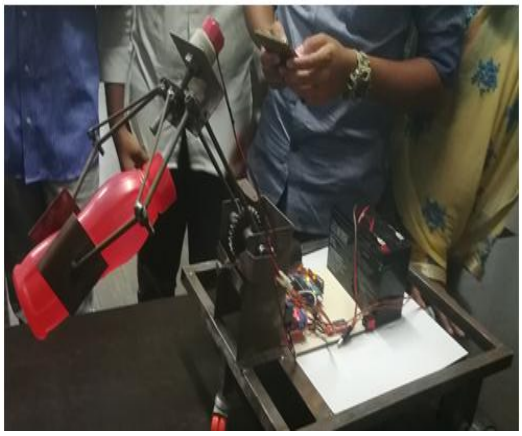

Fig. 9 Grip movement of robotic arm

VI. CONCLUSION

Thanks to the development in robotic industry, many works are made simper and precise. This work discusses about the control of moving robot arm operated with four servomotors and controlled by a suitable microcontroller interfaced with Bluetooth module. A prototype of a robotic arm is designed using Solidworks and an Android App is developed to control the movements of robotic arm with the help of servomotors and the drive circuits. This robot is proposed to replace garbage pickers by removing the garbage and keep the environment clean.

REFERENCES

1. N. Sathish Kumar, B. Vuayalakshmi, R. Jenifer Prarthana, A. Shanka,"IOT based smart garbage alert system using Arduino UNO", IEEE Region 10 Conference, 2016
2. Omijeh, B. O., R. Uhunmwangho, M. Ehikhamenle. "Design analysis of a remote controlled pick and place robotic vehicle", International Journal of Engineering Research and Development, Vol. 10, no. 5,pp.57-68, 2014.
3. Singh, Puran, Anil Kumar, Mahesh Vashisth. "Design of a robotic arm with gripper & end effector for spot welding",Universal Journal of Mechanical Engineering, Vol. 1, no. 3,pp.92-97, 2013.
4. Pachaiyappan, S., M. Micheal Balraj,T. Sridhar. "Design and analysis of an articulated robot arm for various industrial applications." J. Mech. Civil Eng, pp. 42-53,2014.
5. Mohd Annuar, Khalil Azha, Md Zin, Muhammad Haikal, Mohamad Haniff Harun, Mohd Ab Halim, Mohd Firdaus, and Arman Hadi Azahar. "Design and development of search and rescue robot." International Journal of Mechanical & Mechatronics Engineering, pp. 36-41,2016.
6. Patidar, Virendra, and Ritu Tiwari. "Survey of robotic arm and parameters." International Conference on Computer Communication and Informatics, pp. 1-6. IEEE, 2016.
7. Apoorva S., Chaithanya, Rukuma S. Prabhu, Saiswaroop B. Shetty, Denita D'Souza, "Autonomous Garbage Collector Robot", International Journal of Internet of Things, Vol. 6 No. 2, pp. 40-42, 2017.
8. Abramson, Shai, Shalom Levin, and Ran Zaslavsky. "Robotic vacuum cleaner." U.S. Patent 7, 2006.

AUTHORS PROFILE

Vanitha.V received her Bachelor's degree in Electrical and Electronics Engineering from Madurai Kamaraj University and Masters degree in Power Systems from Bharathidasan University. She got her Ph.D degree from Anna University, Chennai. She is currently working as Professor at Sri Krishna college of Technology, Coimbatore. Her research interests are in the areas of Wind energy, Power System and Electrical Machines.

Santhosh.R is currently in final year of B.E in Electrical and Electronics Engineering at Sri Krishna College of Technology, Coimbatore.

Nikhil Adithya.M is presently a final year student of B.E in Electrical and Electronics Engineering at Sri Krishna College of Technology, Coimbatore

Praveen.G is presently in final year of B.E in Electrical and Electronics Engineering at Sri Krishna College of Technology, Coimbatore

Priyanka.R is currently a final year student of B.E in Electrical and Electronics Engineering at Sri Krishna College of Technology, Coimbatore