

# Fabrication of App Controlled Hydraulic Jack using Bluetooth

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**Abstract**— This device is an Intelligent motorized hydraulic jack for automobile garages has been developed to cater the needs of small and medium automobile garages and also people who are not strong enough to manually use a mechanical screw jack. Garages are normally manpowered with very minimum of skilled labors. In most of the garages the vehicles are lifted by using screw jack. This needs manual work and which tires the worker. In order to avoid all such disadvantages. This, motorized hydraulic jack has been designed in such a way that it can be used to lift the vehicle very smoothly without any impact force. The operation is made to be simple that even an unskilled worker can handle, by just demonstrating the working of the motorized hydraulic jack once. The D.C motor is coupled with the hydraulic jack by cam mechanism. The cam shaft moves up and down depends upon the rotation of D.C motor by cam mechanism. This is a simple type of automation project. This equipment is fixed to the chassis of the vehicle, so that it facilitates the lifting the vehicle.

**Keywords**—Hydraulic jack; fabrication; D.C motor; cams, smartphone, arduino, bluetooth

## I. INTRODUCTION

The hydraulic screw jack for automobile garages has been developed to cater the needs of small and medium automobile garages, which are normally man powered with very minimum of skilled labors. In most of the garages the vehicles are lifted by using screw jack. If an elderly person or woman is using the car and there is necessity of changing one of the tyres due to a puncture, then to avoid the manual work which requires lot of effort can be avoided using the app controlled hydraulic jack.

In order to avoid all such disadvantages. This, hydraulic screw jack has been designed in such a way that it can be used to lift the vehicle very smoothly without any impact force. The operation is made be simple that even an unskilled person can handle, by just demonstrating the working of the hydraulic screw jack once.

This is an era of automation where it is broadly defined as replacement of manual effort by mechanical power in all degrees of automation. The operation remains an essential part of the system although with changing demands on physical input as the degree of mechanization is increased.

Bluetooth technology shows its advantage by integrating with smart phones. It has changed how people use digital device at anywhere, and has transferred traditional wired digital devices into wireless devices.

Smartphones have gradually turned into an all-purpose portable device and provided people for their daily use. In recent years, an open-source platform Android has been widely used in smart phones.

Android has complete software package consisting of an operating system, middleware layer and core applications. In this paper we present a review of hydraulic jack controlled by mobile phone or tablets.

## II. LITERATURE SURVEY

The paper [1] is about the integrated automated jack for 4 wheelers, i.e. by the single push button provided an automobile jack can be operated. The system consists of three main parts that is hydraulic pump, driven by an electric motor, hydraulic cylinder for vehicle lift. During the breakdown condition hydraulic jacks actuate separately for either side of car. By the oil incompressible of the hydraulic jack the lifting capacity is more compared with the pneumatic system where it operates on air which is compressible. With the single acting cylinders which are controlled by the control valves and the relief valve the circuit has been done.

Paper [2] overcomes the problem of automated car jack. In order to facilitate repairs a device used to raise all or part of vehicle into the air done by an automotive jack. In this work, electric car jack has been used by the current supply from the car battery which makes easy to operate. For the polarity of motor, a switch is provided. As the required torque is applied at the screw the gear ratio provided the torque. The jack is plugged in where 12V Power supply is used to gear up.

Paper [3] gives information on development of auto car jack using internal car power. By the manual force car jack is a mechanical advantage to allow a human to lift a vehicle. The internal cigarette lighter power (12volts) in order to ensure the power is adequate, gear was used. In this paper they have used two relays where it is connected to the motor with the 12V power supply has been used for switch circuit. And implementation the prototype for the modification on the

features and design, it was implemented on PERODOA Kancil, with the higher torque such as Proton Wira® and Proton Iswara® car.

### III. DESIGN CONCEPT & METHODOLOGY

The project aims at improving the effectiveness, manual effort and portability of the existing hydraulic jack. The objective is to design a hydraulic jack which can sustain affordable load and can be ported with in the vehicles so it can be used when required, which brings many benefits to the users. For examples we need to lift the vehicles it can be used for lifting the vehicles with minimum effort and by using available technology. It is compacted model so it can be portable and can be used any time and any places where it requires operations.

Thus, the design of the model should be economical to use for without any existing problems. We are aiming at designing a hydraulic jack which can be operated without any manual effort for lifting purpose. The hydraulic jack should be able work in any place without any disturbance or in any places.

So, in this project we are planning to implement a new design to the hydraulic jack, more precisely an extra power source is provided for the driving of the motor.

Manual hydraulic jack is converted to automatic one by establishing an interface between the app, electronic circuit, and DC motor and the gearbox. When the Arduino receives signals, the relay passes the 12V DC to the motor which drives the gear train which in turn rotates the lead screw of the jack.

Thus, this can be achieved by providing the power source to drive the motor and it turns the shaft which will rotates and the jack shaft is lifted.

Manual jack is converted into automatic one by establishing an interface between the app, electronic circuit, D.C motor and the gear box. When the Arduino receives the signals, the relay passes the 12v dc to the motor which drive the gear shaft, which in turns rotates the shaft of the jack. When the shaft turns the jack will lift i.e. , the jack shaft lift up.

The jack is automatic, it should stop at the topmost and the bottom most position itself. To achieve this attribute, we have put two contact breaker switches on the arms of the jack. As the jack reaches the topmost position, the switches by the virtue of the position are pressed and the contact with the power supply breaks. Similar is the case when the jack reaches the lowest position. The hydraulic jack is used in the proposed design which is easily available in the market at low prices according to our requirements of the amount of load to be lifted. The task left is to make the jack automatic. Firstly, we have to use a high torque DC motor. It can efficiently run the gear. Since we need to reduce the motor rpm, we need a Reduction Gear Box. The significance of this gear box is not only to transform motion but also to increase the torque so that the lead screw can be rotated to lift the jack. The assembling of all these parts is done in a way to make sure that the symmetry of the system.

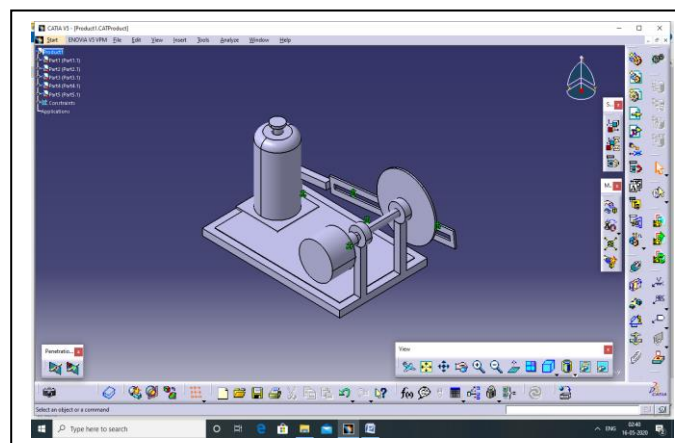


Fig.1. 3D representation of the model

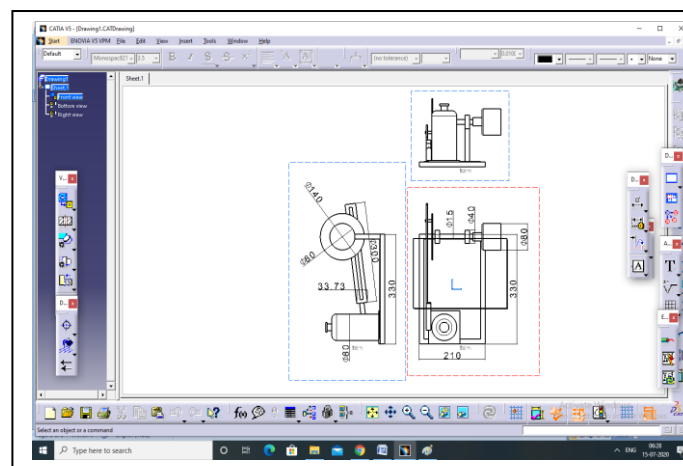


Fig.2. Draft 2D Drawing of the model

#### A. Arduino Uno

Arduino Uno is a microcontroller board based on 8-bit ATmega328P microcontroller. Along with ATmega328P, it consists other components such as crystal oscillator, serial communication, voltage regulator, etc. to support the microcontroller. Arduino Uno has 14 digital input/output pins (out of which 6 can be used as PWM outputs), 6 analog input pins, a USB connection, A Power barrel jack, an ICSP header and a reset button.

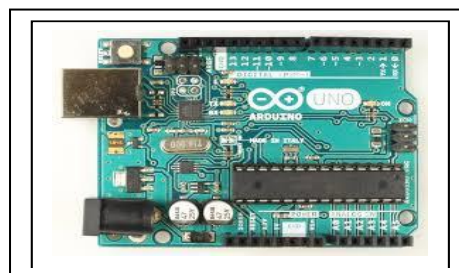


Fig. 3. Arduino uno R3

Arduino can be used to communicate with a computer, another Arduino board or other microcontrollers. The ATmega328P microcontroller provides UART TTL (5V) serial communication which can be done using digital pin 0 (Rx) and digital pin 1 (Tx). An ATmega16U2 on the board channels this

serial communication over USB and appears as a virtual com port to software on the computer. The ATmega16U2 firmware uses the standard USB COM drivers, and no external driver is needed. However, on Windows, a .inf file is required. The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the Arduino board. There are two RX and TX LEDs on the arduino board which will flash when data is being transmitted via the USB-to-serial chip and USB connection to the computer (not for serial communication on pins 0 and 1). A SoftwareSerial library allows for serial communication on any of the Uno's digital pins. The ATmega328P also supports I2C (TWI) and SPI communication. The Arduino software includes a Wire library to simplify use of the I2C bus.

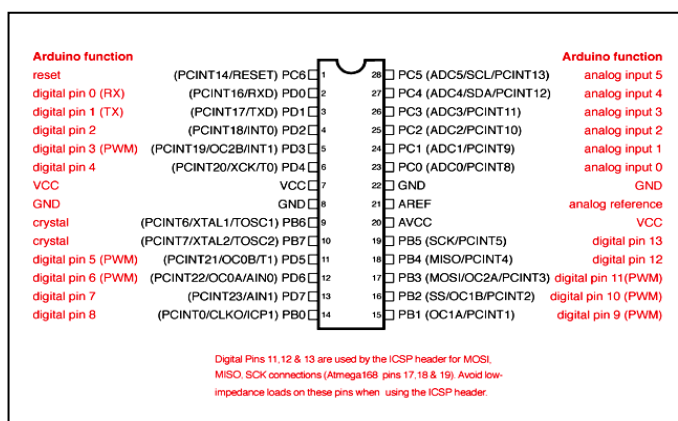


Fig. 4. Arduino Uno pins configuration

### B. Relay

A relay is basically a switch which is operated by an electromagnet. The electromagnet requires a small voltage to get activated which we will give from the Arduino and once it is activated, it will pull the contact to make the high voltage circuit. The relay module we are going to use is the 12V relay. It runs on 12V and we can control it with any micro-controller but we are going to use Arduino.

The Arduino relay module has total of six pins: three on one side and three on other side. On the bottom side, there are three pins which are signal, 12V and ground. We will connect these pins with the Arduino. While on the other side, there are NC (Normally close), C (Common) and the NO (normally open) which are the output pins of the 12V relay. There, we will connect the output device.

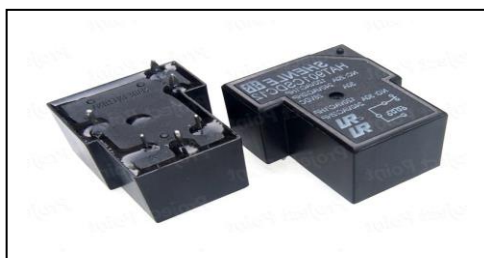


Fig. 5. Relay module

### C. DC GEAR MOTOR

This project mainly deals with the speed control of a DC Motor using a PC. The type of speed control that has been chosen here is pulse width modulation PWM. This project deals with development of DC MOTOR control using PC using PWM. 12V DC Motor drives widely use Micro controllers and The project detail design and complete hardware based high performance DC drive control system will be implemented. Most recently new requirements have arisen. These include faster torque control update with flexible design capability of motion peripherals for high performance military drive applications. Pulse width modulation type of speed control is chosen here because of high accuracy, high reliability, quick response and high efficiency.

Our project deals with the types of problems that we face due to disturbances in supply voltage or load on the motor and enables us to overcome these difficulties by helping us with the appropriate software and hardware.



Fig.6. D.C GEAR MOTOR

Specifications of Gear motor:

Power: 180w, 12v

Torque: 100N.M

Low Speed: 25+/-5rpm

High Speed: 35+/-5rpm

Structure: Asynchronous Motor

### D. Battery

In isolated systems away from the grid, batteries are used for storage of excess solar energy converted into electrical energy. The only exceptions are isolated sunshine load such as irrigation pumps or drinking water supplies for storage. In fact for small units with output less than one kilowatt. Batteries seem to be the only technically and economically available storage means. Since both the photo-voltaic system and batteries are high in capital costs. It is necessary that the overall system be optimized with respect to available energy and local demand pattern.



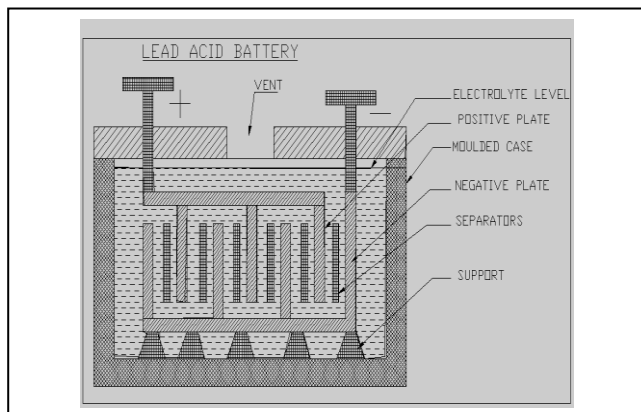


Fig.7. Battery

#### IV. ASSEMBLY

After separately manufacturing each part, it has to be assembled properly to get the final project. The frame is connected to the hydraulic jack using the arc welding. After that the supporting rod from the mild steel rod is welded to the frame to give the support to the structure perpendicular to the frame. There after the motor and gear is mounted with a shaft to rotate the cam using welding and the bearing. The bearing is welded to the shaft which will rotate the shaft of the cam which will helps to transfer the rotating motion into the linear motion. After that the regulatory, relay, Arduino, and Bluetooth is connected from the motor and battery through using wire.

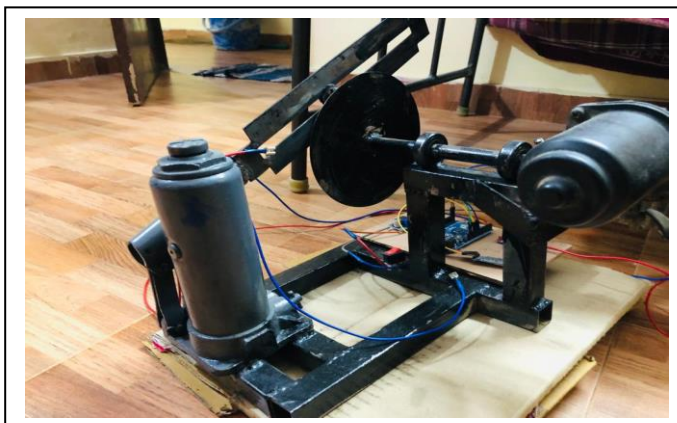


Fig.8. Assembled final look side view

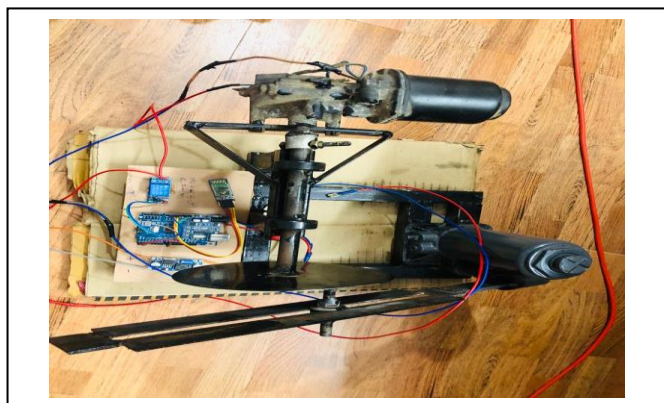


Fig.9. Assembled final look side view

#### D. COST ESTIMATION

Table 1 Cost Breakup

SL. NO	PARTS	AMOUNT
1	HYDRAULIC JACK	1450
2	CAM MECHANISM	250
3	BATTERY	1500
4	CONTROLLER	3000
5	NUT, BOLT, WASHER AND BEARING	800
6	DC MOTOR	1000
7	MS FRAME	1500

#### V. CONCLUSION

The fabrication of Bluetooth hydraulic jack was successfully completed as per the designed specification. The Bluetooth controlled hydraulic jack was fabricated with mild steel for needed parts, fabrication process like marking, cutting, welding and assembling were done. This project work was tested and it worked appropriately, with limited number of links and simple mechanism. This particular design of Bluetooth controlled hydraulic jack will prove to be beneficial in lifting of loads.

The trial performance of this device provides to be successful, with ease of operation and safety, hence the results has given a clear indication of its commercial viability. The cost analysis has shown its economic feasibility and we are under the impression that it can be further reduced, when produced on a mass scale.

A Bluetooth based jack system can be easily attached to all currently manufacture chassis and frames. The main objective of this design is safety, reliable and able to rise with the android app considering some specification based on testing, it is considered safe to use automated jack system. By the torque supplied on the system is more enough to lift the cars.

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