Design and Fabrication of Password Protected Vehicle Security and Automated Center Stand for Two Wheeler

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Abstract— Vehicle security has been one of the most squeezing worries throughout the previous scarcely any years. This venture presents to structure and manufacture procedure of a security framework for vehicles utilizing a secret key ensured commencement and focus stand locking framework, a straightforward versatile equipment module has been made by collecting a LCD a 4*4 lattice film keypad and a transfer switch on a complicated calculation executed in an Arduino processor. The start key circuit of the vehicle is constrained by the transfer included the start circuit and switches on just when the proprietor of the vehicle enters the right secret word in the module correspondingly focus stand will likewise open. The module goes about as an extra keylock for start key circuit framework and vehicle focus stand system. This altogether improves the security and observation worries of the vehicle and thusly forestalls any kind of robbery or weaknesses of the vehicle.

Keywords: Coding, Center Stand, Ardiuno, Battery

I. INTRODUCTION

This invention relates to an improvement in the anti-theft devices that are implemented in Automobiles. It is designed to provide utmost security to Automobiles.

Table 1: Survey of India [26]

An Automobile is a huge personal asset to one and its theft implies a huge loss. Statistics indicate that Auto thefts in India are growing at a rapid rate year after year. With reference to the data collected from the National Crime Records Bureau, about 86000 vehicles were stolen from various parts of our country; however, about 75% of them were never recovered. There are many anti-theft devices available today but their availability has made no significant difference to the number of Auto thefts taking place. This is because of the very simple fact that they are very easy to crack through. For example: A system available in the market comprising of an alarm, a remote and touch sensors can easily be cracked by tampering with the battery supply. On doing so, the system gets into the reset mode due to which the door locks open, thus making the theft simple even without the ignition key. Moreover, these systems consume battery current under idle conditions.

These issues are overwhelmed by the current creation, which gives dynamic security to the vehicle by joining a secret word ensured security gadget in the various circuits of the Automobile. The development doesn't expend battery current under inactive conditions.

The module made for a specific vehicle encourages the proprietor to set up a secret word ensured inception of the vehicle. At the underlying period of establishment of the module in the vehicle the proprietor gets the opportunity to set up a security secret phrase for the module which he can change later on. When the secret word is set the module is a great idea to go. In the event that the proprietor overlooks the present secret word, a one of a kind ace secret key is given to overwrite the present secret word. Each time the proprietors need to begin the bicycle, (s)he needs to place in the secret phrase. The start arrangement of the vehicle will disavow to begin until the given secret key matches the preset secret key.

A stand is a gadget on a bike or cruiser that permits the bicycle to be kept upstanding without inclining toward another item or the guide of an individual. A kickstand is normally a bit of metal that flips down from the edge and reaches the ground. It is commonly situated in the bicycle or

towards the back. Some professional bikes have two: one at the back, and a second in the front.

II. SUMMARY

This framework module made for a specific vehicle encourages the proprietor to set up a secret key secured inception of the vehicle. At the underlying period of establishment of the module in the vehicle the proprietor gets the chance to set up a security secret word for the module which (s)he can change later on. What's more, robotized focus stand is additionally worked by this secret phrase ensured framework. Battery fueled pressure driven siphon and adjusted stand are utilized to make the stand naturally operational. The fundamental favorable position of this instrument is decrease of human endeavors. Secret phrase ensured framework and robotized focus stand both are dealing with Arduino. Before get the middle stand and start the bicycle we put secret word. When the secret key is placed in the module is a great idea to go. Each time the proprietors need to begin the vehicle, (s)he needs to place in the secret phrase. Arduino based secret phrase security locking framework can be given most extreme security by the above upgrades so as to totally fulfill client's needs. By this framework we get greater security of vehicle.

III. EXISTING SYSTEMS

The vast majority of the advanced vehicles are settled in with numerous enemy of robbery frameworks. Various frameworks like an Engine Control Unit (ECU) associated with the Info-Security Circuit Board and sensors inside the vehicle, in-vehicle motor immobilizer, brilliant card interface with vehicle [2], Global Positioning System(GPS) [3], Radio Frequency Identification (RFID) [4] utilized in Intelligent Computerized Anti-burglary (ICAT) framework, Real Time Biometrics based security framework [1] and auto cop instrument which is a video reconnaissance arrangement and so forth has been created till the date. These frameworks have various deficiencies. There is information practicality and system delays, absence of secure processor and keen card chips, conceivable sign debasement, key glitch and distinctive characteristic components like light, precipitation, mist and snowfall [5] going about as mishaps. Moreover, these monetarily accessible items are over-evaluated. Subsequently a similarly modest endeavor to plan and build up a solid vehicle robbery control conspire utilizing is done [6].

The ordinary speedometers which depend on infrared radiation, Hall impact, uncommon earth magnet, encoder have comparative problems when it comes down to cost-adequacy. The ones that are increasingly compelling cost higher and the other way around. So the manufacture of a savvy speedometer is done and incorporated with the security framework in a module for both security and observation of the vehicle [7]. The module is an implanted framework for vehicles. It ceaselessly stores all kind of information from the vehicle. The three significant targets are:

- To ensure an encrypted starting system for a vehicle to strengthen the security
- To monitor performance of the vehicle
- To develop an attachable module for the vehicle to ensure above two objectives

IV. METHODOLOGY

A password protected relay switch is installed in between the battery and the Electronic Fuel Injection (EFI) pump (shown in Fig. 1). When ignition key is turned on, rather than powering the EFI pump the password panel is powered. As the installed relay is normally open (NO), no current flows through the relay to the pump. Hence, the pump does not supply fuel to the engine even if the battery supplies power. The buzzer sets off an alarm when the given password does not match the set password for three consecutive times. Only when correct password is provided, the relay switch is closed and current flows through it to start the EFI pump which starts the engine of the vehicle.

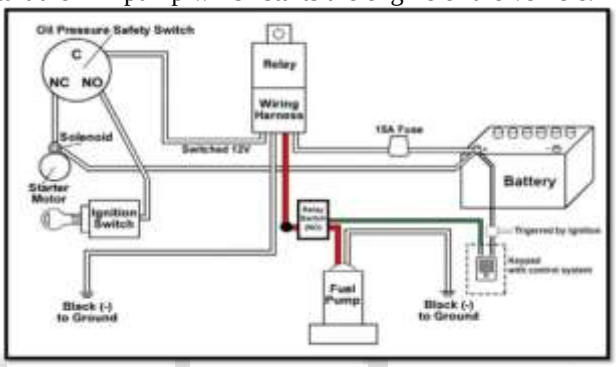

Fig. 1: working diagram [13]

V. COMPONENT USED

SR. NO.	PARTS	QTY.
1	Double layered PCB	1
2	ARDUINO NANO	1
3	4*4 KEYPAD	1
4	LCD DISPLAY	1
5	BUZZER	1
6	RELAY MODULE	2
7	CENTER STAND	1
8	RESISTOR	4
9	LED	4
10	WIRES (M-M/M-F)	10
11	DC MOTOR	1

Table 2: Component used

A. DOUBLE LAYERED PCB

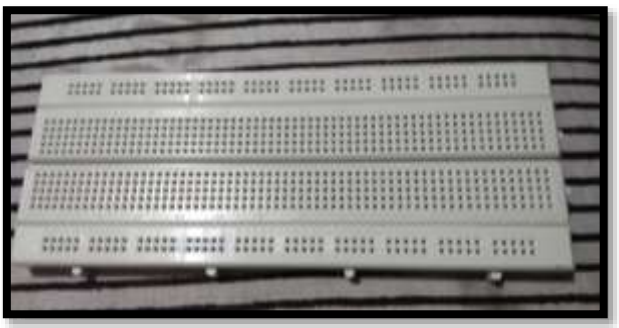

Fig. 2: printed circuit board

PCB is an acronym of printed circuit board which comes with lines, paths and traces incorporated on a single board to electrically connect different electronic components. It which has conductive copper layer on both side of the board.

B. ARDUINO NANO

Fig. 3: Arduino nano

Arduino nano pinout contains 14 digital pins, 8 analog pins, 2 reset pin & 6 Power pins. Each of this digital and analog pins are assigned with multiple functions but there main function is to be configured as input or output.

C. KEYPAD

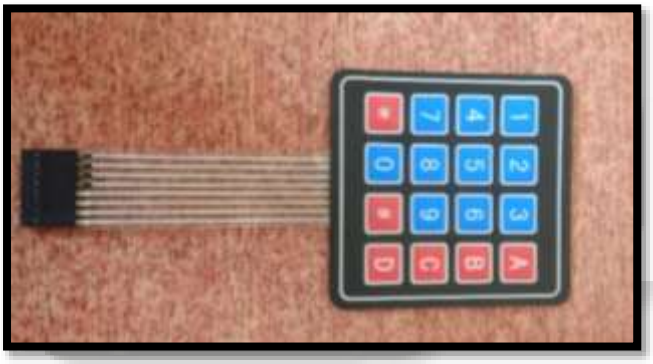

Fig. 4: 4*4 matrix

The 4*4 matrix keypad usually is used as input in a project. It has 16 keys in total, which means the same input values. The 4*4 Matrix Keypad Module is a matrix non- encoded keypad consisting of 16 keys in parallel. The keys of each row and column are connected through the pins.

D. LCD DISPLAY

Fig. 5: liquid-crystal display (LCD)

A liquid-crystal display (LCD) is a flat panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals combined with polarizes. Liquid crystals do not emit light directly, instead using a backlight or reflector to produce image in color or monochrome.

E. BUZZER

Fig. 6: Buzzer

A buzzer or beeper is an audio signalling device, which may be mechanical, electromechanical, or piezoelectric (piezo for short). Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke.

F. CENTER STAND

Fig. 7: Center stand

A center stand is a device on a bicycle or motorcycle that allows the bike to be kept upright without leaning against another object or the aid of a person.

VI. SIMULATION

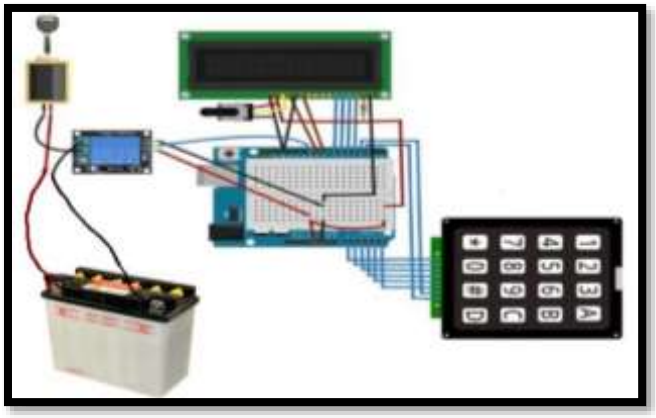

Fig. 8: Working Diagram

A simulation circuit was built (shown in Fig. 8) including all the major components of the proposed security system and the corresponding parts of the algorithm of the system was run in the simulator. The simulation ran successfully necessitating the real life development of the security system. Instead of using Arduino MEGA as used in the main system, Arduino UNO was used in this simulation. A 4*4 Matrix keypad, an LCD,a buzzer, a potentiometer and LEDs were used in the system. For the simulation purposes Autodesk Circuit was used which is an online simulator.

VII. ALGORITHM

The algorithm for the work flow process is shown in the block diagram (shown in Fig. 9). There are three main working Processes here:

- Entering a password
- Changing the password
- Entering a master password in case one forgets the previously set password each individual device is assigned a unique master password. In case the owners of the vehicle forgets their own password, they can override the system through entering the master password.

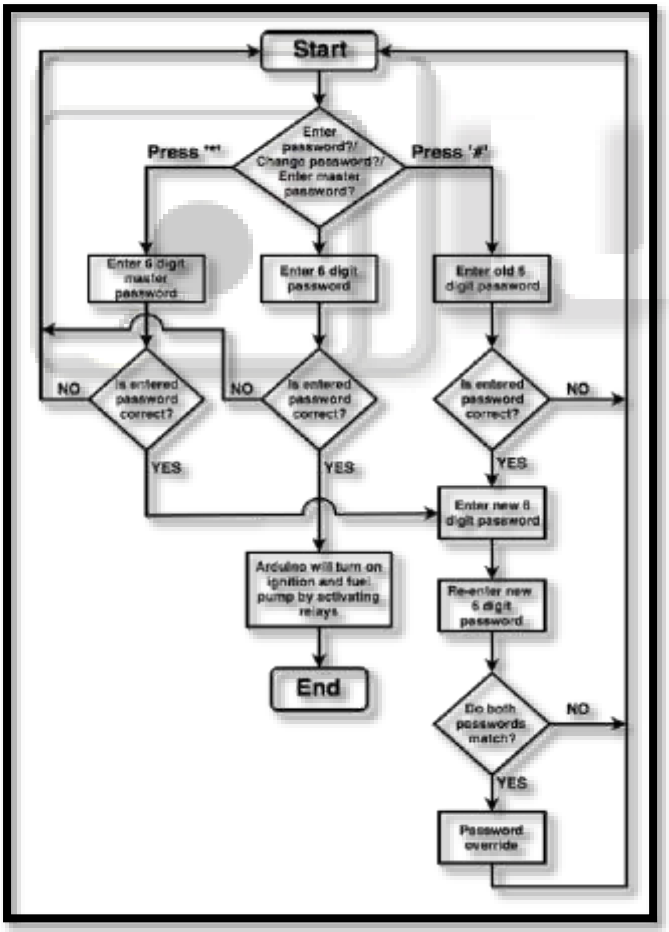

Fig. 9: algorithm of the vehicle security [13]

VIII. PROBLEM IDENTIFICATION

On surveying, it was found that around 72% males and 28% Females drive scooters. Among those 72% males, around 20% are oldies and remaining are adults. Mostly females and old people find it difficult to apply centre stand and hence this made us develop and make it automated. Moreover, applying a side stand;

1) Develops fatigue in stand.
2) Increases chances of accident.
3) Requires more parking spaces.
4) Reduces battery life since the electrolyte is in constant Touch with electrode.

IX. SOLUTION FOR ABOVE PROBLEMS

The robotized focus stand is fixed at a similar area for that of the customary stand. It has two primary parts; the lower unit and the upper unit. The upper unit is turned to the bike outline and the lower unit is joined to a bended surface for simple lifting. The straight actuator is fueled via vehicle battery, constrained by flip DPDT switch which changes the polarities of the gracefully. The direct actuator is turned to the stand get together which circulates load similarly on both the appendages of the stand.

X. STUDY OF PERFORMANCE

The exhibition correlation between the speedometer information and the tachometer information of the arrangement during the turn of the engine is exhibited in the diagram (appeared in Fig. 10). This chart shows that the manufactured speedometer acts in an exact way like that of the tachometer [10]. The variety of information of the speedometer and tachometer with the relating variety in Pulse Width Modulation (PWM) when the engine pivots is appeared in this diagram. The diagram additionally shows that the information accessible from the speedometer and a standard tachometer has little deviation. The engine utilized for exhibit had a most extreme speed of 600 rpm. So the deviation of perusing is appeared at that restriction of turning speed.

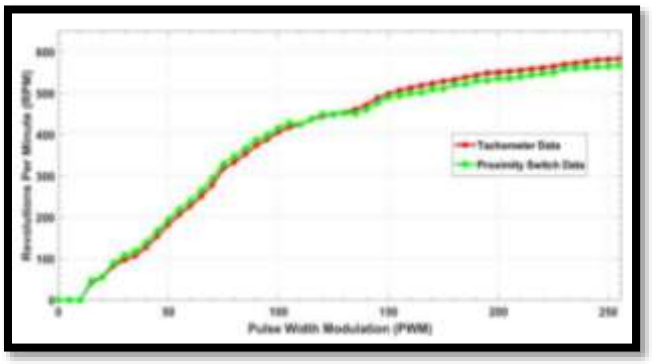

Fig. 10: Error band of speedometer with respect to Tachometer [13]

XI. ORIGINAL PROTOTYPE

The plan of the security framework is appeared in Fig. 7. The PCB for the framework is twofold layered with a 6.15in x 4.9 in measurement. On the top side of the module the keypad, the LCD, LEDs and battery and on the base side the Arduino is put. The significant segments of the module can be disguised from the board making it a convenient module.

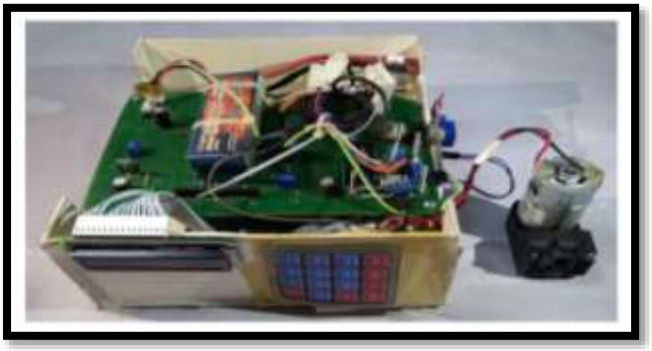

Fig. 11: Labelled Design of Security System.

The plan of the exhibition observing framework is indicated Fig. 11. The PCB is twofold layered of 7.75in x 5.3in measurement. The engine, engine driver and vicinity switch are set on the upper side of the PCB. The significant segments of this module can be camouflaged from the board making it a versatile module also. An engine and a L298 engine driver is introduced for exhibition purposes.

The coordinated framework model is appeared in Fig. 9. It has all the segments of both security and checking framework in one format. This module can be effectively connected to a vehicle dashboard. Other than private vehicles, the module can likewise be introduced in various kinds of vehicles like CNG, Bus, Truck and cruiser and so on.

XII. DESIGN AND ANALYSIS OF CENTER STAND

A. Design and Calculation

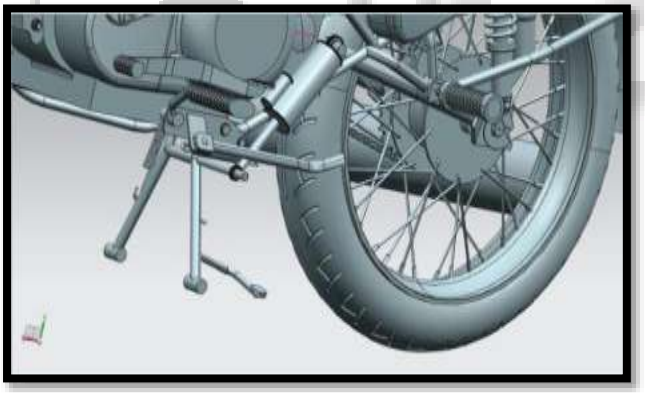

Fig. 12: Assembled View of Center Stand With Linear Actuator

1) Design of Spur Gear

Power input = Pin = Voltage*current=V*I = 12*3.8 = 33.6W

Power output= Pout = Force*velocity=F*v =1000N*16.6mm/sec

Assume α= 200 Full Depth Involute

a) Identification of Weaker Member

Both gear and pinion is made of same material i.e. cast iron

From design data hand book table 23.10

o = 55 MPa

Since gear and pinion is made of same material,

Pinion is a weaker member.

From design data hand book table 23.6 Assume Z1 = 12

Hence from lewis equation for bending y1 = 0.154 – $\frac{0.912}{Z1}$ = 0.078

b) Tangential tooth load

$Ft1 = \frac{9550 \times 1000 \times N.Cs}{n1.r1}$

Where n = speed of weaker member

r = radius of weaker member ∴ r1= $\frac{m.Z1}{2} = \frac{12m}{2}$ = 6m

Also Cs =1.5 from data hand book

N= power in KW

= 16X10-3 KW

∴Ft1 = $\frac{6.3666}{m}$ in N..... (1)

c) Tangential Tooth Load from Lewis Equation

Ft1= o b1 y 1 P Cv

Where o=allowable static stress of weaker member b=3πm to 4πm

y= lewis form factor

P= πm

Vm= $\frac{\pi dn}{60 \times 1000}$ = 3.7699m

Cv= velocity factor

Ft1=134.77m2Cv.....(2) Equating equation (1) and (2)

m3Cv = 0.04723..... (3)

Trial 1:

Select m = 0.4mm

Vm= 3.7699(0.4) = 1.5079m/sec

Cv= $\frac{3}{3+Vm}$ for Vm ≤ 7.5m/sec

Cv= $\frac{3}{3+1.5079}$ = 0.6654

For safe design m3Cv≥ 0.04723 (0.43) X0.6654 ≤ 0.04723

It is not suitable

Trial 2:

Select m = 0.5mm

Vm= 3.7699(0.5) = 1.8849m/sec

Cv= $\frac{3}{3+0.9849}$ = 0.6141

For safe design m3Cv≥ 0.04723

(0.533)X0.6141 ≥ 0.04723

0.0767 ≥ 0.04723

Hence design is safe

From table 23.3

Module (m) = 0.5mm

d) Check for the Stress

Induced stress

ind = (0Cv)ind = $\frac{Ft1}{b1y1P}$ = 20.7851N/mm^2 Allowable stress

σallowable= (0Cv)allowable

55x0.6141 = 33.7755 N/mm2 for safe design

(0Cv)ind< (0Cv)allowable

20.7851 < 33.7755

Hence design is safe

Dimensions

Addendum = 1m = 1x0.5 = 0.5mm

Pitch circle = Zm = 12x0.5= 6mm

b = 10m =10x0.5 = 5mm

Tooth thickness = $\frac{\pi}{2}m = \frac{\pi}{2} X\ 0.5$ =0.7853mm

e) Check for Dynamic Load

According to Buckingham's equation

$$\text{Dynamic load } Fd = Ft + \frac{21Vm\ (Ft+b.c)}{21Vm\sqrt{Ft+b.c}}.$$

From fig (23.35a)

forVm=2.2619m/sec

Error f=0.125

from table 23.32

for, f=0.125, and cast iron material load

Factor C=725KN/m ∴Fd=66.0509N

f) Check for Wear Load

According to Buckingham's equation for wear load Fw = d1bQK

$$\text{Ratio factor } (Q) = \frac{2Z2}{Z1+Z2}\frac{Z2}{Z1} = 4$$

$$Q = \frac{2x48}{12+48} = 1.6 \qquad = 4 \qquad \frac{Z2}{12}$$

∴Z2 = 48 teeth

From table 23.37B

Load stress factor K =1.4362 (for pinion and gear made of cat iron)

Hence Fw= (mZ1)(5)(1.6)(1.4362)

(0.5x12)(5)(1.6)(1.4362)

∴Fw=68.9376N

For safe design Fw>Fd 68.9376>66.0509

Hence design is safe

B. Analysis of center stand

1) Introduction to Analysis

ANSYS is a broadly useful limited component displaying bundle for numerically tackling a wide assortment of mechanical issues. These issues include: static/powerful basic examination (both straight and non-direct), heat move and liquid issues, just as acoustic and electro-attractive issues. When all is said in done, a limited component arrangement might be broken into the accompanying three phases. This is a general rule that can be utilized for setting up any limited component examination.

a) Preprocessing

Characterizing the issue; the significant strides in preprocessing are given beneath:

– Define key focuses/lines/territories/volumes

– Define component type and material/geometric properties

– Mesh lines/territories/volumes as required

– The measure of detail required will rely upon the dimensionality of the examination (for example 1D, 2D, axi-symmetric, 3D).

b) Solution

Assigning loads, constraints and solving; here the loads (point or pressure), and constraints (translation and rotation) are specified and finally solve the resulting set of equations.

c) Post Processing

Further processing and viewing of the results; in this stage one may wish to see:

– Lists of nodal displacements

– Element forces and moments

– Deflection plots

– Stress contour diagrams

2) Objective of Analysis

A 3D model of the Center stand was made. The various models are to be exposed to constrain following up on various pieces of the stand principle body. The power following up on the various models will introduce various outcomes in type of all-out distortion, stress following up on the joints, power response, second response and so forth.

The created model is to be examined and contrasted with the other planned models. The information got is to use to discover the disappointment focuses and the potential misshapenness which will happen on the manufactured stand.

3) Material used

The material utilized for the examination of made 3D model is Structural steel. Basic steel is favored for the utilization of 3D model examination is because of certainty that it gives an essential arrangement of steel. Basic steel is a class of steel utilized for making development Materials in an assortment of shapes. Numerous basic steel shapes appear as an extended pillar having a profile of a particular cross area. Auxiliary steel shapes, sizes, synthetic structure, mechanical properties, for example, qualities, stockpiling rehearses, and so on., are directed by norms in most industrialized nations. Commonplace evaluations are depicted as 'S275J2' or 'S355K2W'. In these models, 'S' indicates basic as opposed to designing steel; 275 or 355 signifies the yield quality in newton per square millimeter or the equal Mega Pascal. J2 or K2 means the materials durability by reference to Charpy sway test esteems; and the 'W' signifies enduring steel. Further letters can be utilized to assign fine grain steel ('N' or 'NL'); extinguished and tempered steel ('Q' or 'QL'); and thermo-precisely moved steel ('M' or 'ML').

a) Mechanical Properties of Structural Steel

Table 1 shows the different Mechanical properties of Structural steel used as Stand material.

Material used	Young's modulus	Poisson's ratio	Bulk modulus	Shear modulus
Structural steel	200 GPa	0.3	1.6667e+05 Pa	761023 Pa

Table.no. 2 Mechanical Properties of Materials used in Analysis

b) Characteristics of Structural Steel

Having high quality, solidness, sturdiness, and malleable properties, auxiliary steel is one of the most normally utilized materials in business and modern structure development. Basic steel can be formed into almost any shape, which are either blasted or welded together in development. And furthermore it very well may be raised when the materials are conveyed nearby, while concrete must be restored in any event fourteen days in the wake of pouring before development can keep, making steel a calendar inviting development material. Steel is inalienably a noncombustible material. Nonetheless, when warmed to temperatures found in a fire situation, the quality and firmness of the material is altogether diminished. The International Building Code requires steel be wrapped in adequate heat proof materials, expanding in general expense of steel structure structures. Steel, when in contact with water, can consume, making a conceivably risky structure. Measures must be taken in auxiliary steel development to

forestall any lifetime consumption. The steel can be painted, giving water opposition. Additionally, the imperviousness to fire material used to envelope steel is usually water safe. Steel gives a less reasonable surface condition for form to develop than wood.

4) Steps in Analysis

a) Modelling

The model has an expansion on the bar which is set between the two legs of the inside stand. The augmentation is slanted to an edge which permits the joint to openly turn. The cylinder power is then applied to the augmentation interface. ANSYS workbench is utilized to make parametric geometry without any preparation or to set up a current CAD geometry for examination. It incorporates robotized alternatives for rearrangements, cleanup, fix, and disfeaturing. Reenactment frequently requests remarkable demonstrating abilities that regular PC helped plan activity don't require. Consequently, these abilities are either ailing in CAD frameworks or actualized in a manner that alternatives for rearrangements and fixes not ideal for performing reproductions. The geometry is appeared in Figure 5.

b) Meshing

Cross section is characterized as the way toward separating the entire part into number of components so that at whatever point the heap is applied on the segment it disperses the heap consistently called as lattice (Refer Figure 6). The cross section system is done as to give hubs on the outside of article that will be investigated. Subsequent to Meshing, the whole structure is partitioned into number of components and every component having its own solidness while stacking. Including each one of those components stiffness's, you can get the Global Stiffness Matrix with which you can figure the pressure created in the structure and so on.

On the off chance that you are applying the heap on the body which isn't fit, at that point the heap circulation isn't uniform and you may get the sporadic or flawed outcomes.

Fig. 13: Geometry view of structure

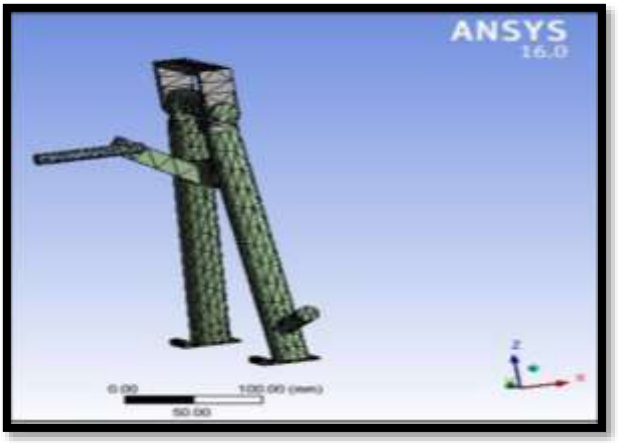

Fig. 14: Meshed view of structure

c) Deformation

Change looking like a body brought about by the use of a power (stress). Misshapening is corresponding to the pressure applied inside the flexible furthest reaches of the material. Physical misshapenings can be determined on and inside a section or a gathering. Fixed backings forestall disfigurement; areas without a fixed help as a rule experience misshapening comparative with the first area. Disfigurements are determined comparative with the part or get together world facilitate framework Deformation test was led on the manufactured model and is appeared in Figure 7. The investigation of the structure gave the above outcomes. The most extreme arrangement was seen as on the cylinder pole instead of on the connection from the welded divide from the cross bar. This twisting outcome from the investigation shows esteem which well inside the most extreme working states of the water powered pole.

d) Equivalent Stress

The von Mises yield standard (otherwise called the most extreme twisting vitality rule) proposes that yielding of a bendable material. A proportional elastic pressure or identical von Mises worry, as appeared in Figure 8 is utilized to foresee yielding of materials under multi pivotal stacking conditions utilizing results from basic uniaxial pliable tests. The pressure arrangement by the activity of power is greatest situated on the mid area of the expansion connect from the crossbar. The mid area encounters the most elevated worry because of the way that it is the purpose of joining the cylinder and the middle stand and power acts through the connection.

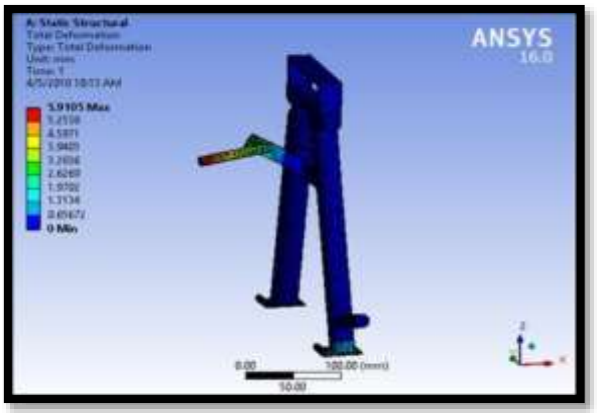

Fig. 15: Deformation of Fabricated Model

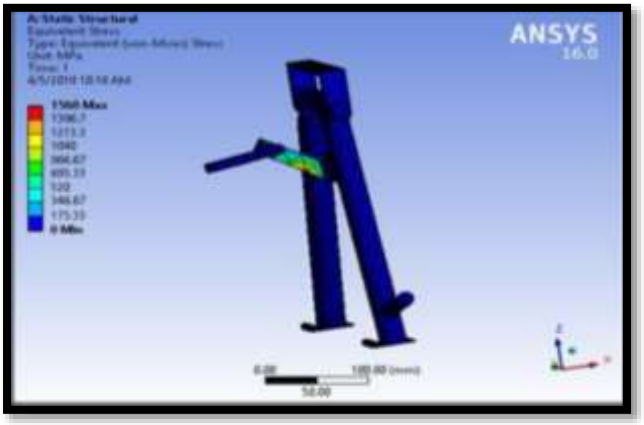

Fig. 16: Equivalent Stress of Fabricated Model

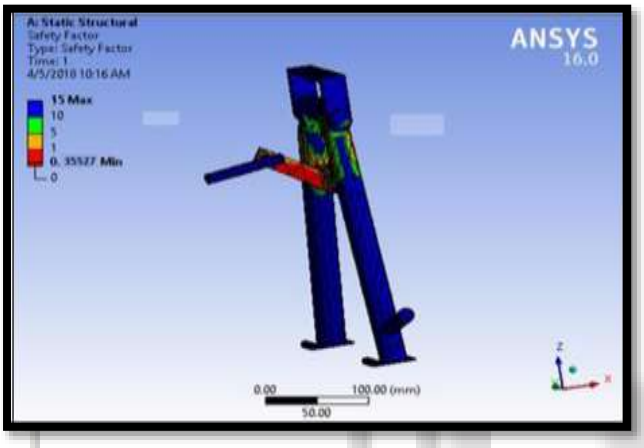

Fig. 17: Safety Factor of Fabricated Model

e) Safety Factor

Factors of Safety (FS), is otherwise called (and utilized reciprocally with) Safety Factor (SF), is a term portraying the heap conveying limit of a framework past the normal or real loads. Basically, the factor of wellbeing is how much more grounded the framework is than it should be for an expected burden. Wellbeing factors as in Figure 9 are regularly determined utilizing point by point investigation since thorough testing is illogical on numerous tasks, for example, scaffolds and structures, yet the structure's capacity to convey load must be resolved to a sensible precision. The security factor result shows a position point where disappointment of the framework may happen. The model examination shows that the safety factor point is most minimal at the connection joining the cylinder and the inside stand. The remainder of the stand structure experience moderately lesser powers.

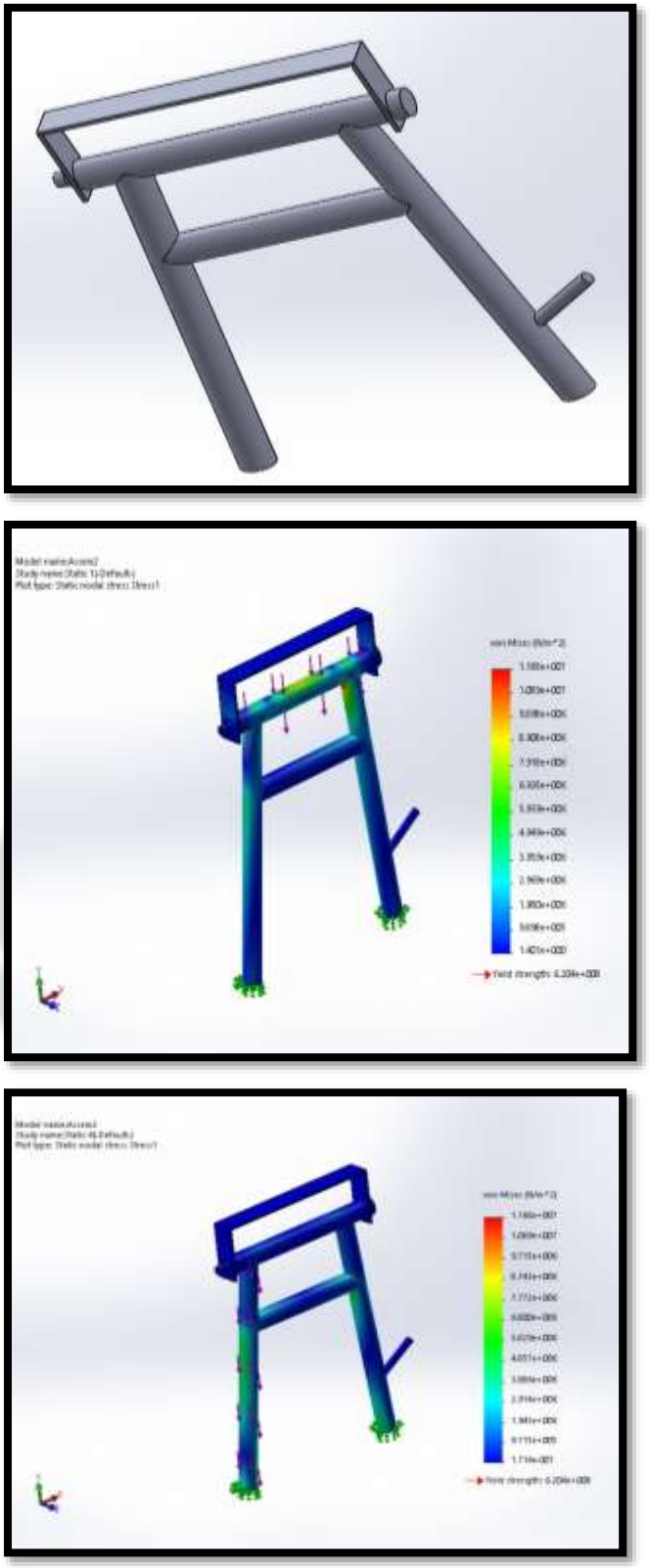

Fig. 18: Analysis of center stand

XIII. ADVANTAGES

1) This system is regarding creating the vehicle safer by the utilization of GSM technology.
2) "Arduino based password security locking system" can be provided maximum security by the above

enhancements in order to completely satisfy user's needs.
3) Requires less human efforts
4) Requires less parking spaces
5) Easy to handle for women and old people.
6) Easy to use for handicaps.
7) Easy to install and uninstall.

XIV. LIMITATIONS

1) This system is very complex.
2) Weight of vehicle increases.
3) Fuel consumption increase as compare to normal vehicle.
4) Initial cost increases.

XV. APPLICATIONS

This is use in vehicle for security.
Anti- theft locking for stolen vehicle.
It can be applicable for two wheelers and mopeds.

XVI. FACTORS TO CONSIDER WHILE SELECTION OF THIS PROJECT

1) Construction
2) Cost
3) Performance

We will use password protection system. Which is complex in construction but it is very useful for vehicle.
We will use automated electric type centre stand which is simple in construction than the Hydraulic type centre stand.

The overall cost is little increased but it is affordable by common people.

Also the performance of this system is better than simple security system.

Hence this system is considered for this project.

XVII. CONCLUSION AND RECOMMENDATION

The connectable module made for a specific vehicle causes the proprietor to set up a secret key secured inception of the vehicle. At the underlying period of establishment of the module in the vehicle the proprietor gets the opportunity to set up a security secret word for the module which (s)he can change later on. When the secret key is set the module is a great idea to go. In the event that the proprietor overlooks the present secret key, a one of a kind ace secret phrase is given to overwrite the present secret phrase. Each time the proprietors need to begin the vehicle, (s)he needs to place in the secret phrase. The start arrangement of the vehicle will renounce to begin until the given secret key matches the current secret phrase. A full practical exhibition observing framework which incorporates speedometer is manufactured requiring little to no effort utilizing the nearness switch. In context of the India, this is an exceptionally urgent and refined part. The vast majority of the open vehicles (CNGs, Taxis and so on.) in the subcontinent does not have a not too bad speedometer that transfers supreme data about its speed. With the module comes a fervent answer for such a predicament.

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