Car Tyre Replacement Robot Using Artificial Intelligence

Vishal N.S, V.Prabhakaran, Dr.P.Shankar

Abstract— The aim of this paper work is to replace defected tyres in cars using robot. This robot is a package of removal and replacement process involved in tyres. This robot is implemented by artificial intelligence and image processing techniques totally powered by batteries which is rechargeable. The whole kit is controlled and works under a micro-processor which is the brain of this device which reduce stress of the car drivers or owners in case of any problem faced by them due to tyres. Artificial intelligence placing land marks in various fields this robot will place a mark in automobile service sectors.

Index Terms— Microprocessor, Artificial Intelligence, GPS/GSM, DIP IC

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1. INTRODUCTION

Car owners or drivers used to face many problems due to their car's tyre. Tyre puncture, bends in rims of tyres or tube burst leads to stop the further movement of the car .To avoid the stress, a robot which acts as a mechanic to avoid the removal or replacement problem of the tyre .which fits at the roof of the car due to compact structure of it .image processing and fuzzy logic is implemented and some mechatronic works is achieved through this to do all the process in replacement of tyres. The Robot when it is switched on it gets out from the deck through its guided way and enters the defected tyre this is achieved through the selection of the user .jacks used to lift the car are build inside during the construction of the car.the robot enters the location and it does its work.
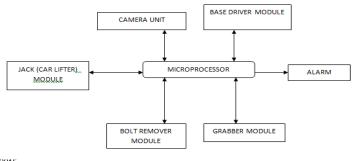
2. CONSTRUCTION

The whole set up is like a circular disc which has four sectors. Sector one driver which drives all the driving unit according to the use, sector two camera section, sector three processor and circuit unit and sector four is power and robust flexible casing.

Sector one Driver unit which controls all the motor activities camera unit fixed at an arm which is 180 degree vertical and

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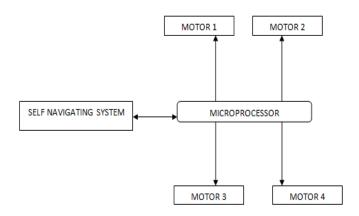 *E-mail : prabhakaranprof@gmail.com*

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horizontal moveable .the the bolt remover which is the main part of the robot it has two motors one is for front and back movement up to 180 degree a twister plate 360 degree which holds the motor of the remover in case of four bolted tyre the plate has four remover sockets containing the remover tool runs under motor of certain rpm capable to remove the nut and hold. And for grabber is one motor for front and back movement and another for grabber the grip action and rotation action of it. Sector two Camera unit which captures the required area and process the required information inside the processor using required IC for this process which organise the movement of the remover .Sector three this is the most sensible sector which has all the circuit boards, and main master processor mother board which controls all the activities of the robot .it is cased properly and the wiring is done and pipelined properly to all the set ups used in this robot. Sector four power is the challenging factor for all the devices .This robot is powered by high voltage batteries which is chargeable and the robot is fixed at the roof of the car it is laminated with solar panels which charges the batteries of the frequently the need of changing the spare tyre is not required whenever it is needed then the robot is used and also powered by chargers to charge the battery. Casing it is the important feature the casing is done by stainless hard metal which is fabricated according to the need of the working. Compaque is the unique feature which makes this robust robot supreme.

3. BLOCK DIAGRAM

Overall Module of ROBOT

The whole working is a step by step process each and every action is achieved one by one in an well organised manner

3.1 STEP-1:

BASE DRIVER MODULE

MOTOR 1   MOTOR 2
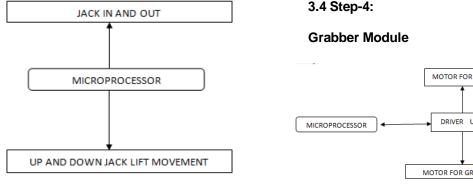
SELF NAVIGATING SYSTEM   MICROPROCESSOR

MOTOR 3   MOTOR 4

Base Driver Module Explanation

The whole set up is a step by step layers Layer one Drive to the wheel and lift .This is the first important step this replacement system will be synchronized to the car using zigbee protocol and accessed by digital display inside the car as a menu option along with the other utilities the defected tyre is selected by the driver through the display. After selection the system is actuated this is the base driver system over it other modules are fitted this is navigated through self navigation system which is pre programmed in the device around the four tyres of the vehicle. When the device is actuated the punctured wheel considered back wheel of a car is defected then the robot from the deck climbs down through slide path .Which is set while constructing the car for this robot to climb up and down. Then the robot will move to the selected wheel which has a defect in it to replace it this is the first action of the robot this is achieved by using four motors connected to four wheels which is used to run the whole set up. This whole part is the lower part of the robot.

3.2 STEP-2

JACK MODULE

JACK IN AND OUT
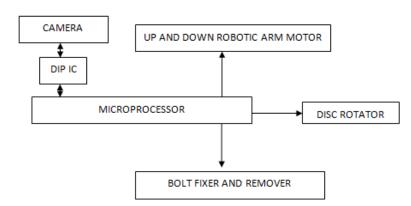
MICROPROCESSOR

UP AND DOWN JACK LIFT MOVEMENT

Jack Module Explanation

Jack used to lift the car up and down to remove and replace the robot according to the certain height, it depends upon the type of the vehicle used which can be programmed according to the requirement
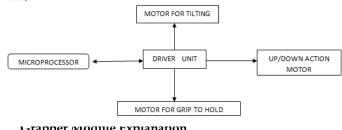
3.3 STEP-3 :

BOLT EXTRACTOR MODULE

CAMERA   UP AND DOWN ROBOTIC ARM MOTOR

DIP IC

MICROPROCESSOR   DISC ROTATOR

BOLT FIXER AND REMOVER

Bolt Extractor Module Explanation

Capturing processing and unscrewing .The whole set up is a circular module this is the upper part of the robot .after lifting the car, camera fixed at the one arm which is 180 degree flexible and rotatable vertically and horizontally will take the snap of the bolt fixed area the picture is processed inside the processor the .consider a tyre fixed with four bolts the camera takes a snap of it. The sockets fixed in the tyre is detected as spots (face detection methodology in camera) using face detection concept under application of DIP IC for processing the remover sockets with motors at fixed at another 180 degree arm rotates its head clock and anti clock wise which has the bolt fixer and remover according to the bolt sockets placed in the tyre .this is used because if the tyre position alters it is easy to fix and remove the bolt. By moving its position back and front, the bolt extractor removes the bolt from the tyre and then the sockets holds the bold and bends back to 180 degree. Layer three is Holding, removing and refitting the tyre.

3.4 Step-4:

Grabber Module

MOTOR FOR TILTING

MICROPROCESSOR   DRIVER UNIT   UP/DOWN ACTION MOTOR

MOTOR FOR GRIP TO HOLD

Grabber Module Explanation

Grabber and holder which is like an ordinary pick and drop robot which is more efficient capable of grabbing tyre from rim and holding a tyre a slight rotating clockwise and anti-clockwise movement to some degrees is programmed because if the tyre is fixed for long time it will be fixed tightly to the rim to remove that this rotation movement is used. After the tyre is removed then an alarm signal is sounded after hearing the sound the work of the driver is to take the tyre out from the grabber and replace with the new tyre then the work will continues as above in reverse manner .to fit exactly to the holes of the tyre and to the rim the slight rotation movement is used to organise the holes. And refitted back again to the car

3.5.STEP-5 :

Back to position. After all the works are done then first the grabber bens and rests inside the circular disc followed by the extractor and then the camera arm fits the dish and the jack pulls down the car and inserted back inside the dish then the whole kit is moved back to the position from where it is placed first and separate sliding path is constructed for this purpose.

4. COMPONENTS REQUIREMENTS AND SPECIFICATION

4.1. MOTORS
Eleven dc motor are used for base driver, front, back,clock and anti clock rotation, for pop and place operations. Then separately minimum four bolds are fitted to fix the tyre so four separate high efficient low rpm dc motors are used to screw or unscrew the bolts .the requirements changes in accordance with the type of vehicle and number of bolts present in it.

4.2. CAMERA
Cameras used here is an high pixel camera which detects the spot where the bolt sockets are present using simple face detection technique used in most of the camera and then the captured image is involved to image processing technique which is achieved through DIP integrated circuit which is an image processing chip and followed through the commands of the microprocessor which process the information and does the extracting work.

4.3. IC
DIP IC(Digital Image Processing Integrated Circuit) which is the important component use to achieve extractor of bolts from tyre which is fixed inside the cameras high efficiency and multi application oriented IC which plays the major role of this robot.

4.4. PROCESSOR
ARM processor is used to control all the operations of the robot which is the highest efficiency processor which controls which manages and organise all the working in a specified manner. Processor programming languages is emulated to perform all the operations of the robot.

5. ADVANTAGES

➢ Fabrication plays major role in this robot this robot is extremely compaque and fits at the roof or dickey of the car. And stainless metals are used for construction of the vehicle.

➢ Half of the power to run this robot is extracted through solar power panels and preserved in batteries and the remaining power is charged through power supply or else if not used fully powered by solar which reduces all the power consumption factors.

➢ Fully automatic which is the key feature for this robot reduces the user work completely.

➢ Robotics and image processing techniques are implemented to achieve maximum percentage of perfection.

CONCLUSION

The overview of this paper work is to embed all the possible technologies to achieve maximum percentage of perfection to replace the defected tyre of the car using robot. Many robots are used in manufacturing of automobiles but this robot will be the best application oriented of automobiles after construction of the car. User friendly actions and easily powered by solar at least one fourth of the power to run the robot. Many advancements are done in robotic field this robot may satisfy all the possible needs to fulfil the requirement.

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