

Automatic Remote Control Material Handling Trolley Robot

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Abstract: *The main objective of this project is to fabricate a robotic trolley for material handling in industries. In this project a robotic vehicle is fabricated which runs like a car by carrying tools from place to another. The motor is connected with the wheel arrangement with the help of speed reduction gear box. When the trolley is loaded with a tool or some other goods it can be easily move to the place as per need by means of wireless remote controller .It can be used in industries, hospitals etc. Industrial operations require continuous flow of material form one workstation to another in industries. This is done manually in most of the small scale industries due to the lack of high initial investment in powered material handling equipment and also the increased maintenance costs of the same. The proper and timely flow of material not only reduces the transit time across the industrial floor but ultimately reduces the time required for the production resulting in increased profits and increased production. This project deals with the concept of portable electric remote controlled forklift for material handling industries. The proposed project consists of development of portable electric remote controlled forklift which can operate with material handling forklift attachment incorporated to the same. This is not only cost effective but also helps in increased industrial productivity.*

Keywords: Base, Chassis, Remote Control Stories, Robotic Trolley, DC Motor

I. INTRODUCTION

The development In the research paper studied the earlier invention of material handling trolley system in collage library, small industry and shopping malls. Early we are use the method formaterial transportation for man power and crane. This method is not economical, costly and risk for material damage. Now automatic material handling robot are used reduce risk to material damage and it is economical. This system is newly launched and removes all methods of material handling as, manually, cranes etc. up to 25kg weight. In the collage library no. of book racks, In between the rack space we draw the black line, the diameter of the line 25mm to 30mm and total length of the library. The robot is followline and traveling the book at particular rack location. Than after get book in trolley and put in rack. This robot handling with help of RF based remote control circuit range up to 15m. The RF based remote control are two parttransmitter and receiver, we fit the remote control receiver part on the robot body. The 8 channel RF based remote control circuit are used, than remote control are operate corresponding relay operate on the receiver board i.e. press key 1 operate relay one as same as particular button press to operate particular relay up to key 8, at particular key to provide exact operation of robot. The robot trace line and do action we give signal with remote to robot and travel material or books inward/ outward desk to particular rack automatically

Nature of problem: When you're working with forklifts, any problem can be serious trouble. You need to know how to recognize the faults, and assess the risks, both in terms of onsite safety and downtime caused by mechanical or other failures. Regular forklift maintenance reduces the risks enormously, but be aware that problems will occur, sooner or later. In general the forklift can be defined as a tool capable of lifting hundreds of kilograms of weight. A forklift is a vehicle similar to a small truck that has two metal forks on the front used to lift cargo. The forklift operator drives the forklift forward until the forks push under the cargo, and can then lift the cargo several feet in the air by operating the forks. The forks, also known as blades or tines, are usually made out of steel and can lift up to a few tons.

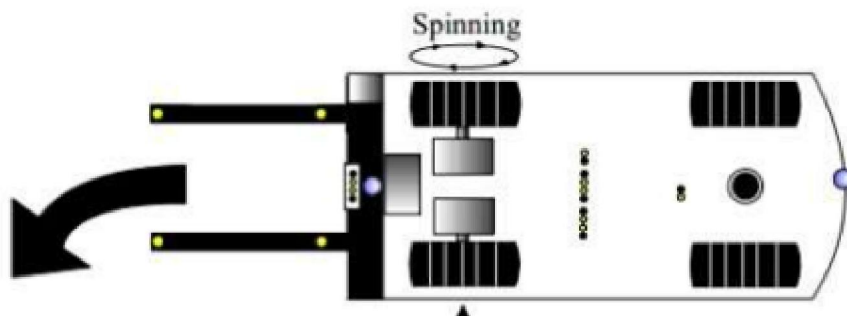
A fork lift one passes on the road may look like a fairly modern invention, but these machines have actually been used for at least the past 2000 years, if not longer. The Romans used forklifts to build huge monuments. Medieval churches

were constructed with them. Also, the Egyptians may have used them to create pyramids. The modern version can be either simple or complex, and forklifts vary based on their application. An ARTICULATED FORKLIFT is a vehicle which has a permanent or semi-permanent pivot joint in its construction, allowing the vehicle to turn more sharply. The word articulated come from Latin articles: small joint. Construction of Battery Operated Forklift” aims at eco-friendly and fuel efficient and robust working with easy material handling and reducing the number of accidents as it is remote operated. We also focused on reducing the number of man power required during the loading and unloading operation of forklift. Though it is remote operated not only the skilled labor but unskilled labor can also operate as it does not require any special training. This forklift will provide better visibility and thus reduces the number of accident and helps in safe transportation to the destination.

II. LITERATURE SURVEY

Health is a Follow Me includes collection of technology which encompass computerized human guided travelling with use of an Arduino Mega, gadgets monitoring and billing with the help of a Bar code reader and an android based totally tablet with large User Interface (UI) strategies. Furthermore, Follow Me consists of computerized parking to its slot and automated charging whilst the trolley is parked in the slot. The research group has provided an accurate, person great smart purchasing trolley to make clients purchasing existence extra handy and less difficult. RFID Tags and RFID Reader: The Smart Trolley may be utilized by the ones clients who are having the club card. In widespread, RFID Tag is attaching with club card. RFID Reader is connected to the trolley. Whenever a patron put RFID Tag close to RFID Reader, RFID Reader detects the RFID Tag and trolley act as Smart Trolley. All this method going to works the use of radio frequency. [1]

A smart trolley (ST) is a strength trolley (PT) to which computer systems, sensors(Proximity Inductive), and assistive technology (Arduino Controller, Bluetooth) are attached. The paper ambitions to offer and complete today's review of ST studies traits. They count on that the information collected on this examine will beautify attention of the popularity of ST technology. The proposed machine is designed to offer higher provider for the patients, children, and elderly humans. It includes a trolley supplied with DC Geared Motors which is managed via Android App.or Voice Command. The trolley is dispatched and received wherein its miles utilized by supplying the needy by remedy, meals, and different components. This makes the aged one or the needy partially independent; nonetheless there must be a person to location the supplies on the trolley.[2]



The maneuverability of the wheelchair will growth and then make the lifestyles of the customers simpler. The traits of this mecanum wheel have been chosen primarily based within the traits of the wheelchair. Therefore, the most velocity of the wheelchair changed into constant in 5 Km/h, and the burden capacity, a person of 80 kilograms. Based on that, the radius R of the mecanum wheel must be 114.61 millimeters. Four mecanum wheels and the frame have been connected with revolute joints and the driving torque was carried out to each revolute joint. [3]

The gift study goals to expand a conventional hand sanitizer device. Sensor-based computerized hand sanitizer dispensers an automatic system which dispenses a managed amount of cleaning soap answer without even touching to the knob, consequently decreasing the opportunity of spreading of infection and creates extra sterile sanitization. Dispensers will best distribute a set quantity of soap in line with motion activation. A programmed amount of sanitizer to be disbursed may be set to a fairly successful amount, wherein waste will be minimal. The average price of

automated hand sanitizer to be had in the marketplace could be very excessive, and it's far tough to reach out to negative humans. Hence, our important goal is to develop contemporary approach of automated sanitization economically and ensuring the availability to the not unusual people. Hence, being in fitness-care profession, we've got formulated natural hand sanitizer and developed sensor-primarily based automatic hand sanitization technique [4]

Smart trolley (ST) is a power trolley (PT) to which computer systems, sensors (Proximity Inductive), and assistive generation (Arduino Controller, Bluetooth) are attached. This paper targets to offer a whole ultra-modern overview of ST studies developments. We expect that the facts gathered on this look at will beautify recognition of the repute of ST generation. The proposed system is designed to offer higher carrier for the sufferers, kids and aged people. It includes a trolley provided with DC Geared Motors that's managed via Android App or Voice Command. The trolley is sent and acquired in which it is utilized by imparting the needy by way of medicine, meals and different components. This makes the elderly one or the needy in part, nevertheless there should be someone in vicinity for the supplies. [5]

III. PROPOSED SYSTEM

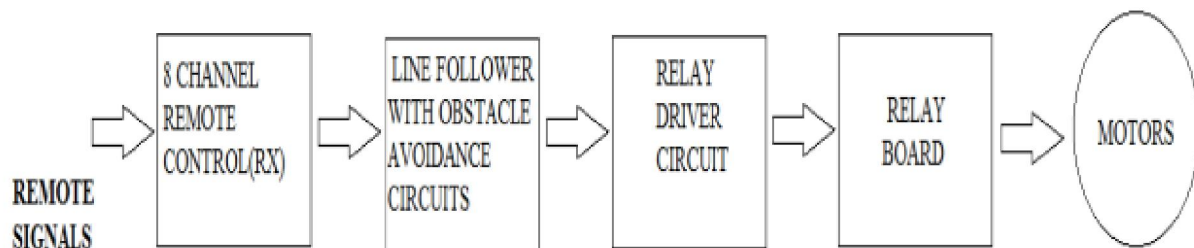


Fig.1. Block Diagram

For the robot operation remote control circuit are used, the remote control circuit has two part transmitter and receiver it's range is 15 meter and frequency is 432MHz's. and this transmitter have 1 to 8 key for particular receiver side relay operation. The 8 channel remote send signal to receiver and operate relay on receiver side provide supply to line follower block and motor driver IC take output relay driver circuit to operate IC ULN2803. The output of the relay driver give to the relay board and relay board operate the motor direction (forward, back, left, right). The content details following as,

- Remote Control circuit
- IR Sensor Module
- Relay logic system
- Obstacle detector circuit
- Line following Robot
- Relay driver circuit
- Power supply

3.1 Remote Control Circuit

This radio frequency (RF) transmission system employs Amplitude Shift Keying (ASK) with transmitter/receiver (TX/RX) pair operating at 434 MHz's. The transmitter module is takes serial input and transmits these signals through RF. The transmitted signals are received by the receiver module placed away from the source of transmission. The system allows one way communication between two nodes, namely, transmission and reception. The RF module has been used in conjunction with a set of four channel encoder/decoder ICs. Here HT12E & HT12D have been used as encoder and decoder respectively. The encoder converts the parallel inputs (from the remote switches) into serial set of signals. These signals are serially transferred through RF to the reception point. The decoder is used after the RF receiver to decode the serial format and retrieve the original signals as outputs. These outputs can be observed on corresponding LEDs and operate relay with particular pressing key of remote as key-1: operate relay 1 for same all remote key's.

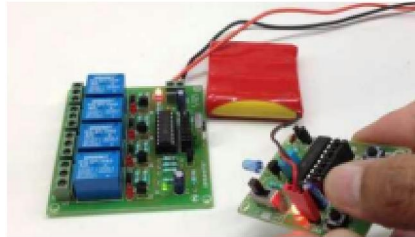


Fig. 2. Wireless Remote Tx-Rx Module

3.2 IR Sensor Module

The basic principle of IR emitter and IR receiver are IR emitter will emit infrared continuously when power is supplied to it. On the other hand, the IR receiver will be connected and perform the task of a voltage divider. IR receiver can be imagined as a transistor with its base current determine by the intensity of IR light cause higher resistance between collector – emitter terminal of transistor, and limiting current from collector to emitter. This change of resistance will further change the voltage at the output of voltage divider in other word, the greater the intensity of IR light hitting IR receiver, the lower the resistance of IR receiver and hence the output voltage of voltage divider will decreased. Usually the IR emitter and IR receiver will be mounted side by side, pointing to a reflective surface. Since the output voltage from voltage divider varies with the intensity of IR light, this given to comparator IC LM358 is used to provide output to IC L293D motor driver circuit.



Fig. 3. IR Sensor Module

3.3 Relay Logic System

A relay is a simple electromechanical switch made up of an electromagnet and set of contacts. Relays are found hidden in all sorts of devices. Relay is used for many control function and is essentially an electromechanical switch. The construction of a typical relay essentially contains a coil of wire wound around an iron core. The relay has set of two contacts, one of which is spring loaded and movable and other is fixed. These contacts are electrically isolated from the coil and are used to make or break another circuit, the motor control using relay logic system as shown in figure. In this figure two relay logic principle as shown. Here two relays are used to control the motor rotation in any direction. When we press the forward switch forward relay will be operated motor runs at forward direction. When we press reverse switch reverse relay is operated and motor will start to reverse direction. This logic can be used to control motor using relay board are used more than two relays. The input is given by relay driver IC ULN2803 and operates relays.

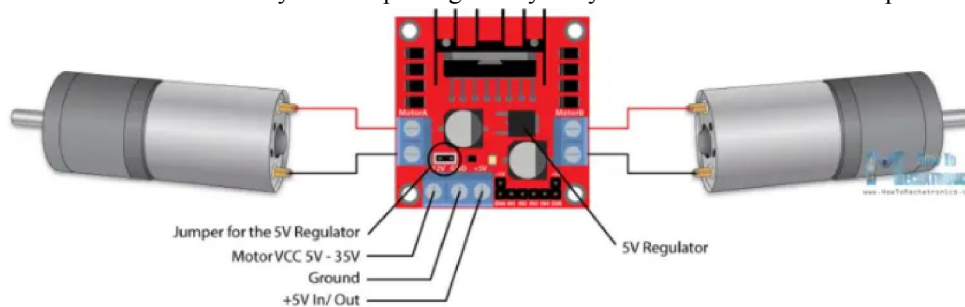


Fig. 4. GSM Module

3.4 Power Supply

In power supply no. of unit are used like battery charger, rectification unit, power regulator. First give the ac supply 230v, 5A to the transformer, This transformer are step down the supply 12v, 3A, In battery charger give supply to bridge rectifier this supply are convert AC to DC and give the supply to battery to charge and directly give to the regulator ICs 7805 and 7812. Now the regulator regulated output the supply as 5v and 12v respectively.

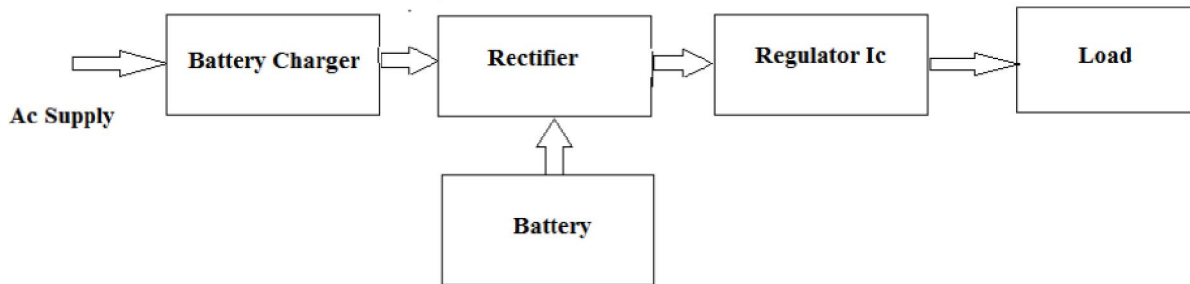


Fig. 5. Power Supply

3.6 DC Gear Motor

A DC motor is a mechanically commutated electric motor powered from direct current (DC). The stator is stationary in space by definition and therefore the current in the rotor is switched by the commutator to also be stationary in space. This is how the relative angle between the stator and rotor magnetic flux is maintained near 90 degrees, which generates the maximum torque. 100 RPM DC Motor with Gearbox generally used for robotic application are used for the driving mechanism, steering mechanism and lifting mechanism. We can adjust it to desired RPM using gear box. Very easy to use. It is excellent for line tracking robotic application.



Fig. 6. DC Gear Motor

Feature	Data
Supply voltage	12V DC
Speed	100 RPM with gear box
Shaft Diameter	6mm
Weight	125gm
Torque	12Kgcm
No-load current	60mA(Max)
Load current	250ma(Max)

Torque of DC motor used, $T = 12\text{Kg-cm} = 1.1772 \text{ N-m}$

Speed of motor, $N = 100 \text{ RPM}$

Angular Velocity, $\omega = 2\pi N/60 = (2 \cdot \pi \cdot 100)/60 = 10.47 \text{ rad/sec}$

Physically Power is the rate of doing work. For linear motion, power is the product of force multiplied by the distance per unit time. In the case rotational motion, the analogous calculation for power is the product of Torque multiplied by the rotational distance per unit time

Rotational Power, $P = T \cdot \omega = 1.1772 \cdot 10.42 = 12.33 \text{ W}$

No. of motors available for driving mechanism = 2 motors

So total power available for driving = $2 \cdot 12.33 = 24.66 \text{ W}$

While the range of obstacle detection is good enough as it is able to detect obstacles within a range of 1m and as result it turns out to be a convenient to be used when something barges in.

IV. CONCLUSION

The Material Handling Robot (MHR) is a productivity increasing feature in a factory. During the manufacturing of this MHR it was found many of intelligence that can be given to it. It provides the basic functions like line following and collision avoiding. And the main function, transportation of goods from station to station. The followings are the main features of the prototype which has been fabricated.

- Speed of delivery
- Adaptive to changes in factory layouts
- Avoid collision with other objects
- Reduction in labor cost
- Reduction in running cost compared to conveyer systems
- Ability to add sensors to detect the payload conditions
- Ability to adjust the lifting time
- Continues cycle of working
- Conditions for line following can be changed easily.

Automatic Guided Vehicle can be used in a wide variety of applications to transport many different types of material including pallets, rolls, racks, carts, and containers. AGVs excel in applications with the following characteristics:

- Repetitive movement of material over a distance
- Regular delivery of stable loads
- Medium throughput/volume
- When on time delivery is critical and late deliveries are causing inefficiencies
- Operation with at least two shifts
- Archive Systems
- Cross Docking
- Distribution
- High Density Storage
- High Speed Sortation
- Material Flow and Transport
- Production and Manufacturing Delivery Systems
- Production and Manufacturing Support Systems
- Warehouse Management and Control
- Work-In-Process Buffers

The fabricated models have following advantages while comparing with the existing models of this kind. The analysing of advantages helps to motivate the fabrication of MHR in the manufacturing industries. The important advantages of the prototype are given below

- Reduce manpower
- Increase productivity
- Eliminate unwanted fork trucks
- Reduce product damages
- Maintain better control of material management
- Traffic control is not needed in this system because of single carrier
- Suitable to transfer frames each of the machines have their own merits and demerits.

The followings are the limitations of the prototype fabricated:

Installation cost is very high.

- MHR are fragile and should be handled with care.

- Regular care, inspection and maintenance needed
- Should be recharged periodically
- MHR will stop delivery when it is forced off the path. Battery should be recharged during intervals. Sun light affects the movement.

REFERENCES

- [1]. Thant ML, Mon KM, Tun KT. Automatic hand -dryer. International Journal of Creative and Innovative Research in All Studies 2019:PP 107-110.
- [2]. Hanwate A, Thakare P., "Smart Trolley using RFID," International Journal of Research in Science and Engineering, pp. 2394-8299, 2015
- [3]. Carlos erlanolival lima shigenorisano., "Design and analysis of a new type of mecanum wheel ," International Journal of Research in Science and Engineering, 2015.
- [4]. Akshay Sharma, "Automatic Sanitizer Dispensing Machine," International Journal of Engineering Research & Technology (IJERT) <http://www.ijert.org> ISSN: 2278-0181 IJERTV9IS070307 Vol. 9 Issue 07, July-2020.
- [5]. L.Subhashree, D.Sruthiraj, S.Vinitha,Joeljosephson," A survey of trolley/wheelchair based smart systemfor exclusive medical applications", International Research Journal of Engineering and Technology Volume: 05 Issue: 03 | Mar-2018 2395-0072.
- [6]. Ng YL, et al., "Automatic Humang Shopping Trolley with Smart Shopping System," JurnalTeknologi, vol. 73, no. 3, pp. 49-56, 2015.
- [7]. Ferdoush S and Li X., "Wireless Sensor Network System Design Using Raspberry Pi and Arduino for Environmental Monitoring Applications," Procedia Computer Science, vol. 34, pp. 103-10, Jan 2014. 16.12.2021 6:48 pm
- [8]. Seema U., et al., "Smart Trolley Follower using Vision based Technique," IJCA Proceedings on National Conference on Advances in Computing, Communication and Networking ACCNET 2016, vol.7, pp. 8-10, 2016.