

“Multifunctional Wireless Hand Sanitisation Based Service Robot Cart”

Saurabh M. Jambhale, Shubham R. Bawane, Saurabh Chakole

Department of PGDIR,
RTMNU-OCE, Nagpur, India.

Saujambhale33@gmail.com, shubhambawane94@gmail.com, Saurabh.c@inurture.co.in

Abstract- There is a new broad health crisis which is known to all of us that is novel coronavirus covid 19. It has spread to world wide and many people get infected by it. The virus is getting spread by getting physical contact, by touching and by gathering at social places. To stop the spreading of corona virus some methods are mentioned by the “WORLD HEALTH ORGANISATION” i.e WHO is to- wear a mask, social distancing, and hand sanitization, work from home, avoid gathering at social places and to avoid crowd places. This is because of virus getting spread by touching an object at local places and due to physical contact with others. We have seen that at public places like shopping malls, hospitals, railway stations, bus stops, petrol pump, utility stores etc there is still gathering of people and crowd is there. Because all such places providing essential services which has to be permitted by govt. And at such places there are chances of getting contact with the covid +ve patient. At such places there is no social distancing and hand sanitization is there. One person at a time at such places can not handle the crowd and can not be able to give instruction to people. In order to treat and reduce the spread of corona virus circumstances, to maintain a social distancing and constant hand sanitisation and disinfection of our hand at public places become a necessity. So the aim of this study is to design, develop and fabricate a smart contactless hand sanitizer dispensing system which is mounted on wireless bluetooth control service robot cart. This cart is developed for making contactless human to human interaction in public places where it can be controlled by smartphone and having inbuilt contactless sensor based hand sanitisation system. The presented system has ability to work contactlessly to interact with patient in hospitals, to provide services at various industries and trolley provider in shopping mall, railway station for automatic hand sanitisation and at various public places as hospitality service provider.

Keywords- Corona virus, Bluetooth, arduino UNO, L298N motor driver, ultrasonic sensor, hand sanitizer dispenser, cart, wireless, service robot etc.

I. INTRODUCTION

The covid-19 pandemic has shown the virus to the emerged through out the world was spreading rapidly and still spreading. However it was commonly spread by droplets and physical contact of the person. Due to poor or inadequate hand washing and hand hygiene is known to be problematic in hospital setting and is a major source of infection contracted while patient are admitted to hospitals not only in hospitals but also in various public area like shopping malls, railway stations, industries etc.

Washing hands, maintaining hygiene is one of the most important parameter for reducing spread of infection, this problems occur due to improper hygiene of staff, medical supervisor's also patient can cause and spread infection. Not only hand sanitisation, the social distancing also plays a vital role to reduce the spread of virus where still people fail to manage.

To avoid such conditions we are introducing hardware system that will help to sanitise the hands automatically to reduce physical contact of the person. It can be applicable in health services to reduce human contact. It is also featured as a shopping cart (trolley) in shopping malls and hospitality services.

Now a days shopping in the malls is a very trendy; everyone would like to go to the malls and buy things, some examples like BIG BAZAR, D-Mart. In such places there is constant human contact, because one trolley or cart gets touch by N-numbers of people. We have to push that trolley by our hand where someone already touches that and also we have to put efforts to do those things. It is very difficult to handle or operate cart, also it increases the human efforts and to maintain the proper hygiene is also a big task. To reduce manual handling of cart and provide an effortless shopping experience and by taking care of current scenario, this project can be used in various

industries to reduce manual handling and provide an automation at very low cost.

Keeping an aim to handfree & effortless handling we are designed a automated cart which can be operated and controlled by BT-05 bluetooth module which is connected to the smartphone to ease in work .To improve customer service ,reducing delivery time and physical hardwork the bluetooth controlled system are introduced in this project, this technique is very chip,user-friendly and efficient.

It reduces the human contact with better delivering services, we are using BT-05 Bluetooth module to established connectivity which has range upto 10 metre that can be controlled by wireless system very effectively.

II. LITURATURE SURVEY

The main aim is to design the cost-efficient Bluetooth-controlled robot cart having ultrasonic sensor for wireless hand sanitizer dispenser to maintain higene and to reduce efforts of human. Many researchers had developed robotic systems to reduce human efforts and described their technologies. These robotic designs were controlled by software programs.

Winter et al. developed Android-controlled robot. This system was used for transferring the information wirelessly [1]. On the other hand, the robotic system was developed using 8051 microcontroller, Bluetooth module which has attached a camera for surveillance [2].

Guardi et al. invented a communication-based robotic platform using Android and Bluetooth [3]. The robotsCost-Efficient Bluetooth-Controlled Robot Car for Material Handling 345 is developed for not only reducing the human labors but is also operated in security and rescue operations [4–6].

Braun et al. described navigation system for autonomous off-road robots which depend on navigation to avoid obstacles in the map [7].

Tezel and Hangun designed and implemented a Bluetooth-controlled robot using Arduino. In this collision-free design, sensor data was got by linear interpolation [8]. The pick and drop robot was also invented. It can be very useful in defence purpose such as diffusing a bomb, land mines, etc [9]. The Android-based robotic car via Bluetooth module was also invented [10].

Ritika Pahuja and Narender Kumar designed an Android-controlled Arduino-based robot car. When the Android app is turned on, the system is con nected via Bluetooth. The Android provides a user-friendly experience [11]. Other Android-based robotic car was designed that was eco-friendly automation system [12].

Avoiding human errors, the manual and autonomous driving switching tech niques were described [13].

Shivaprasad B. developed a robot which can be utilized for fertilization cleaning purpose. The developed system collected the valuable infor mation through sensor on the robot [14]. At another design, the robotic field was involved. This design was very suitable effect on military purpose [15].

Nelson et al. described the Bluetooth-controlled robot model that was controlled by sensor and Bluetooth module. This design does not affect any physical barriers like walls, doors, etc [16]. Bluetooth-controlled robotic systems for material handling have yet not obtained wide popularity and publicity. Public are still dependent on physical labors of human. So, these devices need much publicity and can be used as the best alternative to human physical labors.

III. METHODOLOGY

Component Used:

1. Arduino-Uno:

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online.



Fig 1. Arduino Uno.

The major advantage of Arduino is that, it is easy to code and its simpler form of interfacing to laptop or a PC. The programming is done in a separate and easily installable environment called Arduino IDE, which is open source software. Arduino IDE provides readily made syntax making it easier for beginners.

2. HC-05 Bluetooth:

The Bluetooth module is wireless communication module for this proposed system which can be operated by the property of master/slave. The functionality of this module is that it is configured only by user's commands. Bluetooth module is also programmable input/output

control module and the input/output voltage range is 3.3 to 5V.



Fig 2. HC-05 Bluetooth.

3. Motor Driver:

Motor driver raises the motor driving IC that consists of two motors. These motors work at the same time. This module's operating range is 5.9 to 20 V. This motor driver steers the motor.



Fig 3. Motor Driver.

4. Power Supply:

A power supply is an electrical device that supplies electric energy to an electrical load. The primary function of a power supply is to convert one form of electrical energy to another. We use 18650 battery which is connected in series to make 12 V power supply.



Fig 4. Power supply.

5. Ultrasonic Sensor: An ultrasonic sensor is an electronic device that measures the distance of a target object by emitting ultrasonic sound waves, and converts the reflected sound into an electrical signal. Ultrasonic waves travel faster than the speed of audible sound (i.e. the sound that humans can hear).



Fig 5. Ultrasonic Sensor.

6. DC Submersible Pump:

This is a low cost, small size Submersible Pump Motor which can be operated from a 3 ~ 6V power supply. It can take up to 120 liters per hour motor outlet, submerge it in water and power it. Make sure that the water level is always higher than the motor.



Fig 6. DC Submersible Pump Motor.

7. Arduino NANO:

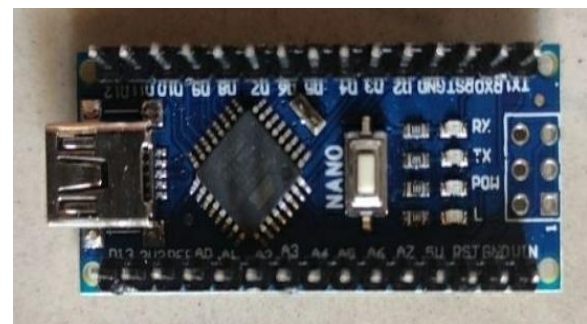


Fig 7. Arduino NANO.

It is the open source smallest Embedded Development board launched by Arduino based on Atmega328 SMD Package Microcontroller. It is a Surface mount Breadboard Friendly board integrated with Mini USB Port. DC Power Jack is not available on this Board, so power can be given through Mini USB Cable.

8. DC Motor:

200RPM – 12Volts geared motors are generally a simple DC motor with a gearbox attached to it. This can be used in all-terrain robots and variety of robotic applications.

These motors have a 3 mm threaded drill hole in the middle of the shaft thus making it simple to connect it to the wheels or any other mechanical assembly. We use 4 dc motor for robot driving system.



Fig 8. DC Motor.

9. Hand Sanitizer:

Hand sanitizer, also called hand antiseptic, handrub, or hand rub, agent applied to the hands for the purpose of removing common pathogens (disease-causing organisms). Hand sanitizers typically come in foam, gel, or liquid form.

IV. CIRCUIT DIAGRAM AND ITS WORKING

1. Circuit Diagram of Bluetooth Controlled Robot Cart:

Basic connection and circuit diagram is shown in above figure. Arduino UNO, Bluetooth HC-05 module and motor driver are the heart of this design. In this paper, arduino and Bluetooth are interfaced. The bluetooth chip establishes the connection between android devices and arduino.

The bluetooth operated app is already available on google play store. We have to just down load and connected to arduino via Bluetooth module.

The motor driver is also attached with arduino to control the speed of two motors. Together all these makes above system which can be very userfriendly.

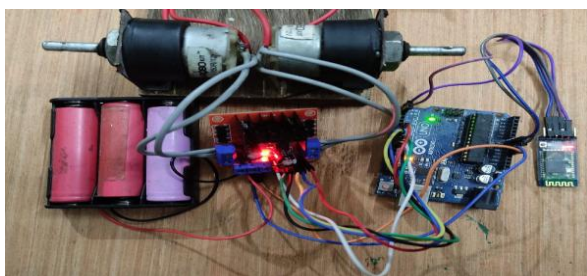
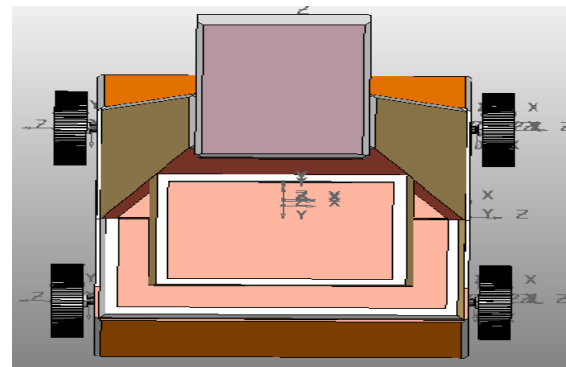


Fig 9. Circuit Diagram of Ultrasonic Sensor Based Hand Sanitizer Dispenser.

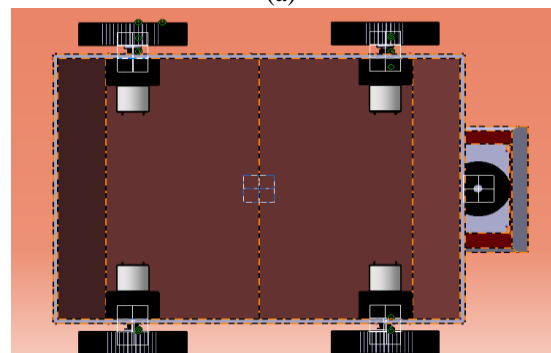
Basic connection and circuit diagram is shown in above figure. The functioning of wireless hand sanitizer dispenser seems to be very simple and effective as one simply needs to wave their hands near the the ultrasonic sensor and instantly sanitizer get ejected from bottle with the help of submersible pump.

It is capable of dispensing hand dispenser in contactless manner, all users need to do is place their hand beneath the dispenser and asensor will detect their presence and despence the gel. To all such things the necessary instruments are: arduino nano, battery, ultrasonic sensor, submersible pump and its basic circuit digram as shown in above figure

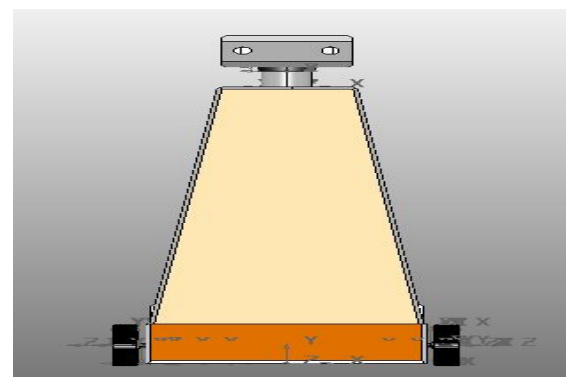
2 . 3D CAD Design:



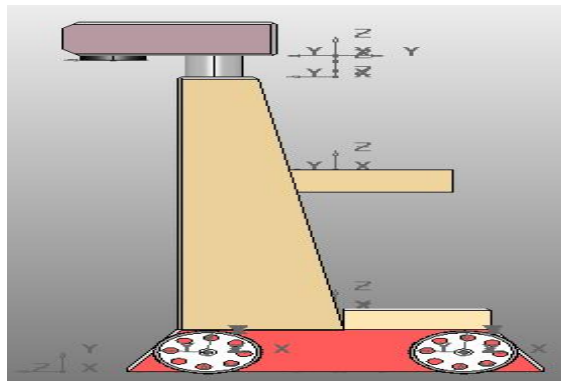
(a)



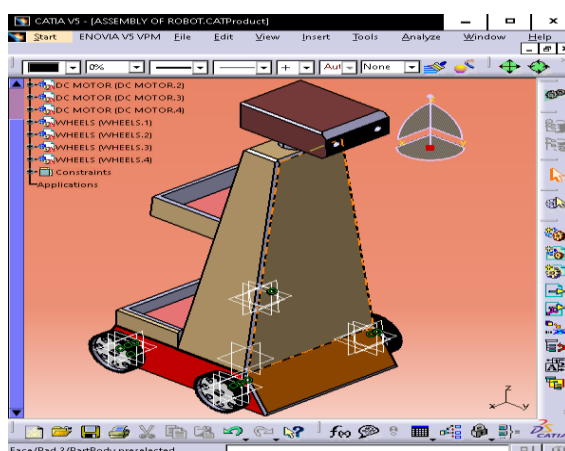
(b)



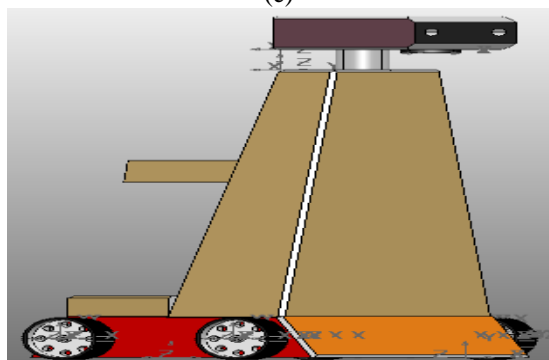
(c)



(d)



(e)



(f)

Fig 10. 3D Model.

In above figure the 3D cad design is shown. The basic structure carries the overall circuits, motors, microcontroller, sensors, and its own weight.

This kind of structure is useful at various places some of them are explained as follows;

- **Household Applications:** Trying to shifting materials can be hazardous in a family. The device is used in household applications like kitchen, storeroom, etc.
- **Industrial Applications:** This device is more suitable for industrial purpose. It can be used to deliver the valuable documents, files, materials, etc.

- **Educational Applications:** To transfer the important documents, papers, files, etc of school, college from source to destination, and this device is very useful. This proposed device is also suitable for the laboratory and library.
- **Hospitality Services:** This proposed device is very much applicable for hospitals, shopping mall, public places, banks, offices, etc.

V. CONCLUSION & FUTURE SCOPE

While there are many papers is there that propose an idea for wireless hand sanitizer dispenser, Bluetooth robot car, Bluetooth control cart for shopping, material handling robot, service robot etc, but none of them have been able to produce an economical version for this project.

We in our project combine all the things according to current scenario. However there are many options that can be used to increase the productivity of this project by using artificial intelligence and machine learning. But in this project we just made a prototype and it is tested and it working properly.

According to current situation, this project is used in many places and can be used to fulfill the daily requirements delivering medicine to patient bed in hospitals for shopping in shopping malls as cart and as a wireless hand sanitizer dispenser at various places.

Thus this prototype allows better shopping, hospitality and service experience in this covid-19 situation. In present and in future there is very high demand of such kind of robot. We have contributed and make this service robot for helping people and mankind.

REFERENCES

- [1] Kazacos Winter, J.: Android controlled mobile robot (2013).
- [2] Selvam, M.: Smart phone based robotic control for surveillance applica-tions. Int. J. Res. Eng. Technol. 3(3), 229–232 (2014) Cost-Efficient Bluetooth-Controlled Robot Car for Material Handling 353.
- [3] Guardi, V.M.: Design of a Bluetooth Enabled Android Application for a Microcontroller Driven Robot. Diss. Rensselaer Polytechnic Institute (2014)
- [4] Birk, A., Schwertfeger, S., Pathak, K.: A networking framework for teleoperation in safety, security, and rescue robotics. IEEE Wirel. Commun. 16(1), 6–13 (2009).
- [5] Casper, J.L., Micire, M., Murphy, R.R.: Issues in intelligent robots for search and rescue. In: Unmanned Ground Vehicle Technology II. International Society for Optics and Photonics, vol. 4024, pp. 292–303 (2000).

- [6] Liu, Y., Nejat, G.: Robotic urban search and rescue: a survey from the control perspective. *J. Intell. Robot. Syst.* 72(2), 147–165 (2013)
- [7] Braun, T., Schaefer, H., Berns, K., Topological large-scale off-road navigation and exploration RAVON at the European Land Robot Trial 2008. In *IEEE/RSJ International Conference on Intelligent Robots and Systems, IROS 2009*, pp. 4387–4392. IEEE (2009)
- [8] Tezel, C., Hangn, and B.: Design and implementation of bluetooth controlled collision avoidance 4 wheel robot using arduino with linear interpolation method for determination. *Int. J. Eng. Sci. Appl.* 1(4), pp. 151–156.
- [9] Goud, R.K., Kumar, and B.S.: Android based robot implementation for pick and retain of objects. *Int. J. Eng. Trends Technol. (IJETT)* 16(3) (2014).
- [10] Sharma, A., Verma, R., Gupta, S., Bhatia, S.K.: Android phone controlled robot using bluetooth. *Int. J. Electron. Electr. Eng. ISSN*, pp. 0974–2174 (2014).
- [11] Pahuja, R., Kumar, and N.: Android mobile phone controlled bluetooth robot using 8051 micro controller. *Int. J. Sci. Eng. Res.* 2(7), 14–17 (2014).
- [12] Maity, A., Paul, A., Goswami, P., Bhattacharya, and A.: Android application based bluetooth controlled robotic car. *Int. J. Intell. Inf. Syst.* 6(5), 62 (2017).
- [13] Sheng, W., Ou, Y., Tran, D., Tadesse, E., Liu, M., Yan, G.: An integrated manual and autonomous driving framework based on driver drowsiness detection. In: *2013 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pp. 4376–4381. IEEE (2013).
- [14] Shivaprasad, B.S., Ravishankara, M.N., Shoba, B.N.: Design and implementation of seeding and fertilizing agriculture robot. *Int. J. Appl. Innov. Eng. Manag. (IJAIEEM)* 3(6), 251–255 (2014).
- [15] Kuhnert, K.D.: Software architecture of the autonomous mobile outdoor robot AMOR. In: *Intelligent Vehicles Symposium*, pp. 889–894. IEEE (2008).
- [16] Rai, N., Rasaily, D., Wangchuk, T.R., Gurung, M., Khawas, R.K.: Bluetooth Remote Controlled Car using Arduino.