Solar Powered Automated Parking System

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Abstract- As a key part of an intelligence based vehicle technology, an automated parking has become a well known research subject. Automated parking technique can do parking activities securely and rapidly without a driver and can improve driving relief, while extraordinarily decreasing the likelihood of stopping mishaps. This paper describes parking slot detection based automated parking system. To build the usage of parking slots and convenience, machine vision using infrared sensors strategy is acquainted to build up a way to detect empty parking slot for the parking. In the proposed system, the driver needs to leave the vehicle in the predetermined opening close to entrance and the individual can leave the vehicle without looking for an empty space along these lines diminishing the ideal opportunity for leaving and utilizing accessible space. The mechanical module lifts vehicle from distributed passage leaving space and park the vehicle in the empty slot and the leaving residential area and data is sent to the driver. The mechanized parking technique will have crucial advantages like, lessening congested roads, time saving, and fuel saving.

Keywords: intelligent vehicles, automatic parking system, infrared sensor.

I. INTRODUCTION

Over the decades our country has been developed drastically, now we are in this state that we have a lot of well contacted roads, commercial building and increasing number of automobiles. While parking these automobiles in parking space we use the manual procedure of parking. Which most of the cases is unplanned and lack of discipline. Due to this, people can park their cars anywhere they want to, which creates a mess as people do not follow the particular cue most of the time. As a result of this, a huge traffic jam takes place in that place. While parking in and retrieving car due mismanagement cars can get dent by bumping with each other as there is lack of sufficient space. This leads to arguments, fights among people which sometimes makes huge traffic jam. This is also an economical loss as we need to repair our damaged car and also cars consumes extra fuel while parking in or out. Traffic jam is an issue here as it kills our precious time. Due to this chaos in parking our valuable time gets wasted. It harms the students, office going staffs and emergency patients to a great extent.

Parking has been a major problem in our cities due to the two reasons i.e. lack of space and unauthorized parking. Unregulated growth in the number of vehicles, compounded with unplanned parking areas in small localities such as residential complexes and office plazas make it a daunting exercise to find a parking spot for an automobile. This leads to people parking in any empty spot they can find [1]. This issue is critical when a spot assigned to a particular person or resident of a building gets occupied by a visitor's vehicle. This kind of situation often causes disputes in residential areas and can cause a nuisance such as a traffic jam in public spaces. Given that the problem of parking arises due to inappropriate parking of vehicles at the parking area, a well-managed parking lot with proper allocation of parking slots for both resident and visitor vehicles coming to the locality can prevent disputes and help traffic flow well [2].

While a majority of the world's current electricity supply is generated from fossil fuels such as coal, oil and natural gas, these traditional energy sources face a number of challenges including rising prices, security. Solar energy production does not require fossil fuels and is therefore less dependent on this limited and expensive natural resource [3]. Although there is variability in the amount and timing of sunlight over the day, season and year, a properly sized and configured system can be designed to be highly reliable while providing long-term, fixed price electricity supply [4].

II. RELATED WORK

Various researchers have focused on the issue regarding automatic parking system. Few of them are described here,

In "Fully Automated Valet Car Parking System", Mr. T. Joby Titus S. Abhisheik, V. Balakrishnan Jemy Sam and M. Mohan proposed that the designing of a system for the automated parking of cars in which human involvement is eliminated. The car can be lifted by using robotic arm which is connected with dc motors. The PIR sensor detects the presence of car. The RFID reader reads the tag value which contains user's information is attached to the user's vehicle. The robotic arm which is controlled

by arduino starts operating once the user parks the vehicle in entrance slot [1].

In a paper "The use of parking lots to solar-charge electric vehicles" by Pedro Nunes , Raquel Figueiredo B and Miguel C. Brito proposed the potential of the parking solution, starting with a concise overview discussing the technical, environmental and financial issues constraining the development of solar parking slots [2].

Abhishek Belsare, Shubhangi Jawalkar, Jennifer Kachhap and Reshma Padwal in their paper "Vacant parking space detection system" proposed the progress of computer vision techniques, many video surveillance systems provide new kinds of intelligent functions, like object detection and tracking. Using this it will be possible to design a system which will monitor empty spaces in parking lots using video surveillance, which will help drive park a car efficiently [3].

Dr Y. Raghavender Rao in his paper "Automatic Smart Parking System using Internet of Things (IOT)" proposed Smart Parking System (SPS) which enables the user to find the nearest parking area and gives availability of parking slots in that respective parking area and it mainly focus on reducing the time in finding the parking lots and also it avoids the unnecessary travelling through filled parking lots in a parking area. Thus it reduces the fuel consumption which in turn reduces carbon footprints in an atmosphere [4].

Holger Banzhaf, Dennis Nienh, Steffen Knoop, J. Marius Zollner, suggested that, In the near future, humans will be relieved from parking. Major improvements in autonomous driving allow the realization of automated valet parking (AVP). It enables the vehicle to drive to a parking spot and park itself. This paper presents a review of the intelligent vehicles literature on AVP. An overview and analysis of the core components of AVP such as the platforms, sensor setups, maps, localization, perception, environment model, and motion planning is provided. Leveraging the potential of AVP, high density parking (HDP) is reviewed as a future research direction with the capability to either reduce the necessary space for parking by up to 50% or increase the capacity of future parking facilities [6].
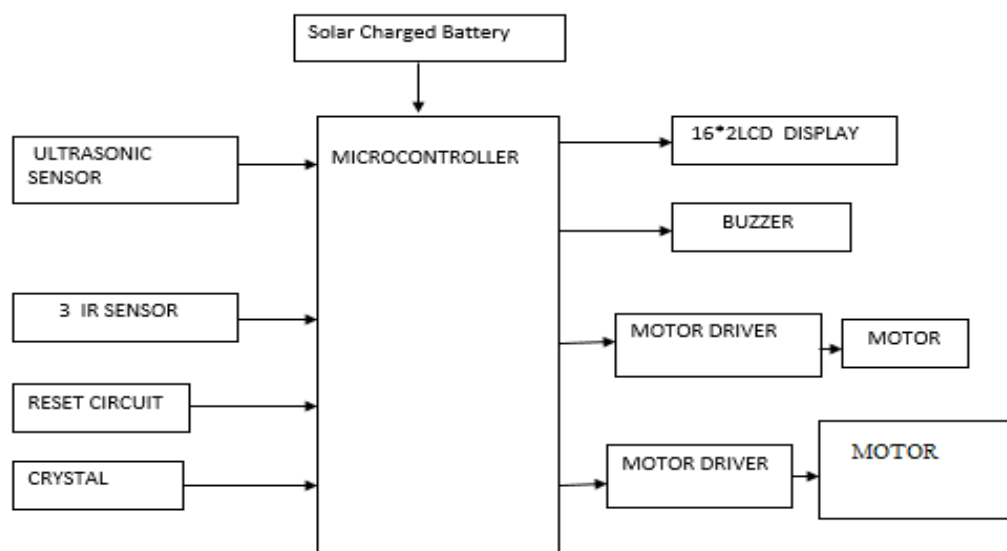
III. PROPOSED SYSTEM

Fig.1: Block diagram

A. BLOCK DIAGRAM DESCRIPTION:

The system proposes an automated car parking system in which human involvement is eliminated. In this project parking robot towing vehicle with the help of mechanism build up using DC motors. Robot search slot either Occupied or Available with the help of an ultrasonic sensor. Robot parks vehicle at the appropriate available slot closest to the OUT sign (Exit) and returned to allocated slot Display the slot numbers where vehicle has been parked on the LCD. Robot always follows a specific path with the help of an infrared sensor. When robot task is done then it comes in their allocated parking slot and gets charged automatically using solar panel.

IV. SYSTEM FLOW
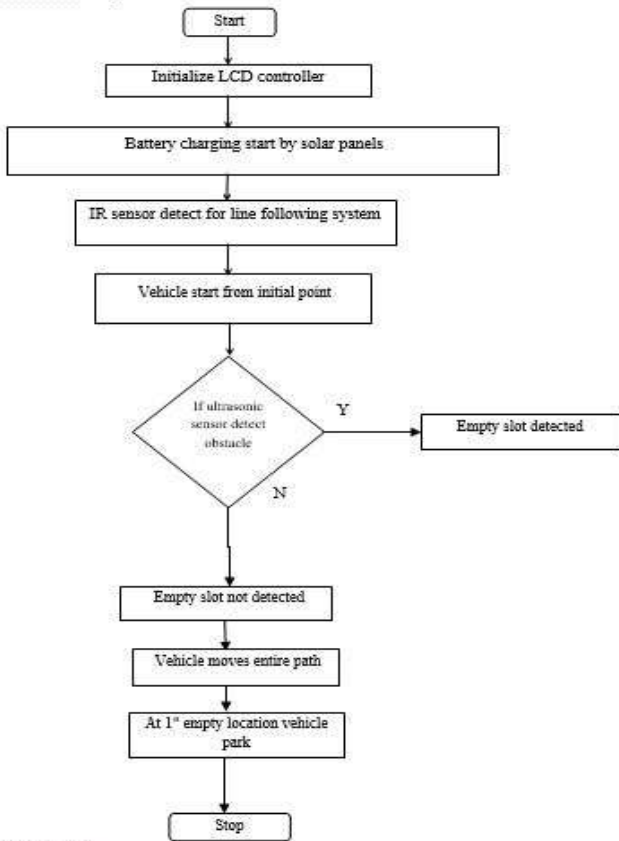
A. Flowchart of Main System

Fig.2: Flowchart of Main System

B. Flowchart for Line Follower System
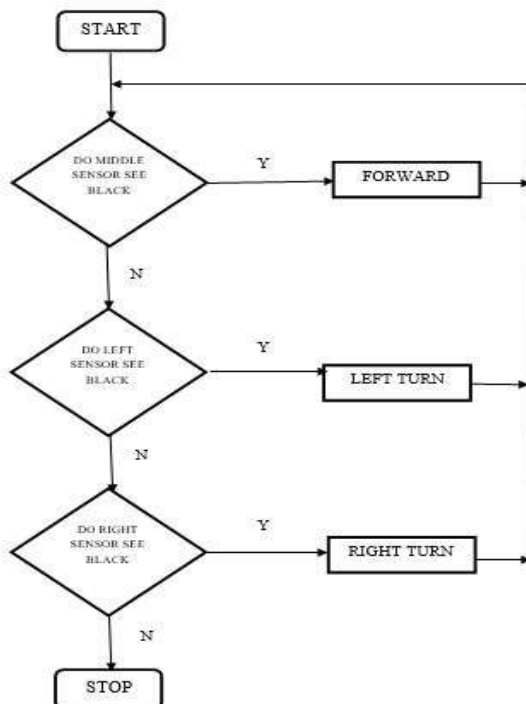

Fig.3: Flowchart for line follower system

Algorithms:
A. Algorithm of Line follower System

Step 1: Start.
Step 2: If middle sensor sense black then go forward.
Step 3: If left sensor sense black then turn left.
Step 4: If right sensor sense black then turn right.
Step 5: Stop.

B. Algorithm of Main System
Step 1: Start.
Step 2: Initialize LCD controller
Step 3: Battery charging start by solar panels
Step 4: IR sensor detect for line following system
Step 5: Vehicle start from initial point
Step 6: If ultrasonic sensor detect obstacle then empty slot is noted.
Step 7: Vehicle moves entire path
Step 8: At 1st empty location vehicle park
Step 9: Stop

V. RESULTS AND DISCUSSION

The prototype of the system is shown in figure 4. The prototype was tested in the laboratory. The parking slots are drawn on a paper and pasted on the floor. There are 9 slots each slot approximately of dimensions 30cm×45cm. During the process of parking if any of the slot between 7th, 8th or 9th any slot is caught empty, then robot parks the vehicle on that parking slot through reverse operation. When the robot starts, first in process it picks up the vehicle through the motor. There are 11 node lines through which robot operate either forward or reverse. In 5th node, robot turns right till it senses 6th node line. When robot senses 6th node line then it goes forward up to 7th node line. When robot senses 7th node line, robot again takes right turn. The 8th and 9th node lines are for forward going process. 10th node line is a last line when running the whole process, simultaneously robot senses parking slot itself through ultrasonic sensor and displays the message on LCD. Robot can charge through solar energy. The 12V battery charges either through solar energy or direct AC power supply through 12V dc transformer. An alternative source for battery charging is provided for giving reliable and accurate output.
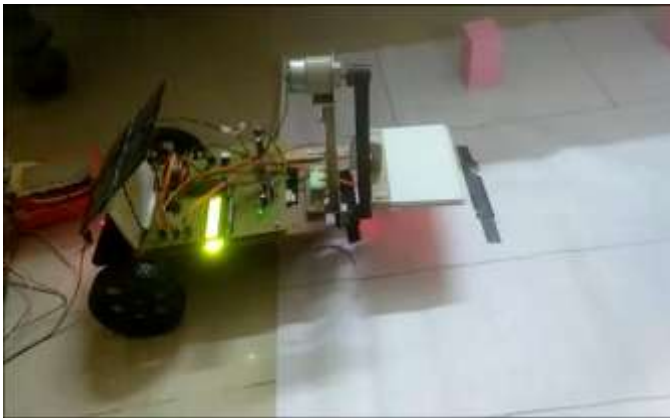
Fig.4: Prototype of Automated Parking System

Fig.5: Battery Charging through Solar Panel

VI. CONCLUSION

Proposed technique of automated parking system presented in the paper makes the parking of vehicles at given parking slot increasingly proficient. The searching of parking slot was implemented through automated searching method using infrared sensors and the prototype was tested experimentally. The intelligent searching of free parking slot leads to efficient utilization of available space with less efforts and more accuracy. In addition, the system also leads to minimization of traffic problems in public space and time as well as fuel saving.

REFERENCES

[1]. Mr. T. Joby Titus S. Abhishek V. Balakrishnan Jemy Sam and M. Mohan "Fully Autonomic Valet Parking System Architecture", Proceedings of the IJIRST National Conference on Networks, Intelligence and Computing Systems, March 2017.

[2]. Pedro Nunes, Raquel Figueiredob and Miguel C. Brito, "The use of parking lots to solar-charge electric vehicles", Renewable and Sustainable Energy Reviews, 2016,pp. 679–693.

[3]. Abhishek Belsare, Shubhangi Jawalkar, Jennifer Kachhap and Reshma Padwal, "Vacant Parking Space Detection System", International Journal of Advance Engineering and Research Development, **V**olume 3, Issue 3, March -2016,pp. 729 –731

[4]. Dr. Y. Raghavender Rao, "Automatic Smart Parking System using Internet of Things(IOT)", International Journal of Engineering Technology Science and Research, Volume 4, Issue 5, May 2017,pp. 2394 – 3386.

[5]. Kyoungwook Min and Jeongdan Choi, "A Control System for Autonomous Vehicle Valet Parking" proceedings of 13th International Conference on Control, Automation and Systems (ICCAS 2013) Oct. 20-23, 2013.

[6]. Holger Banzhaf, Dennis Nienh , Steffen Knoop, J. Marius Zollner, "The Future ofParking A Survey on Automated Valet Parking with an Outlook on High Density Parking", 2017 IEEE Intelligent Vehicles Symposium (IV) June 11-14, 2017, Redondo Beach, CA, USA.

[7]. Ms. Marzia Alam, "Automated Car Parking System", Thesis Submitted in Degree of Bachelor of Science in Electrical and Electronic Engineering, Spring 2017 BRAC University Dhaka, Bangladesh.

[8].https://www.engineering.com/SustainableEngineering/RenewableEnergyEngineering/SolarEnergyEngineering/WhySolarEnergy/tabid/3893/Default.aspx, Accessed on 22-08-2019.

[9].https://www.quora.com/How-do-piezoelectric-buzzers-work, Accessed on 24-09-2019.

[10]. https://medium.com/@jeremymartin071/advantages-and-disadvantages-of-automated-Parking-system-d725492fd67f, Accessed on 23-10-2019.