Motorized Remote Control Mini Forklift Robot

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Abstract- *The mechanical field is improving day by day. Lots of innovative ideas are entering into the field. This project report is indeed to endow with a comprehensive study of the technical and theoretical aspects of "FORKLIFT" all the topics covered in this report are essential for the complete understanding and survey of the title "FORKLIFT". In the project we have studied and modified the product called Forklift machine. The reports engrosses different chapter and each is design in the organized style. Covering basic introduction, specification, application, and its uses in various industries*

Keywords- Autonomous Forklift Robot , Mechanical Energy,linear & vertical movement , comfort , Autonomous Forklift Robot

I. INTRODUCTION

In general the forklift can be defined as a tool capable of lifting hundreds of kilograms. 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. Forklifts are either powered by gasoline, propane, or electricity. Electric forklifts relay on batteries to operate. Gasoline or propane forklifts are sometimes stronger or faster than electric forklifts, but they are more difficult to maintain, and fuel can be costly. Electric forklifts are great for warehouse use because they do not give off noxious fumes like gas powered machines do. Forklifts are most often used in warehouses, but some are meant to be used outdoors. The vast majority of rough terrain forklifts operate on gasoline, but some use diesel or natural gas. Rough terrain forklifts have the highest lifting capacity of all forklifts and heavy duty tires (like those found on trucks), making it possible to drive them on uneven surfaces outdoors. It is important for forklift operators to follow all safety precautions when using a forklift. Drivers should be careful not to exceed the forklift's weight capacity. Forklift operators also need to be able to handle forklift's rear wheel steering. Driving a forklift is similar to driving a car in reverse, meaning that the driver must constantly steer to keep it moving in a straight line. The driver must be aware of the forklift's ever-changing center of gravity and avoid making any quick sharp turns or going too fast. It is advisable that anyone who operates a forklift be fully trained and licensed. Forklifts have revolutionized warehouse work. They made it possible for one person to move thousands of pounds at once. Well-maintained and safely operated forklifts make lifting and transporting cargo infinitely easier. This is the general description of a normal forklift truck. To enhances the technology further, prototype module is constructed with remote technology, there by the operator can walk along with the forklift for better visibility and the container can be placed accurately (precision position). This increases the safety of the operator. The mechanical structure of this prototype module is constructed with square metal pipes, this structure looks like a rectangular box and the vertical moving mechanism that contains metal forks is assembled over the structure at front side. Since it operates through a remote, it doesn't contain any steering mechanism. The entire vehicle is designed to drive through four wheels, and four motors are used to drive all the four wheels directly. Two left side motors of front and rear are connected parallel, similarly the other two motors used to drive right side front and rear wheels are also connected parallel. All these four motors are driven through a single 'H' bridge DC motor drive package. All the four wheels are directly coupled to the motor shafts independently. The DC Motors are having reduction gear mechanism internally, there by speed is reduced and torque is increased. To make the project work more realistic, much importance is given for practical orientation, therefore a prototype module is constructed for the demonstration purpose. This module simulates the real working system and based on this technology with slight changes in the structure and motor ratings, the system can be converted for real applications. The method of converting rotary to linear motion is implemented in the mechanism. The forklift is designed to move in all directions including reverse direction also.

The project aims to design and build a motorized remote-controlled mini forklift robot capable of lifting and transporting small objects within a defined area. The robot will be controlled remotely via a wireless transmitter, and it will incorporate motors, sensors, and possibly a microcontroller to enable precise movement and object manipulation. The primary goal is to create a functional

prototype that demonstrates the feasibility of using such a robot for tasks like warehouse management, small-scale logistics, or educational purposes.

Additional features:

1. To design a motorized remote control mini forklift robot
2. To improve the safety for human
3. Noise less machine
4. To give the more accuracy weight
5. To save the time

Fig.1-Final Model of Motorized Remote Control Mini Forklift Robot

II. IDENTIFY, RESEARCH ANDCOLLECTIDEA

I) Michael G. Kay, "Material Handling Equipment", January 12, 2012

Material handling involves short-distance movement that usually takes place within the confines of a building such as a plant or a warehouse and between a building and a transportation agency. It can be used to create "time and place utility" through the handling, storage, and control of material. The characteristics of materials affecting handling include the following: size -width, depth, height; weight; shape; and other slippery, fragile, sticky, explosive, frozen. Some of the major equipment categories are, Transport Equipment. Equipment used to move material from one location to another for e.g., between workplaces, between a loading dock and a storage area, etc. The major subcategories of transport equipment are conveyors, cranes, and industrial trucks. Positioning Equipment. Equipment used to handle material at a single location. For e.g., to feed and/or manipulate materials so that are in the correct position for subsequent handling, machining, transport, or storage. Unit Load Formation Equipment. Equipment used to restrict materials so that they maintain their integrity when handled a single load during transport and for storage. Storage Equipment. Equipment used for holding or buffering materials over a period of time Identification and Control Equipment. Equipment used to collect and communicate the information that is used to coordinate the flow of materials within a facility and between a facility and its suppliers and customers

II.Ibrahim O Abdul Malik, "Design and manufacture of a hydraulic workshop crane", ISSN 2319-5991, Vol. 3, No. 3, August 2014

Oil at high pressure from the reservoir is sent to one end of the cylinder through the rubber pipes. The oil exerts pressure on the piston and thus pushes it upwards. Process goes on and the entire side of the cylinder is filled with oil and thus moving the piston to its extreme. The release liver valve is used to bring the piston back to its original position. The hydraulic oil returns back to reservoir.

III.Suresh Bollimpelli1, "Design and Analysis of Column Mounted JIB Crane", 2015

In this work, a static, modal and harmonic analysis of a column mounted jib crane using ANSYS software is presented. A column mounted jib crane of 1.5 Ton capacity is modeled using CATIA which is imported into ANSYS where calculations are performed. The detailed drawing of various parts of the crane is obtained from TATA Advanced systems Ltd (TASL) Adibhatta village, Hyderabad. The deflection values, Von Misses stress etc. are obtained using the analysis. The hand calculations of the column mounted jib crane have been done using simple strength of material expressions. The deflection is obtained as 3.709mm, when the load applied is 1.5 tons. The maximum stress obtained is 147.8Mpa which is less than the allowable stress The static stress was found to be within the limits of safety. The model analysis shows the natural frequencies of the crane to be in the lower range 0-10Hz. The fundamental frequency is found out to be 0.323589 Hz. All the other higher frequencies are also found to be very low making the jib crane less stiff and highly stable for any transient loading. The harmonic analysis is performed with a view to predict the performance of the crane if a cycle time dependent load is allowed to act at the trolley. For this hypothetical situation, the von-mises stress and displacement along the z-directions were obtained using ANSYS. The maximum von-Mises stress of 60Mpa occurs at fundamental frequency of 1 Hz. The maximum z-direction displacement of 5mm was observed. These values indicate that the column

mounted jib crane is safe to operate under the load of 1.5 Tons under static and cyclic time dependent loads also.

IV.Okolie Paul Chukwulozie, "Steel Work Design and Analysis of a Mobile Floor Crane" 2016

The transportation of heavy machine parts and equipment within and outside the workshop has been a source of concern and needs urgent attention because of the hazard it exhibits. This negative effect on the health of engineers, led to the invention of the floor jib crane but research shows that contemporary designs of floor jib crane fail over time when this static load is left on it for a prolonged period. This project is centered on the design and fabrication of a mobile floor crane equipped with a facility to lock the load at any level as a special feature, to tackle the issue of failure due to static load. The mobile crane is designed to bear a maximum load of about 1000 kg, with a counter weight of 2.6 KN which gave the crane a 3.034 factor of safety. The materials employed are; sheet metals, angular iron, bolts, nuts, metal rollers etc. The fabrication processes involved drawing, marking out, cutting, filling, welding and assembling. For permanent joints, the arc welding process was employed. As indicated earlier, the mobile floor crane gains its significance in the transportation of heavy machine parts within and outside the workshop. It can also be used to load and unload machine parts on trucks.

III. SCOPE OF THE PROJECT OR OVERVIEW

1) Mechanical Design: Creating a compact and sturdy chassis capable of supporting the weight it needs to lift and maneuvering efficiently in confined spaces.
2) Electronics: Integrating motor controllers, sensors (such as proximity sensors for navigation and load sensors for lifting), and a microcontroller for processing commands from the remote control.
3) Remote Control Interface: Developing a user-friendly interface for remote control, possibly utilizing a handheld controller or smartphone app.
4) Power System: Choosing an appropriate power source (like batteries) to ensure sufficient runtime and power for the robot's operations.
5) Software Development: Writing code to control the motors, interface with sensors, and handle communication between the remote control and the robot.
6) Testing and Iteration: Conducting thorough testing to ensure the robot operates reliably and safely, and refining the design based on test results
7) Safety Considerations: Implementing safety features to prevent accidents, such as emergency stop buttons and obstacle detection sensors.
8) Documentation and User Manuals: Providing clear documentation and user manuals to guide users on operating and maintaining the robot safely.

IV. DETAILS OF DESIGN, WORKING AND PROCESSES

Forklift trucks are vehicles designed to move and stack heavy or bulky goods. They are mainly used in warehouses, stockyards, and other storage areas. Forklift trucks are highly mobile with a very small turning circle which allows them to move easily in confined spaces. On the front of the truck are two forks operated by hydraulics. The driver must fit these forks into the pallets on
which goods are stored. The operator then usesthe hydraulic forks to lift the pallet, takes

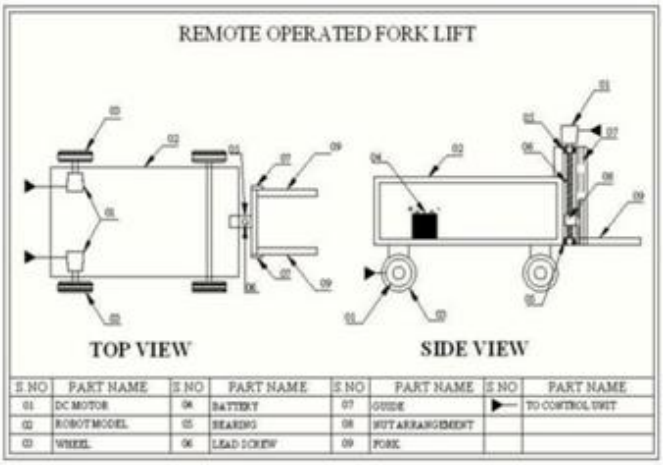


Fig.2.CAD Design

it to where it is needed and sets it down. Some goods, such as bricks, can be moved by fork-lift trucks without the need for pallets. They are stacked in bales with spaces for the forks.The operator must work carefully as these goods are not protected by pallets. Some trucks are fitted with small computer display panels that direct the operator where to place goods in the warehouse.

Operators may also have to keep records and follow instructions written on a Worksheet. They are also responsible for the basic maintenance of the truck. This includes greasing or oiling parts and changing or recharging the battery. Forklift truck operators may have to work in a noisy and dusty environment. Working outdoors in all weather conditions may also be necessary

Industrial lift trucks are used for handling materials, parts, products, tools, equipment, supplies and maintenance items. Fork lifts are efficient for material handling because

they are self-propelled, maneuverable and require only one operator to lift, transport, and stack or un-stack the material. Forklifts may be used for indoor or outdoor use depending on their size, tires and load capacities. The major factors that lead to injuries involving the use of fork-lifts include unsafe driving and material handling practices. Although the term' forklift', 'forklift', or' fork truck' is instantly recognizable,

Their full, official title is a Fork Lift Truck, due to the fork shaped tool

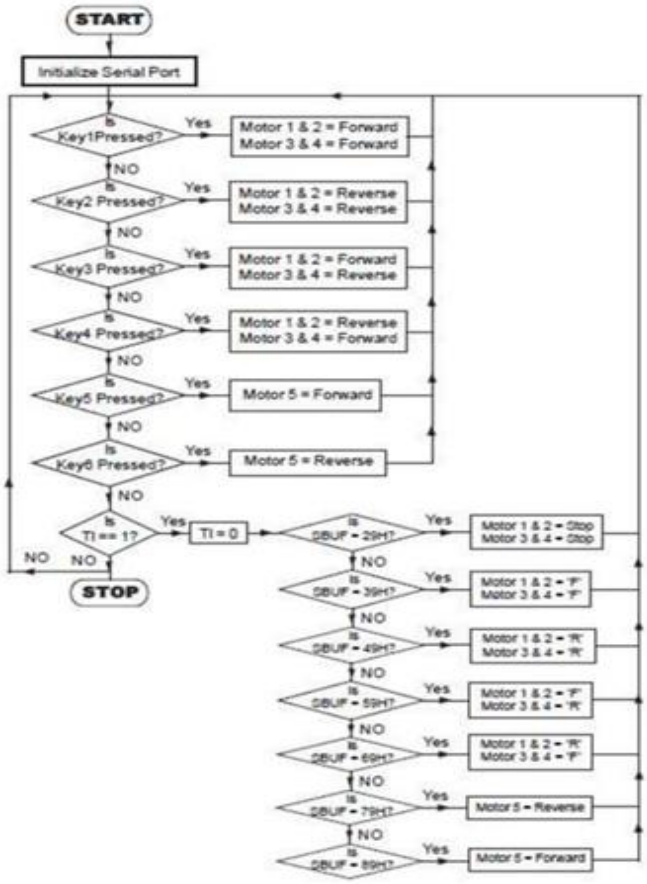


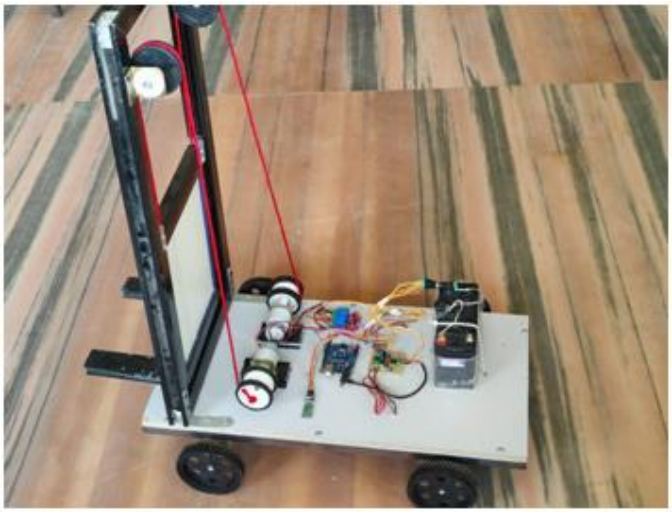
Fig.3.Process Of working

At the front that traditionally was used to lift pallets. But now, like any other piece of equipment, the forklift has evolved and is available in a wide variety of styles, with varying functions and capacities, depending on where and how they are to be used. All lift truck operators must be trained prior to operating a lift truck. Training is provided by the concern manufacturer and consists of both formal instruction and practical training. Training is both vehicle- and workplace-specific. The training is a one-time requirement unless The operator is involved in a lift truck accident or is observed op-eating the truck in an unsafe manner. Industrial lift trucks must be inspected prior to each day of service. A daily inspection checklist must be completed and any defects should be reported and corrected immediately. A truck may not be placed into service if any defects are found during the inspection.

V. CONCLUSION

The project work" remote control minifork lift" is aimed to control through remote control designed. The advantage of using this technology is to increase the safety of operator by operating the fork lift from certain distance. This increases the efficiency of the productivity, because human errors due to poor visibility can be minimized. The system is designed and developed successfully, for the demonstration purpose proto type module is constructed.

After going through these collected data and statistics from various joumals as well as research papers, we came to conclusion that remote controlled fork lift is the only way to stop such industrial issues like labour cost, hazardous material handling.



VI. RESULT AND APPLICATIONS

We can lift the 10 kg material by using 12vdc motor without operator. The technology is to add to the safety of the operator by operating the fork lift from a sure distance. This increases the efficiency of the output because human error due to poor visibility can be minimized. The system is de- signed and developed productively, for the display purpose prototype model (mini reproduction) is constructed. Most of all human safety is a major concern by using the remotely operated forklift.

APPLICATIONS:

- Transport the goods from one place to another place. Storage the goods in specific storage.

- Shifting the cargoesinships, trucks etc.
- The Hydraulics and other type of forklifts are the most economical solution for all the industries and ware-houses where material handling as well as transportation of it at short distances is required.

VII. FUTURE SCOPE

- Autonomous Navigation: Introducing capabilities for autonomous navigation using technologies like computer vision, lidar, or SLAM (Simultaneous Localization and Mapping) to enable the robot to navigate and operate in dynamic environments without constant remote control.
- AI Integration: Implementing artificial intelligence algorithms for better decision-making, such as optimizing load handling, route planning, and obstacle avoidance.
- IoT Connectivity: Adding IoT (Internet of Things) connectivity to allow remote monitoring, control, and data analytics for performance optimization and predictive maintenance.
- Enhanced Lifting Capabilities: Improving the lifting mechanism to handle heavier loads or lift items to greater heights, expanding the robot's versatility and utility.

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