Solar Yard Parking System

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Abstract— **Now a day's vehicle parking is an important issue and day by day its necessity is increasing. We are still using the manual vehicle parking system and that is why we are facing problems like wastage of time and fuel finding free space around the parking ground when we need to park our vehicle which requires a good amount of lighting. Another issue is chaos that happens while parking because there is no particular system anyone can park anywhere that sometime causes damage to the vehicles while moving out or in the parking lot. Security is also an issue there. To solve these problems we are introducing new car parking system.**

Keywords—IOT, Solar panels, sensors, vehicle detection, arduino.

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 vehicle due mismanagement vehicles can get dent by bumping with each other as there is lack of sufficient space. This leads to arguments, fights among people which sometimes make huge traffic jam. This is also an economical loss as we need to repair our damaged vehicle and also a vehicle 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.

Therefore we need a solution which can overcome these problems. Here we are introducing Solar Yard Parking System as a solution of these problems as well as a replacement to the manual yard parking systems at commercial spaces. This system not only saves time and money, it can also save the energy.

As we are advancing with time, the manual vehicle parking system in commercial spaces is creating hurdle which is causing wastage of time and some economic losses as well.

Fig;1: Google Maps - John Deere India Pvt. Ltd Shikrapur, Sanaswadi, Maharashtra 412208

II. WORKING PRINCIPLE

When a vehicle enter the parking,TF Mini sensor will detect the vehicle. The working range of TF Mini sensor is 0.3m-12m and operating range 0-60°C.As the vehicle is detected, the signal is send from arduino to servo motor and barrier gate is opened.
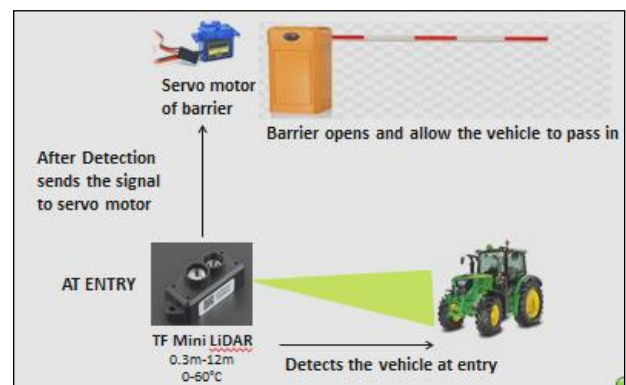

Fig.2: Detection of vehicle and barrier opening

When the vehicle enters in, the LCD display will display the empty parking slots. The driver will viewed the empty slot from LCD screen and park the vehicle in respective slot.
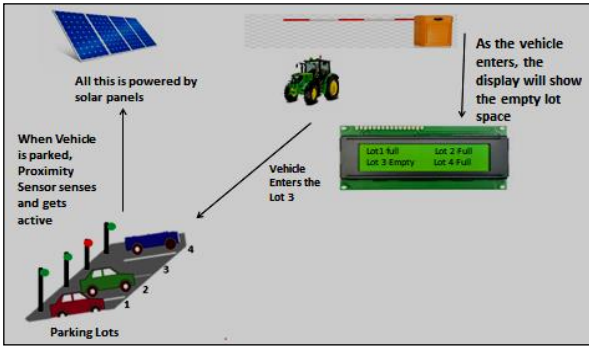
Fig.3:Availability of lot

All the equipment used in the parking system i.e. TF Mini sensor, servo motor, LCD display, proximity sensor are solar panel operated.

III. LAYOUT AND ARCHITECTURE

The layout of the parking system to be used for tractor parking in John Deere Company is shown in Fig.1.The layout shows the overall land available for parking, positioning of different sensors, Solar panels,etc as in Fig.4.
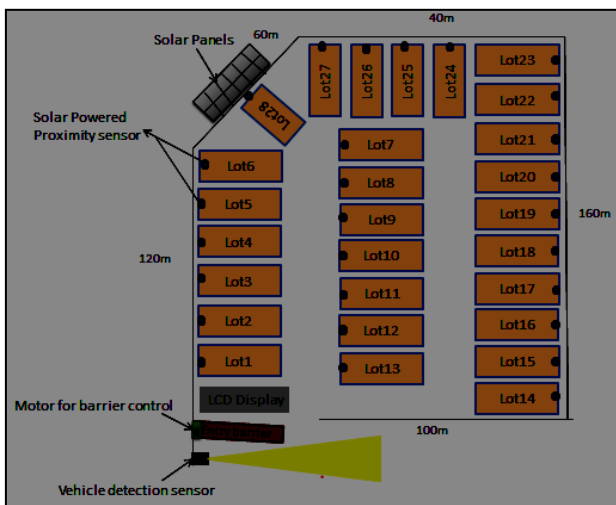

Fig.4: Layout of Solar Parking System

The flow chart of the working of parking system using IOT is shown in Fig.5. Firstly, vehicle detection sensor senses the vehicle entering and opens the barrier.The proximity sensor, LCD display, detection sensor, motor for barrier control are solar operated. When the vehicle enters into respective lot the proximity sensor senses and gets activated. LCD will display occupied lot from the signal of proximity sensor. When the vehicle exists from the lot, proximity sensor deactivates and shows the empty lot on LCD.
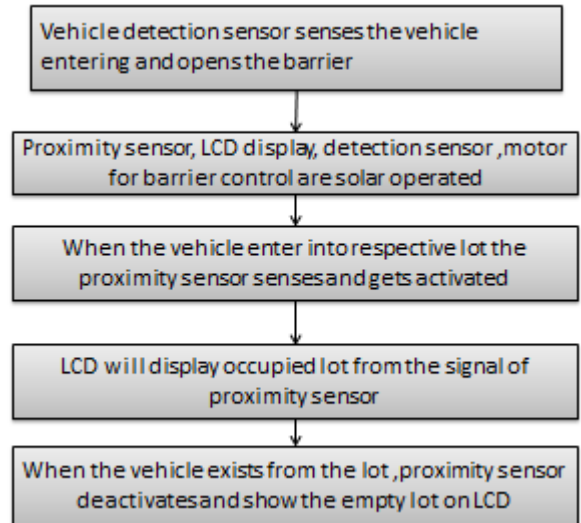

Fig.5: Architecture flow of the parking

IV. ANALYSIS

After designing the parking system, it is necessary to find the impact of automated parking on various parameters. The various parameters taken into consideration is distance travelled to parked the vehicle, search time taken for parking, fuel consumption,CO_2 emission and fuel cost.

A. Assumptions:

There are certain assumptions to be taken into account for analysis purpose. Following are the assumptions:

1) Speed is assumed 10Km/hr=10X2.78=27.8m/sec

2) Fuel Consumption for medium to heavy duty vehicle ranges from 30-45Litre/100Km. We assumed it 30.1Litre/100Km

3) CO_2 emission rate for 1 Litre of diesel is 2.68Kg/Litre.

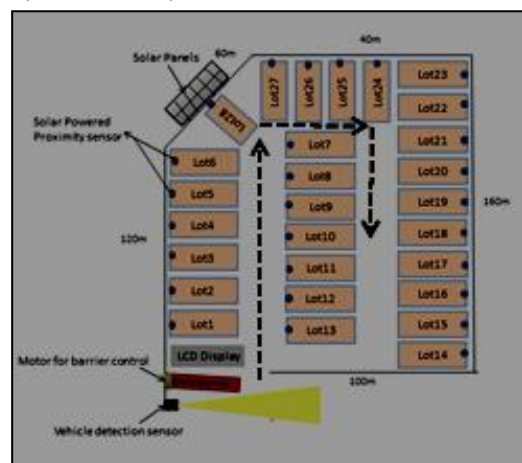4) Cost of diesel is Rs.76.99/Litre.

B. Analysis without system:

Fig.6.Search for empty lot without system

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For Lot 18 the driver has to move around to search for empty lot.

1) **Distance covered**=300m
2) **Search time**= 300/2.78=107.9sec
3) **Fuel Consumed** =300/3322.25=0.0903Lit
4) **CO_2emitted**=0.0903 X 2.68=0.24Kg
5) **Fuel Cost**=0.0903 X 76.99=Rs.6.9521

C. Analysis with system:
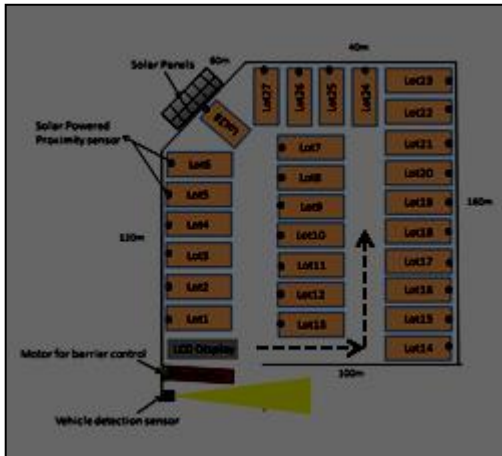

Fig.7. Search for empty lot with system

For Lot 18 the driver will move directly toward Lot no 18.

1) **Distance covered**=160m
2) **Search time**= 160/2.78=57.554sec
3) **Fuel Consumed** =160/3322.25=0.0482Lit
4) **CO_2emitted**=0.0482 X 2.68=0.129Kg
5) **Fuel Cost**=0.0482 X 76.99=Rs.3.71

D. Comparative Results:

The table below shows the comparative study of parking system with and without IOT and impact of it on various parameters. Here the parking of lot no.18 is taken into consideration. Based on it, distance travelled for parking, search time, fuel consumption, CO_2 emission and fuel cost are calculated.

Cases	Distance (m)	search time(min)	fuel consumption (lit)	co2 emission (kg)	fuel cost(INR)
without system- Lot18	300	1.798	0.0903	0.24	6.9521
with system - Lot18	160	0.959	0.0481	0.129	3.71

Table.1.Comparative result of various parameter with and without system
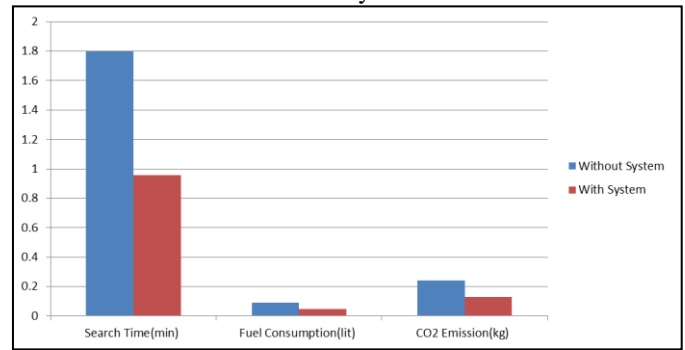

Fig.8.Comparasion of important parameters with and without system

V.   ADVANTAGES

- Reduces the time for searching the empty parking space.
- Fuel of vehicle is reduced.
- Eco-friendly and lowers the energy consumption.

VI.   CONCLUSION AND FUTURE SCOPE

Conclusion

- Efficient solution for parking the vehicle with low energy and fuel consumption.
- The time for driver is reduced to find the empty parking space.
- Solar energy makes system eco-friendly.

Future Scope:

- RFID scanning for identifying the type of vehicle (tractors, trucks, etc.) in yard parking.
- Camera can be installed for visual empty lot detection.
- Solar panels can be substituted with solar paints for power generation.

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