Smart Car Parking Space Indicator with Security Facility & Energy Saving

Rahul Raj[1] Patel Kartik[2] Chudgar Jay[3] Rathod Paras[4] Patel Kashyap[5]
[1,2,3,4,5]B.E. Student
[1,2,3,4,5]Department of Electrical Engineering
[1,2,3,4,5]SAL Institute of Technology & Engineering Research, India

Abstract— This project work is done in order to overcome the problem of parking in city. We live in modern world where maximum people uses cars and in upcoming time the rate of cars that need is also increasing. So there is traffic in parking area due to maximum cars enters in parking area. To overcome this problem, we are working on this project. We are using sensors and latest technology to solve this problem. The sensors are using for allocation of space for parking of car. We have to program for this project. We keep in mind about energy saving and try to save energy in project as possible. The Arduino is integrated with IR sensor to work for detection of empty space for parking. We use motion sensors to save energy. Light operates when cars or person enters in second floor of parking area So that energy is saved in our project. There is heavy rush in parking area. This project helps to reduce traffic in parking area. At first we were using Arduino Uno but due to the limited amount of pins for connection and future expansion we decided to use Arduino MEGA for this project. We have also added Stepper motor on entrance and exit which are operated using two IR sensors each. When a car enters the parking lot the first IR sensor senses it and commands stepper motor to open the gate and when the car is going inside the parking lot the second IR sensor senses it and commands stepper motor to close the gate. We have also added the second floor for the customers who are parking their cars for long term parking. If there is no movement on the second floor there is a motion sensor if there is no movement then the motion sensor will not detect the motion and it will cut off the supply on second floor.

Key words: Smart Parking Space Indicator, Security Facility, Energy Saving

I. INTRODUCTION

The requirement of cars are growing rapidly for professionals which leads to increase in demands of cars. Maximum people go with cars that causes parking problem the car owner. They park their cars here and there which leads to problem for other public. It is a major problem in metro cities where businessmen wants to move with car .The problems are increasing with time. So it is nacesssary to make project on it. And we afford to reduce problem by making this project .This project help in all respect to this problem. When our project will made, it makes more advantage for parking of car.

II. AIM & OBJECTVES

The main aim of our project is to overcome the problem of parking. Cars need parking .It takes lot of space so where to park is problem when people drive cars. IF people parked their car on road that leads to heavy traffic in road. So. IF somebody has urgent work, then they become late for their work. Time is precious for all. So, We understand the problem of public and meet the demand of smart parking by preparing project on it. Conventional parking system, when cars enter in parking area then if parking area is huge then there is great problem to know where to park for car owner and watchman suffers from problem to give direction for parking .Our objective is to solve the problem of parking by using Latest technology.

A. Benefits

There are several advantages of employing a car park system for urban planners, business owners and vehicle drivers. They offer convenience for vehicle users and efficient usage of space for urban-based companies. Automated car park systems save time, money, space and simplify the often tedious task of parking. Auto car lifts move vehicles into safe and secure storage areas until they are needed.

B. Maintenance & Service

Service intervals vary for automated car parking systems, depending on the type of machines used and their usage. Parking systems should be serviced at least once a year, and up to four times a year for high traffic areas or for valet parking. In addition, regular cleaning is mandatory to keep the car parking system in great working order, especially with the problems posed by weather (salt on the road can spread to lifter platforms and cause severe damage if not removed. A reputable car parking company will regularly clean all critical elements of its automated parking system, including the car lifters top and bottom, all concrete pits, all posts resting on the concrete, and the entire concrete floor in the parking area.

III. WHAT IS INTELLIGENT CAR PARKING SPACE INDICATOR

This is full automatic parking space indicator. The model is based on arduino uno. When any object or car come outside the parking, the system will goes on .and shows how many space available for the parking.it can helpful, when car parking is full, so extra cars will not come in the parking.

A. Materials/ Tools Required

- IR sensors
- Arduino UNO
- Liquid cristal display
- Jumper wire
- Arduino MEGA
- Steper motor
- Driver
- Motion sensor

B. IR Sensor

1) Principles of Operation

We have already discussed how a light sensor works. IR Sensors work by using a specific light sensor to detect a select light wavelength in the Infra-Red (IR) spectrum. By using an

LED which produces light at the same wavelength as what the sensor is looking for, you can look at the intensity of the received light. When an object is close to the sensor, the light from the LED bounces off the object and into the light sensor. This results in a large jump in the intensity, which we already know can be detected using a threshold.

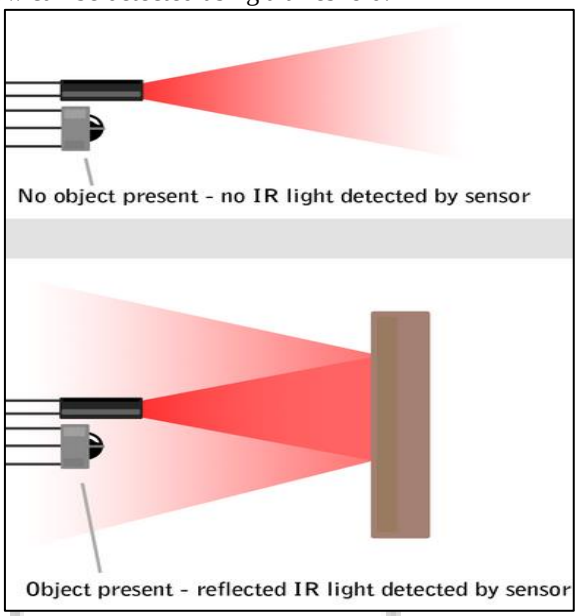

Fig. 1:

2) Detecting Brightness

Since the sensor works by looking for reflected light, it is possible to have a sensor that can return the value of the reflected light. This type of sensor can then be used to measure how "bright" the object is. This is useful for tasks like line tracking.

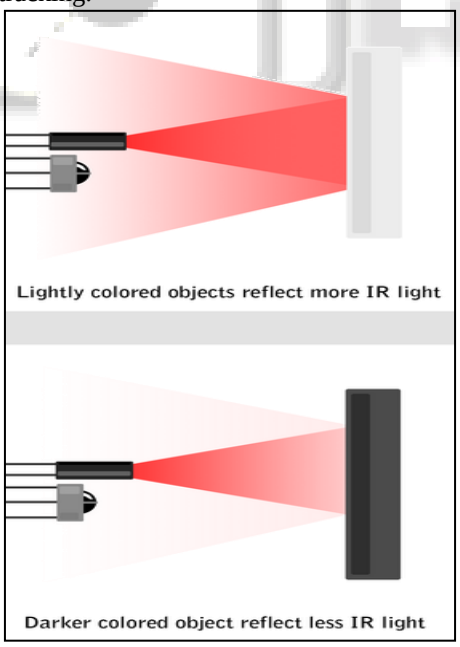

Fig. 2:

C. Arduino Uno

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter. Revision 2 of the Uno board has a resistor pulling the 8U2 HWB line to ground, making it easier to put into DFU mode. Revision 3 of the board has the following new features: 1.0 pinout: added SDA and SCL pins that are near to the AREF pin and two other new pins• placed near to the RESET pin, the IOREF that allow the shields to adapt to the voltage provided from the board. In future, shields will be compatible both with the board that use the AVR, which operate with 5V and with the Arduino Due that operate with 3.3V. The second one is a not connected pin that is reserved for future purposes. Stronger RESET circuit.•Atmega 16U2 replace the 8U2.• "Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform; for a comparison with previous versions, see the index of Arduino boards. Summary Microcontroller ATmega328 Operating Voltage 5V Input Voltage (recommended) 7-12V Input Voltage (limits) 6-20V Digital I/O Pins 14 (of which 6 provide PWM output) Analog Input Pins 6 DC Current per I/O Pin 40 mA DC Current for 3.3V Pin 50 mA Flash Memory 32 KB (ATmega328) of which 0.5 KB used by bootloader SRAM 2 KB (ATmega328) EEPROM 1 KB (ATmega328) Clock Speed 16 MHz Schematic & Reference Design EAGLE files: arduino-uno-Rev3-reference-design.zip (NOTE: works with Eagle 6.0 and newer) Schematic: arduino-uno-Rev3-schematic.pdf Note: The Arduino reference design can use an Atmega8, 168, or 328, Current models use an ATmega328, but an Atmega8 is shown in the schematic for reference. The pin configuration is identical on all three processors. Power The Arduino Uno can be powered via the USB connection or with an external power supply. The power source is selected automatically.

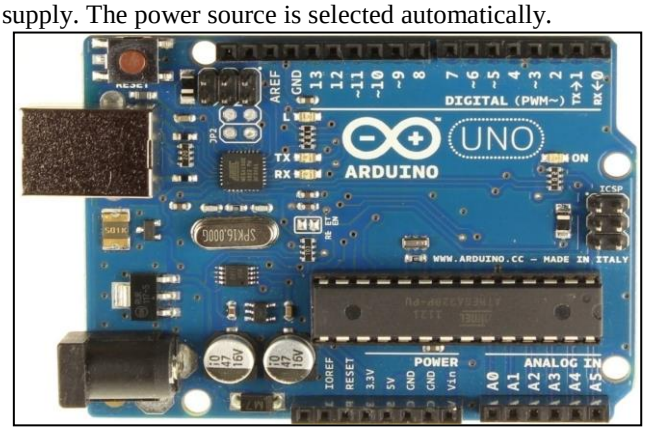

Fig. 3:

External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and Vin pin headers of the POWER connector. The

board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts. The power pins are as follows: VIN. The input voltage to the Arduino board when it's using an external power source (as• opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin. 5V.This pin outputs a regulated 5V from the regulator on the board. The board can be supplied• with power either from the DC power jack (7 - 12V), the USB connector (5V), or the VIN pin of the board (7-12V). Supplying voltage via the 5V or 3.3V pins bypasses the regulator, and can damage your board. We don't advise it. 3V3. A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA.• GND. Ground pins.• Memory The ATmega328 has 32 KB (with 0.5 KB used for the bootloader).

It also has 2 KB of SRAM and 1 KB of EEPROM (which can be read and written with the EEPROM library). Input and Output Each of the 14 digital pins on the Uno can be used as an input or output, using pinMode(), digitalWrite(), and digitalRead() functions. They operate at 5 volts. Each pin can provide or receive a maximum of 40 mA and has an internal pull-up resistor (disconnected by default) of 20-50 kOhms. In addition, some pins have specialized functions: Serial: 0 (RX) and 1 (TX). Used to receive (RX) and transmit (TX) TTL serial data.

IV. LIQUID CRYSTAL DISPLAY

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on.

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.

The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc.

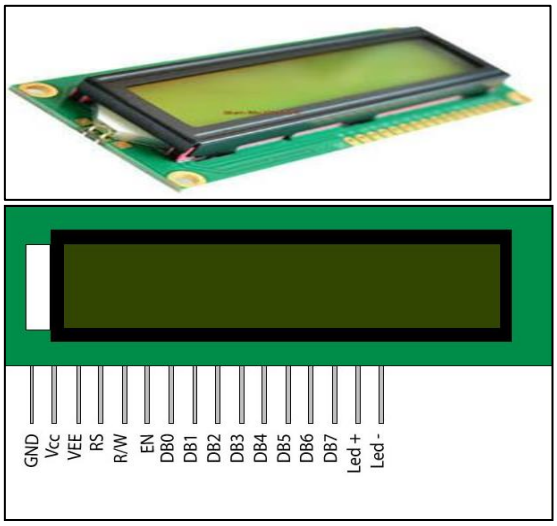

Fig. 4:

The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD.

A. *LCD Connection with Arduino*

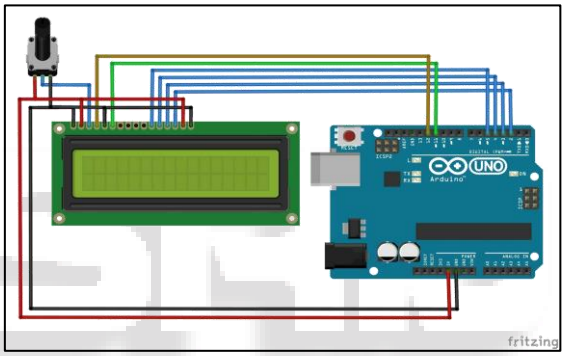

Fig. 5:

V. JUMPER WIRE

A. *Cables-Wires-Pins!*

Arduino is great but sometimes connecting interesting things to it can be a pain. Here are some things that may make it easier for you. Here are some of the cables and pins that are available, and below we'll show you how to use them for many different applications. Here are a few places you can jump to, if you're in a hurry.

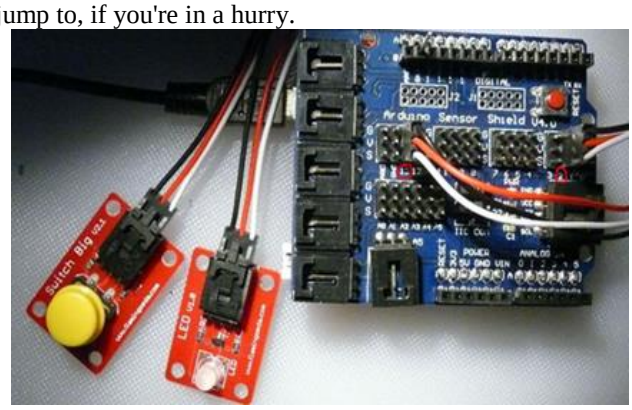

Fig. 6:

– "CableMaker" Flat Colored Cable: Make almost any cable very quickly

- "Pin Strips": male-male pins you can use to make any female connector into a male pin
- 3-Pin Cable Pinout

For use on Breadboards many people use "jumper wires" with male pins on both ends. But if you need to connect to a male pin on a module or Arduino type board that's a problem. The "Cablemaker" flat cable can easily be stripped apart into single (or multiple) jumper wires. The ends are female but the supplied pin strips can many of these cables are based on using the Sensor Shield or the YourDuinoRoboRED which has built-in 3-pin connectors. Take a look at the Sensor Shield and you will see that all the Arduino Digital Input/Output pins and Analog input pins are brought out to groups of 3 pins each. Many Input and Output devices (and servos, which this pinout is based on) have one signal pin plus Vcc (Usually +5V) and Ground. So 3 pins is the most common connection and we make this handy 15 cent cable for you (right).

The flat end plugs easily onto a (Sensor Shield - See It) or YourDuinoRoboRED which has pins arranged correctly as (G)(V)(S) Ground-Voltage-Signal. So just plugging in connects.

Here's an example of how easy it is to connect an input device (Switch) and an output device (LED) using this cable. We have an associate who has designed an excellent line of small modules that just plug in, called "Electronic Bricks". (He also designed the Sensor Shields). You can see many of the typical Electronic Bricks (HERE).

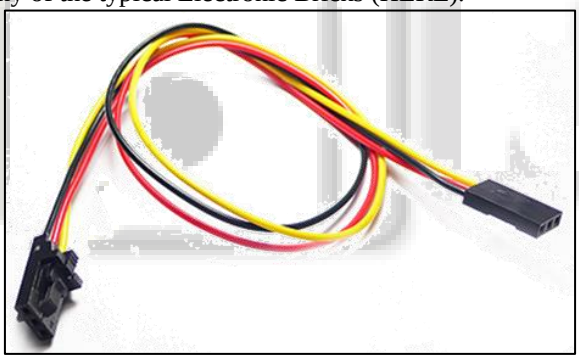

Fig. 7:

Sometimes you need to connect to some device that is not an Electronic Brick. One easy solution is the 3-Pin Terminal Block Brick. Here's an example of using it to connect a waterproof temperature sensor. You could also use it to connect devices like Phototransistors, Thermistors, Buzzers, every I/O pin similar to a Sensor Shield. The top connector has 3 colors: Blue=Gnd, Red=+5V, Yellow=Signal. You will see that this is similar to the colors on the 3-pin cables. The bottom connector is for the Analog Inputs, and has Gnd - +5V - Signal in the other direction.

Fig. 8:

There is also a very useful cable that plugs into a Sensor Shield on one end, but has separate female sockets on the other end. This cable looks like the photo on the right and is available here:

There is also a 4-pin cable similar to the 3-pin one shown above. This has Voltage, Ground and Two signal wires. It is typically used for communications setups where the 4-pin socket on the right side of a Sensor Shield connects to a device that uses Serial Communications (2 directions: Transmit and Receive), or an I2C device like an LCD Display. On the right is an example of a 4-pin cable connecting to an LCD display.

NOTE: The Sensor Shield Version 5 has two 4-pin connectors and you can connect both serial communications devices and I2C/TWI devices at the same time.

B. Arduino Mega

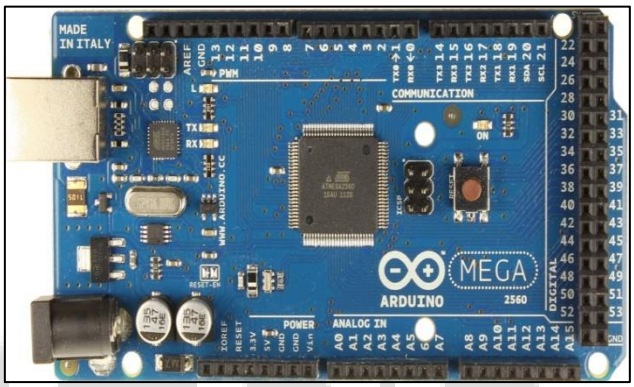

Fig. 9:

The MEGA 2560 is designed for more complex projects. With 54 digital I/O pins, 16 analog inputs and a larger space for your sketch it is the recommended board for 3D printers and robotics projects. This gives your projects plenty of room and opportunities.

Microcontroller	ATmega2560
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limit)	6-20V
Digital I/O Pins	54 (of which 15 provide PWM output)
Analog Input Pins	16
DC Current per I/O Pin	20 mA
DC Current for 3.3V Pin	50 mA

Table 1:

C. Stepper Motor

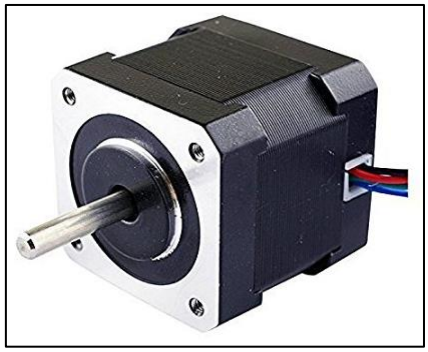

Fig. 10:

A stepper motor or step motor or stepping motor is a brushless DC electric motor that divides a full rotation into a number of equal steps. The motor's position can then be commanded to move and hold at one of these steps without any position sensor for feedback (an open-loop controller), as long as the motor is carefully sized to the application in respect to torque and speed.

Brushed DC motors rotate continuously when DC voltage is applied to their terminals. The stepper motor is known by its property to convert a train of input pulses (typically square wave pulses) into a precisely defined increment in the shaft position. Each pulse moves the shaft through a fixed angle.

D. Stepper Motor Driver

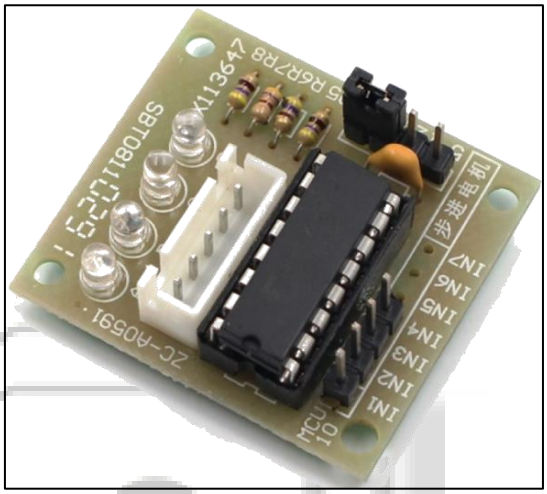

Fig. 11:

A stepper motor drive is a circuit which is used to drive or run a stepper motor. It is often called a stepper motor driver. A stepper motor drive usually consists of a controller, a driver and the connections to the motor.

The circular arrangement of electromagnets is divided into groups, each group called a phase, and there is an equal number of electromagnets per group. The number of groups is chosen by the designer of the stepper motor. The electromagnets of each group are interleaved with the electromagnets of other groups to form a uniform pattern of arrangement. For example, if the stepper motor has two groups identified as A or B, and ten electromagnets in total, then the grouping pattern would be ABABABABAB.

E. Motion Sensor

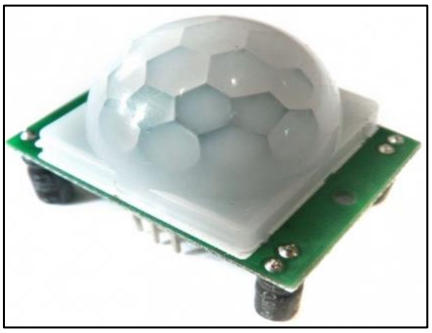

Fig. 12:

A motion detector is a device that detects moving objects, particularly people. Such a device is often integrated as a component of a system that automatically performs a task or alerts a user of motion in an area. They form a vital component of security, automated lighting control, home control, energy efficiency, and other useful systems.

Most low-cost motion detectors can detect up to distances of at least 15 feet (4.6 m). Specialized systems cost more, but have much longer ranges. Tomographic motion detection systems can cover much larger areas because the radio waves are at frequencies which penetrate most walls and obstructions, and are detected in multiple locations, not only at the location of the transmitter.

VI. BLOCK DIAGRAM

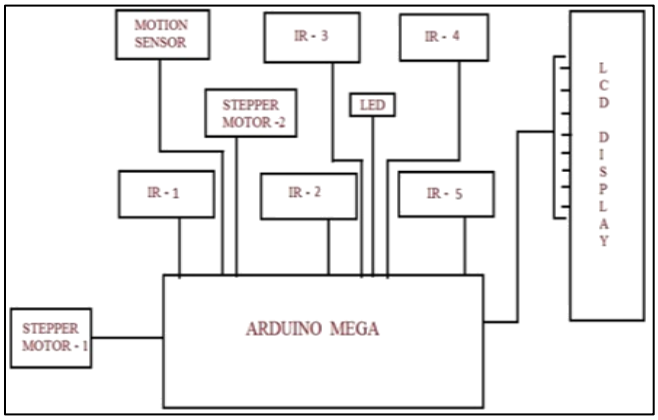

Fig. 13:

VII. SUMMARY OF RESULTS

A. Advantages of Work/Result

1) It reduces traffic in parking area.
2) It saves time for parking of car.
3) Easy to know where to park by watching on LCD display.
4) It saves energy due to use of motion sensor in 2nd floor of parking area.
5) Convenience in parking.

B. Usefulness with Respect to Existing Solution

1) We have all been in a huge parking lot before and not been able to find a parking spot.
2) Imagine being late for a flight and upon entering the huge parking lot, a simple display tells you exactly how to get to a great parking spot.
3) Minimize road rage incidents resulting from people stealing spots.
4) User will be able to drive up to parking lot and view current map of parking spots.
5) When any user come with their car, at that time system will start. When any car already entered, the system will automatically off.

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