FABRICATION OF MINI FORK LIFT USING WI-FI MODULE

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Abstract

Here we propose the design and fabrication of a remote controlled mini fork lifter. The mini fork lifter defines the concepts of using forklifts for weights lifting as well as placement using pulley based mechanism. Our system allows for efficient implementation of this concept. The mini forklift uses pulley and belt arrangement In order to lift loads. It is connected to a powerful 12V motor in order to lift weights and also consists of a counter weight in the back to maintain proper balance while lifting weights. The lifting mechanism is attached onto a 4 wheel drive frame chassis strong to support the frame as well as counterweight. It consists of 4 motors needed to control vehicle movement in all 4 directions. The system uses 2 supporting rods with bearing setup in order to achieve smooth vertical movement of the forklift. Also we use 4 motor drive in order to drive the forklift with efficient strength. We now use a Wi-Fi based circuit system in order to run the mini forklift from a distance by receiving wireless control commands by Wi-Fi**.**

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 suWI-FI aces 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.

II. WORKING METHODOLOGY

The mechanical structure of this prototype module is constructed with square metal sheets& flats, this structure looks like a rectangular box & the vertical moving mechanism that contains metal forks is assembled over the structure at front side. Since it operates through a Google link, it doesn't contain any steering mechanism. The entire vehicle is designed to drive through four wheels, & 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. The detailed description is provided in following chapters.

The fundamental concept involved in the system is to create mechanical movements in the forklift according to the command signals generated and transmitted through the Google link designed with WI-FI module. In this concept, the command signal information produced through an activated key inte WI-FI aced with data transmitting controller, & and accordingly based on the digital code generated by the controller chip, the data is super imposed over the carrier & transmitted as modulated signal. The received signal is demodulated through WI-FI receiver module & the output is fed to another microcontroller unit arranged over the forklift. This controller is programmed to control the motors through H Bridge. This process is called Radio communication, and it is the process of sending information from one place and receiving it in another place without using any connecting wires. It is also called as wireless communication system. In general Radio waves are produced by rapidly changing currents flowing through a conductor. These radio waves spread out in space like ripples produced on the WI-FI ace of a pond when a stone is dropped in the water. When these fast moving radio waves strike some other conductor placed in their path at a distant point, they produce in the second conductor weak currents of the same nature as the original current which produced these radio waves. Thus a communication link will be established between two distant points. In this project work this communication system is playing active roll it is essential to describe the system well, therefore it is described in detail in following chapters.

III. LITERATURE REVIEW

From the reference of the actual forklift named Landoll we had scaled the actual dimensions to prototype model. The mechanical structure of this prototype model is constructed with metal plates, this structure looks like a rectangular frame& 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 remote technology transfers the data by RFID. All 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 mechanism, there by speed is reduced and torque is increased.

IV. DESCRIPTION OF THE PRODUCT AND WORKING PROCESS
Microcontroller

The controller used here is belongs to 8051 family architecture & often it is referred to as MCS-51. This microcontroller is having an 8-bit data bus. In this family some of the controllers are capable of addressing 64K of program memory and a separate 64K of data memory. The 8051 has 4K of code memory implemented as on-chip Read Only Memory (ROM). The 8051 has 128 bytes of internal Random Access Memory (RAM). The 8051 has two timer/counters, a serial port, 4 general purpose parallel input/output ports, and interrupt control logic with five sources of interrupts. Besides internal RAM, the 8051 has various Special Function Registers (SFR), which are the control and data registers for on-chip facilities. The SFRs also include the accumulator, the B register, and the Program Status Word (PSW), which contains the CPU flags. Programming the various internal hardware facilities of the 8051 is achieved by placing the appropriate control words into the corresponding SFR's.
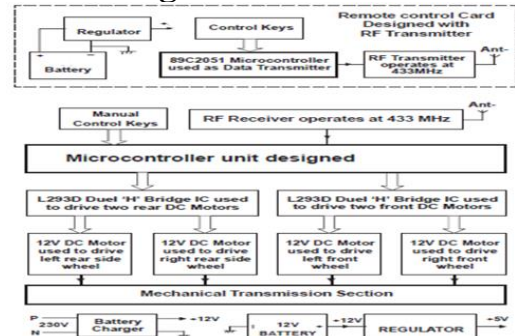

Fig shows micro controller

H – Bridge
The motor driving circuit is designed with L293D chip; this is popularly known as 'H' bridge device generally used to drive the low power DC motors. The current flowing through each driver circuit is restricted to 600 ma & it can with stand up to a peak current of 1.2 amps.This chip is having two drive circuits internally; therefore it can drive two DC motors simultaneously. As two motors are connected in parallel, single chip can drive four motors comfortably. Since the device can accept TTL logics, it can be inteWI-FI aced with controller directly. This device is built in with four channel drivers, there by both motors can be rotated in both directions. The enable pins & channel inputs are controlled by the microcontroller.
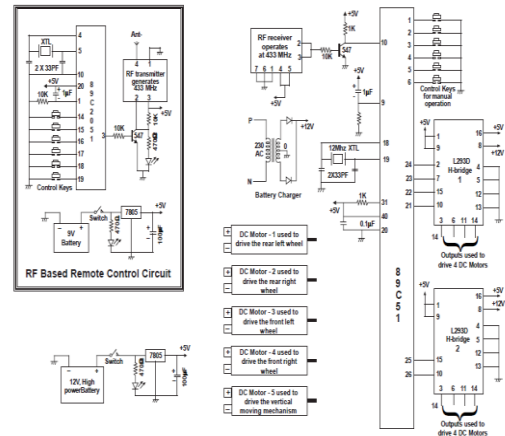
Fig shows H-bridge

Fork- Lift Trucks

The basic module of forklift truck was built around hundred years ago, at that it was used for simple applications, but today it is found in everywhere at industries, godowns, dock yards, railway yards, warehouses, etc. wide variety of modules are in use for different applications. In fact today there is no such depot that functions without this fork lift truck. Most of the forklifts worldwide, more than 99%, they required human operators; they are suppose to sit in the driving cabin arranged over the fork lift to drive it. Some tomes accidents may take place because of poor visibility (poor visibility conditions may raise when the fork lift raises a huge container). Often poor visibility problems are more for the operator, because most of the forklifts are having lifting mechanism at its front side. This leads to human errors. To avoid these problems, here in this project work, Google link operated forklift is designed for the demo purpose.

Fig shows industrial fork lift

V.BLOCK DIAGRAM, CIRCUIT DIAGRAM & PROGRAM FLOW CHART

Block Diagram

Complete Circuit Diagram Of Google link Operated Fork Lift.

VI. DESCRIPTION OF THE COMPONENTS

Power source description

The subject of forklift is related to automobile & it moves in the field, it cannot be driven through mains; hence it is designed to operate through a heavy duty battery. This battery is nothing but a chemical voltage source, and there by the power source itself moves along with the forklift, because it is assembled over the fork lift chassis. A chemical voltage source is one of the most important sources of electrical energy. It is a self contained voltage source and does not need any outside energy. When the battery is discharged it is supposed to be charged with suitable charger which acquires energy from mains supply, i.e. single phase conventional energy source. The electrical energy supplied by a chemical source of voltage is produced by chemical action within the source itself. Chemical voltage sources normally exist in the form of batteries and cells of various types. These batteries are extensively used for mobile applications.

Fig shows the battery

'H' BRIDGES

Whenever a robotics hobbyist talk about making a robot, the first thing comes to his mind is making the robot move on the ground. And there are always two options in front of the designer whether to use a DC motor or a stepper motor. When it comes to speed, weight, size, cost... DC motors are always preferred over stepper motors. There are many things which we can do with DC motor when inteWI-FI aced with a microcontroller. For example we can control the speed of motor, we can control the direction of rotation, we can also do encoding of the rotation made by DC motor i.e. keeping track of how many turns are made by the motors etc. So we can see DC motors are better than stepper motors.

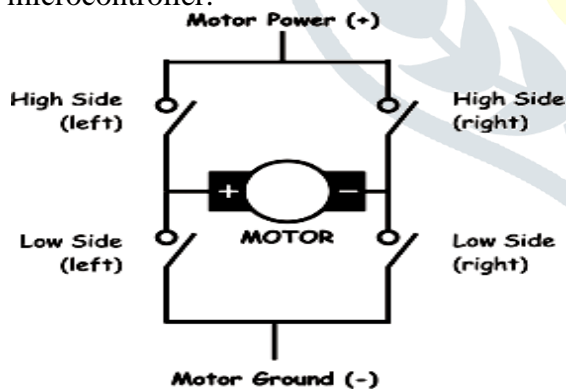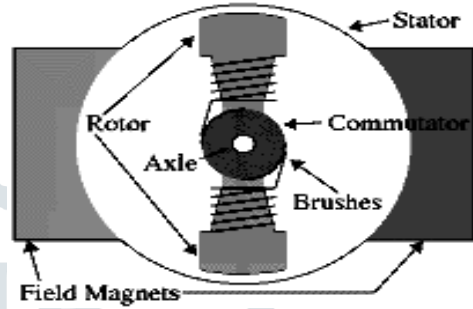In this part of tutorial we will learn to into WI-FI ace a DC motor with a microcontroller.

Fig shows the H Bridge circuits

DC MOTORS

Permanent magnet DC motor responds to both voltage and current. The steady state voltage across a motor determines the motor's running speed, and the current through its armature windings determines the torque. Apply a voltage and the motor will start running in one direction; reverse the polarity and the direction will be reversed. If you apply a load to the motor shaft, it will draw more current, if the power supply does not able to provide enough current, the voltage will drop and the speed of the motor will be reduced. However, if the power supply can maintain voltage while supplying the current, the motor will run at the same speed. In general, you can control the speed by applying the appropriate voltage, while current controls torque. In most cases, DC motors are powered up by using fixed DC power supply, therefore; it is more efficient to use a chopping circuit.

VI. CONCLUSIONS & FUTURE WORK

The project work "Google link operated forklift" is aimed to control through wireless communication network designed with WI-FI modules. The main advantage of using this technology is to increase the safety of operator by operating the forklift from certain distance. This increases the efficiency of the productivity, because human errors due to the poor visibility can be minimized. The system is designed and developed successfully, for the demonstration purpose prototype module (mini module) is constructed & results are found to be satisfactorily. The WI-FI modules used in the project work are purchased from the market, they are working well. During the trail run we have tested the range & we found that the transmitter is able control the forklift from a distance of 3 feet.

While designing and developing this proto type module, especially while fabricating the mechanical parts, we have consulted few experts those who are having knowledge in Mechatronics, these professionals working at different organizations belongs to Hyderabad helped us while fabricating the forklift. Except mechanical parts, remaining electrical & electronic components are easily available. Since it is a prototype module, much amount is not invested, the whole machine is constructed with locally available components, especially the mechanical components used in this project work are procured from mechanical fabricators, and they are not up to the requirement, lot of modifications must be carried out in design & is essential to make it as real working system. Hence, the forklift is to be enhanced further for obtaining better results. Although a good amount of work has been done in the project work, even

though additional features like speed control, high speed, etc. must be incorporated in the real working system. In this regard there is still scope of further improvement in the control structure by providing more flexible control. The mechanical design must be improved by using suitable gears and bearings. Speed must be increased, when the speed is increased, during emergencies breaking system must be employed. Likewise many modifications can be carried over in the future work.

REFERENCES

While designing and fabrication of this project work, we studied lot of material gathered from websites, consulted experts of various field. The information is gathered from yahoo.com search Engine. Regarding micro controllers plenty of books are available, the following are the references made during design, development and fabrication of the project work.

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