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Solar Operated Car Parking System with Coding

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Abstract: *This project report has shown the concept of automatic car parking system, which can automatically sense the empty space available for parking and according to it displays the number of empty platform available on the LCD. This automated car parking system reduces the time taken to check the space for the vehicles. In this proto we used the infrared sensor s which are placed on each of the floor , to sense the cars. The system is developed using 89S52 Micro Controller. It also uses the worm and worm wheel mechanism for lifting the cars and placing it on the platform, two D.C motors are used , one for rotating the lifting mechanism in 360o and another one for placing and picking the cars using the worm gear attach to its shaft. Our motive of the project was to make parking system which is easy, consume less space, quick technology, self –operated and safety of vehicles.*

Keywords: Infrared Sensor, microcontroller, worm and worm wheel mechanism, LCD display, relays.

I. INTRODUCTION

Nowdays there are more and more multi-storey building are springing up every day, this giving rise to vehicle parking problems. Thus giving rise to vehicle parking problems. Thus there is a limitations of land which leads to cutting down of trees. This has a harsh and adverse effects on the environment. This project aims of saving the ground space required for parking Using the parking system any number of cars can be parked according to the requirement, This microcontroller Based Car Parking System enables enables the parking of vehicles, by displaying the available slots thus reducing the parking space that is used by users. Here in this parking system any number of cars can be parked according to the requirement, making the system very modern and saving the space. The correct incentive for applying automation is to increase productivity, that possible with current human labor levels so as to realize economics of scale. The incorrect application of automation, which occurs most often, is an exercise to replace human labor. Simply put, whereas correct appliance of automation can net as much as 3 to 4 times original output with no increase in current human labor, incorrect application of automation can only save a fraction of current labor level cost. An Automatic car parking system is a smart parking system which will play an important role to reduce traffic in the city. Cars parked callously on the streets limits, the space so with a smart parking system these problems can be solved. Moreover, this kind of system will reduce the manual work and save time. Such a system can be used in a large multilevel building.

There has been some problems realted car parking issues which are: How to control the number of the car inside it, monitoring the movement of car in/out side of the parking lot , to check whether there is a place inside for more cars or not and safety to park. The microcontroller serves as a programming tool to run the whole operation, to reduce the cost in terms of requirement such as job opportunity and to increase security. Moreover, this system is faster, flexible and can meet the market requirement. The aim of this paper is to solve this problems by designing a system to control the parking area using microcontroller.

Whenever a cars is placed on the pick platform the LCD screen displays the empty space available with the help of infrared sensors and microcontrollers. These operate the motor to the specific platform to the vehicle and place the vehicle .the pick platform will return to its initial position. Now the 89S52 microcontroller decrements the value of the count that will display on LCD and displays it on LCD. If the count reaches 0, i.e. if the parking space completely filled, this LCD will display NO SPACE FOR PARKING on LCD. If any vehicle leaves the parking area, the microcontroller will increment the number of count and allows the other vehicles for parking. This project use

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regulated voltage 5V, 500mA power supply. Unregulated voltage 12 V DC is used for relay circuit. 7805, which is three terminal voltage regulators is used for voltage regulation. The bride type full wave rectifier the ac output of secondary of 230/12V step down transformer. They are needed to have parking area in the existing situation where no space for parking the car is available .the purpose of the Microcontroller based car parking system is to specify the usefulness of the hardware and software and software simulated product motivation is car parking system shows usefulness to parking the car.

The rotary structure geometry enables the maximum space for parking rather than ground parking or floor parking. This system can also be built up in underground parking concept which is extremely new concept.

II. Problem Statement

To avoid the ground parking and floor parking these rotary automated car parking system have to be implemented. As this system are automated using microcontroller and infrared sensor it has become easy to locate the free parking space with less hectic to human and safety parking for vehicles. The pick platform rotates 360^0 with the help of dc motors. The system is quick and flexible operation with less human labor and self-operation technology. The vehicle owner only has to place the vehicle to platform and rest operation will automatically completed. Thus this facility is not available in ordinary parking system.

III. Literature Survey

Noor N.M. Z Razak and Mohd Yamani, --car parking system. The smart parking system implemented mainly in the Europe, United State and Japanis developed with the incorporation of advanced technologies and researches from various academic discipline. Now-a-days there is a rapid growth in parking system. manpower is needed for each car parking slot to select a parking slot manually and give direction to drive properly into slot. So, there is a need to develop an automatic parking system which will reduce manual work as well as will be useful for careful parking of cars and other vehicles. Parking system routinely experience parking related challenges, especially in the urban and metropolitian areas. While doing a survey we have found that this automatic car parking system has been proposed by various researchers using different technology .in some paper some researchers have proposed this system using Around View Monitor(AVM). In their paper they have discusses fusion of AVM and ultrasonic sensor, used to detect the vacant parking slot in the automatic car parking system. The AVM provides a virtually 360 degree scene of the car in birds eye view. The AVM helps the driver to maneuver into parking spots. Through the birds eye view. A driver can check for obstacle around the vehicle. First , the parking slot marking detected in the AVM image sequence. a tree structured based method detect the parking slot marking using individual AVM image sequence and image registration technique. Second , empty slot is detected using ultrasonic sensors. The probability of parking slot occupy is calculated utilizing ultra-sonic sensor data acquired while vehicle is passing by parking slots, and finally the selected empty slot is tracked and the vehicle is properly parked in selected empty slot is tracked and the vehicle is properly parked in selected parking slots. some other researchers have discuss this system using another technology i.e. GSM Technology. The functionality of the technology is that the user sends a message to the GSM modem which is placed at parking end. The GSM Modem will send a confirmation message to the user whether the slot is vacant or not. If it is vacant then the user has to message the exact time and duration he/she wants to park the vehicle in the parking slot. Then the GSM modem will send a password and the parking lot number to access the reserved parking lot. Once the confirmation message has been send , the counter for the reservation time will be automatically start for sending message another paper attempt to discuss this system using FPGA Technology. In their paper they have discuss law to implemented an automatic car parking system using FPGA technology. Where the access in parking which is made by barrier, if there are vacancies with the lifting of barrier a ticket is issued with a client code and there starts a timer for measuring the time left in the parking. The analogue signal transferred through a digital analogue converter as input signals in the FPGA. To work with FPGA Xilinx software has to be used.

C. Patel, M. Swami,P.Saikia, S.Shah,--Rotary Automated car parking system. Another paper discusses a system using some digital key along with some robotics technique. When a car enters the entry of the automated car parking

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system. An IR detection subsystem detects the presence. Then the driver is promoted to enter a valid key and to choose the option either parking or retrieving a car. Each key is checked for accuracy and assigned a designated parking slot. Upon entering the correct key, car is picked up along with the pallet from the stack system and placed in the designated spot when drivers return to pick up the carhe enters the valid key for which the system will check in its database and car is return back to the drive way. The stack system will be pull down the pallets to make room for incoming pallets. The system includes robotic lift with motors for picking car and placing in it in the designating spots. Another paper discuss a system where microcontroller 89S51 has been used ,in their paper they have discussed a system a system which automated with the user being given a unique ID corresponding to the trolley being allocated to him/her. The idea is to move and park cars with no disturbance to the already parked cars in the system. Some other researchers have discussed this system using RFID. According to their system, the vehicle owner has to register first with the parking owner and get the RFID tag. When the car has to be parked the RFID tag is placed near the RFID reader, which is installed near the entry gate of the parking lot. As soon as the RFID tag is read by the reader , the system automatically deducts the specified amount from the RFID tag and the entry gate boomer open to allow the cars inside the parking area. At the same time, the parking counter increments by one. Similarly, the door is opened at the exit gate and the parking counter decremented.

Microcontroller based car parking system shitaln B. Dhote, Mamta B. Tayade, Sagar dilip Bharambe, India. In the previous parking system driver manually selects the parking slot and drive into it. This method is useful as a backup tool for failure cases of automatic parking system methods. Manpower is needed for each car parking slot to select a parking slot manually and give direction to drive properly into the slot. There is need of manpower .so this system is replaced by the ultrasonic based sensor are mounted on both side of the front bumper. Adjacent vehicle are detected by using ultrasonic data. This ultrasonic sensor find the adjacent vehicles and driver properly drive into the free space between that adjacent vehicles. Using the multiple echo function, parking space detected more accuretly in real parking environment. These method fail when there is no adjacent vehicles and in slanted parking situations where adjacent surface vehicle are not perpendicular to the heading direction of ultrasonic sensors. Another method is parking slot Marking-based methods. In this method vehicle mounted cameras , are used . it simply tracks the parking slot marking present on the road. The distance between point and line-segment is used to distinguish guideline from recognized marking line segments. Once the guideline is recognized, T-shape template matching easily recognizes dividing marking line-segment. This method fails where parking slot marking are not present. Scanning lader based system is implemented between vehicles to recognize free space parking slot .this system consist of range data preprocessing comer detection and target parking position designation. The major disadvantages of this system is the expensive price of the sensor. A photomic-mixer- Device(PMD) camera is used to scan parking –scene to detect free parking slot. PMD sensor allows referring to a large number of spatial point measurements detailed representing cuts of the observed scene. So we moved onto infrastructure based method. in this method , bird eye view camera is used which is used which helps to track the vacant parking slot.

IV. DESIGN PROCEDURE

After the text edit has been completed, the paper is ready for the template. Duplicate the template file by using the Save As command, and use the naming convention prescribed by your conference for the name of your paper. In this newly created file, highlight all of the contents and import your prepared text file. You are now ready to style your paper; use the scroll down window on the left of the MS Word Formatting toolbar.

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4.1 Frame of Model

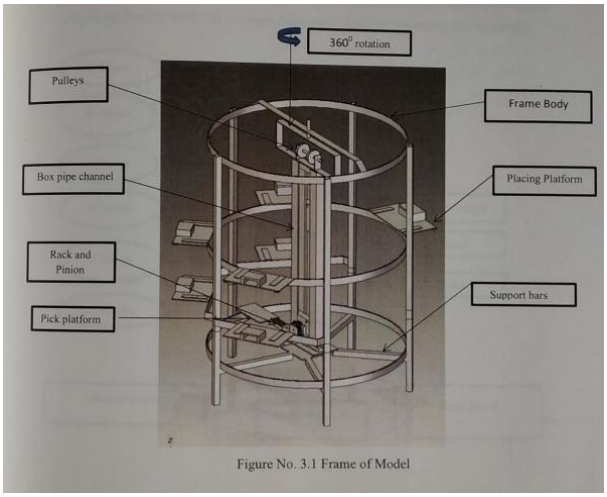

Figure No. 3.1 Frame of Model

A. Principal of Operation

The system is fully automated It includes circular structure platform made from material cast iron , Rack and pinion mechanism , two pulleys, cotton thread rope(used for proto purpose only), 6 infrared sensors, three DC motors , step down transformer , Microcontroller PIC16F877A ,6 relays , 6 limit switches, 12v battery for power supply.

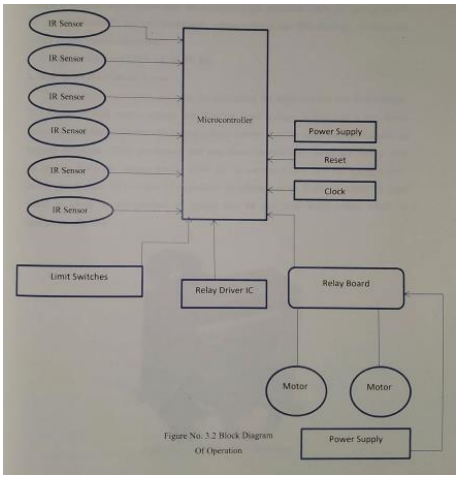

Figure No. 3.2 Block Diagram Of Operation

B. Power Supply Circuit

The name itself indicates that this circuit is used to supply the power to other electrical and electronic circuit or devices. There are different types of power supply circuits based on the power they are used to provide for devices. For example, the micro-controller based circuits, usually the 5 V dc regulated power supply circuits are used , which can be designed using different techniques for converting the available 230 AC power to 5V DC power. Generally the converters with output voltage less than the input voltage are called as step-down converters.

C. Channel Section

Three motors are used ; one motor is coupled to box pipe channel section at bottom to rotate the section in 360^0 second motor is attached to pinion gear shaft which gives to and from motion to the pick platform as shown in the following figure 3.3 third motor is attached to pulley shaft.

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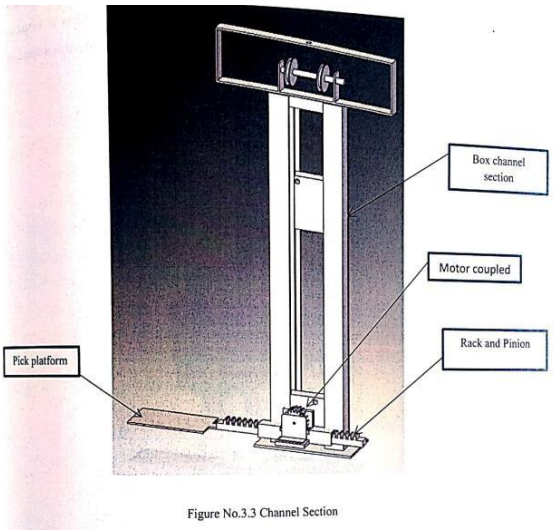


Figure No.3.3 Channel Section

The pulley lifts up and lifts down the vehicle platform. Limit switches are used on each floor to stop the platform on required floor. This is automatically operated.

D. Limit Switch

A typical limit switch consists of a switch body and an operating head. The switch body includes electrical contacts to energize and de-energize a circuit. The operating head incorporates some type of lever arm or plunger, referred to as actuator. The standard limit switch is a mechanical device that uses physical contact to detect the presence of an object (target). When target comes in contact with the actuator, the actuator is rotated from its normal position to the operating position. This mechanical operation activates contacts within the switch body. Figure 3.4 shows the limit switch.

1. Infrared Sensor
2. Relay
3. LCD Display
4. Circuit Diagram

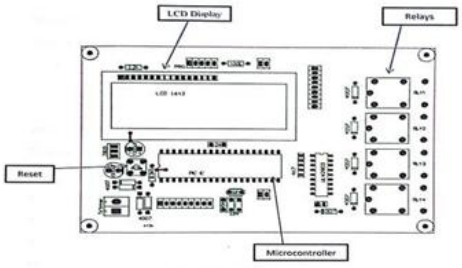
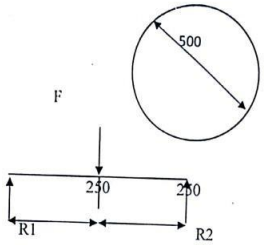


Figure no. 3.5 Top side of circuit

4.2 Design Calculation

A. For Material Selection

(Area of frame=500mm^2)



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Total load on frame is about 5 kg F=5x9.81

F=49.05N

This load is Applied at the center as shown in

From fig. R1+R2=F and

$\sum M_{R1}=0$

Fx250-R2x500=0 49.05x 250-R2x500=0

Therefore,

R2=24.525 R1+24.525=49.05 R1=24.525 M_0=24.525x250 M_0=6131.25

Y=b/2(b= width of angle used)

=40/2 =20mm

$I=bd^3/12$

$=d^4/12 =(40)^4/12 =213333.33mm^4$

Stress on Frame,

$б =M_b y/I$

$б =(613.25x20)/213333.33$

$б =5.74N/mm^2$

$б = S_{yt}/fos$ therefore, $S_{yt}= б$ xfos

=5.74x10.....(assuming fos=10)

$=57.48N/mm^2$

Selecting material GCI 15 having Tensile strength(min)=150N/mm^2

Therefore all assumptions are in safer state.

Material Selection for Pulley Shaft.

Table No. 3.9 Material Specifications

Designation	UTS (N/mm^2)	YEILD STRENGTH (N/mm^2)
15C8	440	240

ASME code for design of shaft since the loads on most shafts in connected machinery are not constant, it is necessary to make proper allowance for harmful effects of load fluctuation. According to ASME code permissible values of shear stress may be calculated from various relations.

$F_{s(allowable)} =0.18F_{(ut)} =0.18x440 =79.2 N/mm^2$

OR

$F_{s(actual)}=0.3F_{(yt)} =0.3 x 245= 73N/mm^2$

$F_{s(actual)}<F_{s(actual)}$

Considering minimum of the above values

This is allowable value of shear stress that can be inducted in shaft material for safe operation.

4.3 Motor Selection

For phase motor POWER= 2π n T/60 Consider motor of 30rpm

Consider total weight on central shaft

Force=25 x 9.81 =122.25N

Torque= forces x perpendicular distances(radius of base plate)

Diameter of base plate 155mm=0.0775m T=122.25x0.775

T=9.5Nm

P=2 x 3.14x30x9.5/60

P=30watt

Hence we used the motor of 30 rpm and 48 watt

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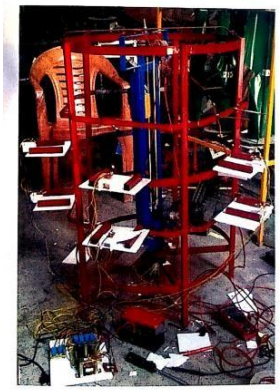
For lifting Motor POWER= 2 πn t/60
Consider motor of 100 rpm
Total weight to lift is about 6 kg including weight of vehicle.
Force=6x 9.81=58.86N
Torque=forces x perpendicular distances (radius of center pulley)
Central Pulley to lifting shaft 50mm=0.5m T=58.86 x 0.025
T=1.475Nm
P= 2 x 3.14 x 100 x 1.475/60
P=15.4 watt
Hence we used the motor of 100rpm and 25 watt
For placing Motor POWER = 2 π n T/60
Consider motor of 60 rpm
Total weight to push is about 4.5kg including weight of rack and pinion
Force= 4.5 x 9.81 =44.14N
Torque= forces x perpendicular distance (Radius of center pinion)
Pinion diameter 45mm= 0.45 m
T=44.14 x 0.0225
T=0.993Nm

V. EXPERIMENTAL SETUP

After the successful assembly of all parts and circuits the trail was taken on the proto, all the possible parameters were tested.

1. Is the platform returning to its initial position?
2. All the IR sensors working properly and sensing the empty platform.
3. The channel section is rotating in 360^0 or not.
4. Does the programming need any variation or not.

Actual images of model



VI. RESULT

Case 1 A lift mechanism is used to park the car on the first floor which is implemented using motor. Motor is rotated clockwise it stops when it reaches on the first floor according to the priority basis. It shows in the Figure 6.1

Case 2 When all the cars parked on the first floor then the lifter moves on the second floor which is implemented using motor. A motor is rotated clockwise it stops when it reaches on the second floor. A car is parked on the first floor according to the priority basis. It shows in the figure 6.2

Case 3 When all the cars parked on the first floor as well as second floor i.e. no space is available, then it displays no space. It shows in the figure 6.3

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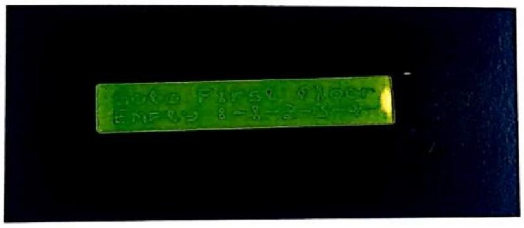

Figure No.6.1 When Space Is Available On First Floor

Figure No.6.2 When Space Is Available On Second Floor

Figure No.6.3 When No Space Is Available

VII. CONCLUSION

Automatic multi-stored car parking system is very good substitute for car parking area. This automated car parking system enables the parking of vehicles and thus reduces the time taken to check the space to be used by displaying the spot where the space for parking is available on an LCD display by using IR sensor at the empty platform. This automated car parking system enables the parking of vehicles around 3600 thus consuming less space than ordinary parking system. The system makes more flexible , safety, less human labor and less hectic to vehicle owner.

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