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Medical Electric Trolley

Vishal Patra[1], Yash Shelke[2], Sujata Tidame[3]

[1,2]*Students, MVP's KBT College of Engineering, Department of Instrumentation and Control Engineering, Nashik, Maharashtra, India*
[3]*Assistant Professor, Dept. of Instrumentation & Control Engineering, Nashik, Maharashtra, India*

Abstract – *Medical Electric Trolley is a remotely operated vehicle which will be used to serve Covid Affected Patients with food and daily necessities and it will also Carry Medical Equipment's. Our system will ensure that there will be no further spread of disease from human to human. The operator will be controlling it using Remote Controller so that the access to the trolley becomes easy and will get a good range to serve patients. This trolley is strong enough to handle obstructions and also has a good strength to carry load. We have used two casters and two AGV wheels. It is a four-wheel design out of which two wheels are coupled with motor and controller and two other wheels are for support, this system is completely battery operated.*

Key Words*: *Motorised Trolley, Transmitter & Receiver, Master Controller, Hybrid Stepper Motor

1.INTRODUCTION

Trolley now-a-days is an important aspect for transferring different stuffs/items from place to place as per the requirement. Trollies are used in various places like mall, airport and shops for handling the goods. In our system we have used Medical Electric Trolley to serve food to patients and for carrying necessary tools for medical use to fight Covid and other transferable diseases. The design of this motorised trolley using battery power to transfer medical equipment's from one place to another reduces human effort and avoid chances of spread of disease.

The proposed paper aims on the design and development of Covid prevention aspect. Thereby, transfer of this disease from human to human can be reduced to a considerable extent. Hence this paper work is titled as "MEDICAL ELECTRIC TROLLEY". The motorised trolley delivers a simple solution for transporting goods throughout hospitals, and many other places were moving goods quickly and efficiently is necessary. With its simple controls, the motorised trolley functions a quiet operation and compact design for a smooth, safe & easy movement. Using the advance motorised trolley will increase productivity of carrying goods to patients while decreasing the risk of spread of Covid, strain or physical exertion.

As a result, we have developed this motorised trolley so that access to every patient becomes easy and safe.

2. LITERATURE REVIEW

In literature [1], according to the author, a shopping trolley or a shopping cart, is a vital instrument for purchasing goods in supermarkets. Customers traditionally use it to bring things to the cashier when shopping, and it is not intended to leave the store. Customers who want to find a certain product in a store using the traditional shopping method are inconvenienced and much of the time get wasted in this process.

In literature [2], according to the author, carrying a shopping trolley in a supermarket makes it more difficult to reach the various types of products offered in the mall. These carts are sometimes left behind and the customer moves on. Some trolleys are dispersed near the mall's departure door, giving the approaching client a strange appearance. The procedure begins with a phone call to a cell phone number.

In literature [3], according to the author, in today's job, the emphasis is on efficiency, comfort, progression, and cheap cost, with manual effort being minimized to the greatest extent possible. The author's approach intends to provide automatic mobility to the user with the help of some external sources in order to shorten the period of transportation and thus boost the carrier's efficiency. Thus, the author is going to work upon superior mobility.

3. PROPOSED SYSTEM

3.1 Block Diagram

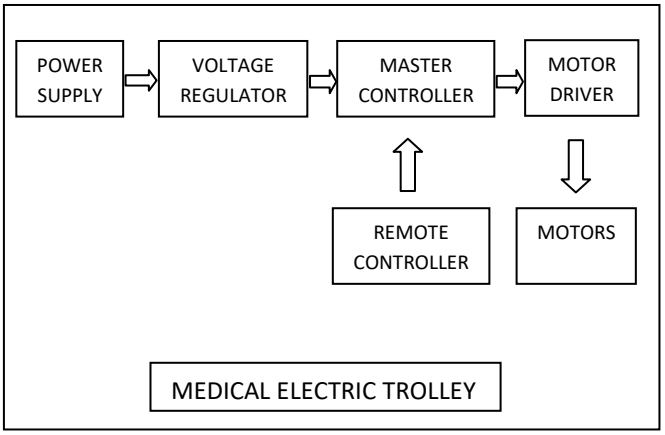

Figure -1: Block Diagram

3.2 Components Used

Selection of component is an essential factor while designing a system. As a result, for our Medical Electric Trolley we have selected such components which are more suitable and more appropriate as per our requirement.

1. B&R Master Controller

Figure -2: Master Controller from B&R

The X20 Compact-S family of CPUs is both powerful and compact. These CPUs are fully maintenance-free due to their fanless and battery-free architecture. An ARM Cortex A9-500 processor, 256 MB RAM, and a 1 GB built-in flash memory are included in the (X20CP0483). The FRAM for storing persistent variables has a capacity of 32 kB. The CPU has plenty of communication options, including POWERLINK, Ethernet, USB, and RS232.

2. B&R Stepper Motor

Figure -3: Stepper Motor from B&R

Motor selection was one of the key aspects to select while designing our system. As a result, we have selected Hybrid Stepper Motors from B&R (80MPH Stepper 3A/6A). Some of the highlights of this motor are: high torque and overload capability, max speed of 3000 RPM, 4 NM holding torque, two phase hybrid stepper motor i.e., 3A Series/6A Parallel.

3. Remote Controller (Transmitter)

Figure -4: Transmitter

The motors force a certain action to occur once the RC receives the radio signals. All operating parts, including the motor, receive power from the power source. The transmitter sends radio waves to the receiver, which activates the motors. The number of electrical pulses (signals) is translated into some action by the circuit board. We used a 7*7 mm DPDT 6 pins for this Arduino-based transmitter.

Receiver

Figure -5: Receiver

The four-channel relay [5] module has four 5V relays as well as the accompanying switching and isolating components, allowing for simple interfacing with few components and connections. Each relay's contacts are rated for 250VAC, 30VDC, and 10A in each case, as indicated on the body of the relays. All of the connections on the motor wiring have been linked to the relay module.

4. Battery

Figure -6: Battery Unit

After selection of the most appropriate motor, it is essential to select a proper power source. As a result, we have chosen 48V/20AH Li-Ion battery pack. Some of the specifications of the battery are as follows:

- Rated Power = 48V / 20AH
- Nominal Voltage = 48V
- Peak Voltage = 54.4V
- Discharge Voltage = 39V

For the charging unit of battery, we have used Enermax Systems (ES-4805) Li-Ion battery charger 48V/5A with input voltage 170-300V, 47-63Hz and Output voltage 54.6V.

3.3 SOFTWARE USED

Figure -7: B&R Automation Studio 4.7

We used B&R Automation Studio 4.7 [4] for Master Controller programming, which is a comprehensive software development environment with capabilities for all aspects of a project. In one environment, the controller, drive, communication, and visualization may all be configured. The programming languages integrated in Automation Studio, which can also be used independently, give effective support to the user.

3.4 PROGRAMMING

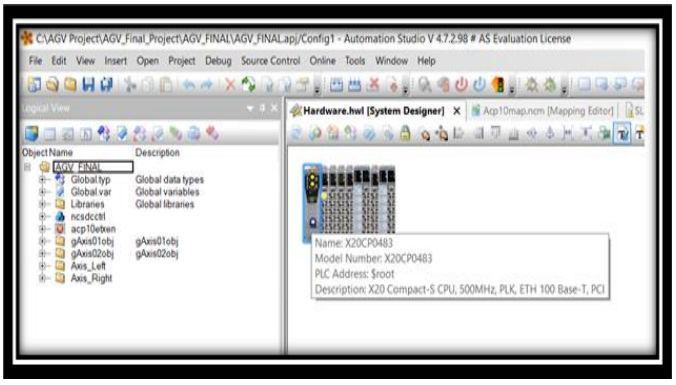

Figure -8: Hardware Selection

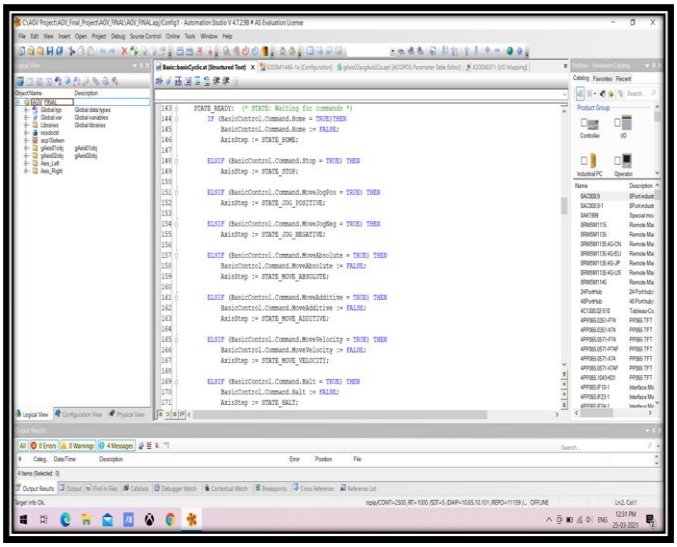

Figure -9: Programming Using ELSE IF Loop

4. WORKING

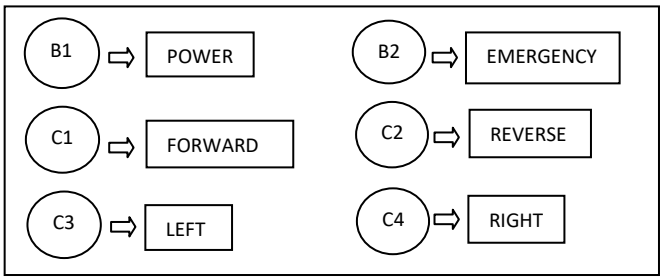

Figure -10: Working

When we press the push button, the transmitter sends a set of electrical pulses in response to our activity. The motors force a certain action to occur once the RC receives the radio signals. All operating parts, including the motor, receive power from the power source. The transmitter sends radio waves to the receiver, which activates the motors. We've used DPDT type buttons in our transmitter.

- When we press B1 motors will Power ON
- When we press B2 motors will be in EMERGENCY State i.e., under fault condition
- When we press C1 motors will rotate in FORWARD Direction i.e., trolley will move straight
- When we press C2 motors will rotate in REVERSE Direction, i.e., trolley will move backward
- When we press C3 trolley will move toward LEFT
- When we press C4 trolley will move toward RIGHT

5. ADVANTAGES

- It will avoid the risk of Corona Spread
- It will be easy for operator to carry food & tools
- It will be very helpful to doctors for carrying test equipment

6. APPLICATIONS

- Can be used remotely by the Operator to serve food to patients
- Can be used by Doctor to carry medical test equipment

7. CONCLUSIONS

We may conclude that using a Medical Electric Trolley rather than humans to transport food and medical tools will be more advantageous. It will ensure that Covid does not spread further. Transporting loads weighing up to 80 kg will be simple and safe. It will be quite simple for the operator to manoeuvre the Electric Trolley using RC and reach Covid or similar patients from a distance.

This project is created for our medical hospital. Following the successful completion and testing of the project, we

discovered that everything was working as expected and in accordance with the specifications given by the Medical Hospital.

8. FUTURE SCOPE

- The same system if provided with slight modification in chassis design can used as a wheel chair.
- This trolley can be trained to follow a specific path if encoder is purchased with a magnetic tape sensor.

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IMAGE OF TROLLEY DESIGN AND ASSEMBLY

Figure -11: Trolley Design

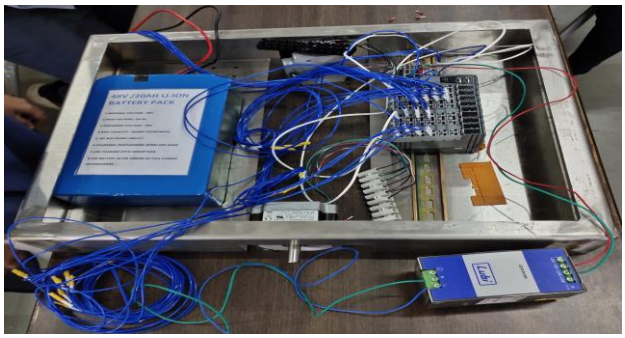

Figure -12: Controller Assembly

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BIOGRAPHIES

Vishal Patra
Student- Instrumentation & Control Engineering, MVP's KBTCOE, Nashik

Yash Shelke
Student- Instrumentation & Control Engineering, MVP's KBTCOE, Nashik