

Energy Efficient Low Cost Arduino Based Smart Parking System with Concept of Counting

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Abstract— In recent years our world is witnessing a great advent in technology and population. With the increase in population there has been an increase in the number of four wheelers i.e. cars. People need more parking spaces. Car parking is a major problem nowadays. Safe and secure parking is needed. Four different car parking proposals are tried and tested: counter-based, wired-sensor-based, wireless-sensor-based, and image-based. In this paper we test a counter based parking system. Arduino and an electronic circuitry has been used to tackle this problem of parking. It keeps a count of the number of cars in the parking lot and also displays if there are empty spaces. Such parking lot does not require any human presence. It is also cheap and easy to operate.

I. INTRODUCTION

The present life style and living comforts are giving rise to a heavy traffic of vehicles inside the city. The associated problem with this is to accommodate and handle vehicles in a parking system is very challenging [1],[2]. The number of four wheelers has increased at a great extent and their management in the parking lots of public places or residential areas in very troublesome. Human management can cause errors. The conventional parking lots do not have sufficient area and they do not have display system to the number of cars in the parking lot [3],[4]. The parking's do not have efficient sensors which automatically show if a lot is empty or full. Many strategies have been implemented but there are not very popular [5]. Smart Parking is a parking concept that combines technology and human innovation in an effort to use as few resources as possible such as fuel, time and space and to achieve faster, easier and denser parking of vehicles for the majority of time they remain idle [6].

A car owner can save time and fuel in finding a suitable parking spot. Similarly few of the parking system have proposed camera and image processing, GSM and internet of things (IoT) based approach to intimate and exchange information for the request of parking space [7]. Some of the presentations in this regard are simulated in software packages to understand the feasibility and opportunity to implement. The current advances in wireless communication technology lead to the use of IoT (Internet of Things) based parking lot management and remotely enquiring the

availability of the space to park the vehicle. The application of computer vision to identify the empty space in the parking area is also found in few publications and accordingly allocation of space takes place for the incoming vehicle [8]. An IoT based parking system proposal and model for airport taxi area was presented and its features were noted. Literature has provided the cases of study and application of RFID (Radio frequency identification tag) to allot and locate the vehicle in the parking lot to minimize time and ensure safety [9].

The inter based booking of parking space for the vehicle in advance like travel ticket booking was found and that concept used cloud based data management. A specific computer algorithm based image processing using OCR allocation schemes for men and women and differently able peoples etc. The current work on automatic parking lot with a vehicle occupancy counter uses Arduino controller to overcome the problem of vehicle count or availability of space to park. The circuit automatically detect the presence of car in front of the gate and do not use any complex circuitry [10], [11]. Then it verifies whether the space in the parking lot is available or not. For a case if there exists an empty space to house the incoming car then it opens the gate of the parking lot otherwise it does not open. The revised count is shown on the display. This project through counter will be cheap and easy.

II. BLOCK DIAGRAM AND CONCEPT

The complete interconnections of the components are shown in the block diagram. One IR sensor detects an approaching car towards the gate and another sensor is at the exit gate which senses the car going out of the parking lot, which is shown in fig.1.. The sensors are connected to the arduino and the arduino is programmed in such a way that if a car enters a parking lot the counter increases by one and while exit decreases the counter by one. The gate which uses a servo motor will open for an approaching car till the parking lot reaches the maximum capacity. The total count of cars will be shown on a LCD screen at the entrance. There are four more sensors at the parking spot which are in turn connected to LED's. The LED's will glow whenever a parking space is empty otherwise the light will not glow as the sensor will sense a body. The LEDs are used for car owners to understand which parking spot is empty, which is shown in fig.2.

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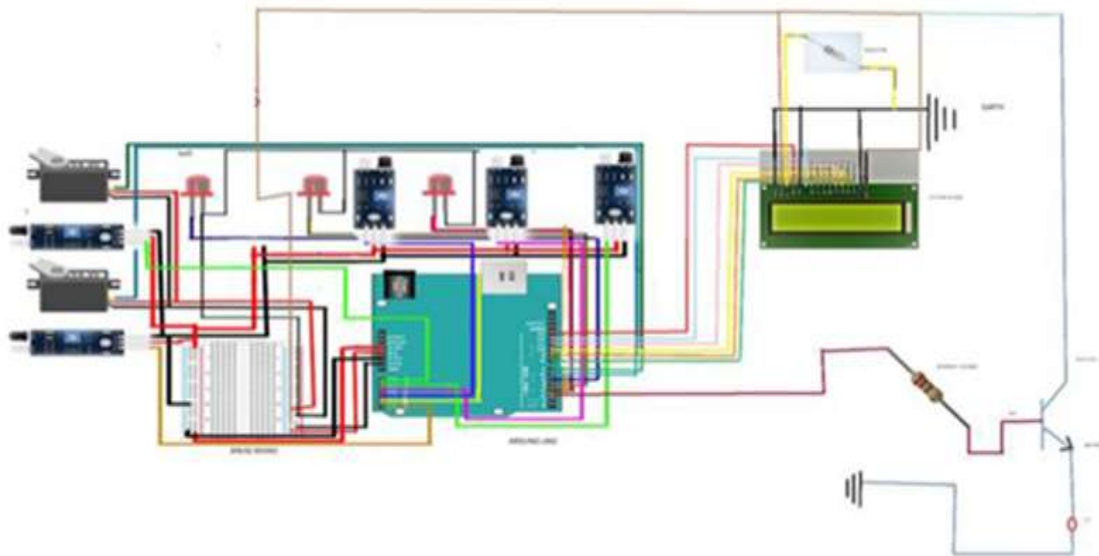


Fig.1. Circuit Diagram of proposed system

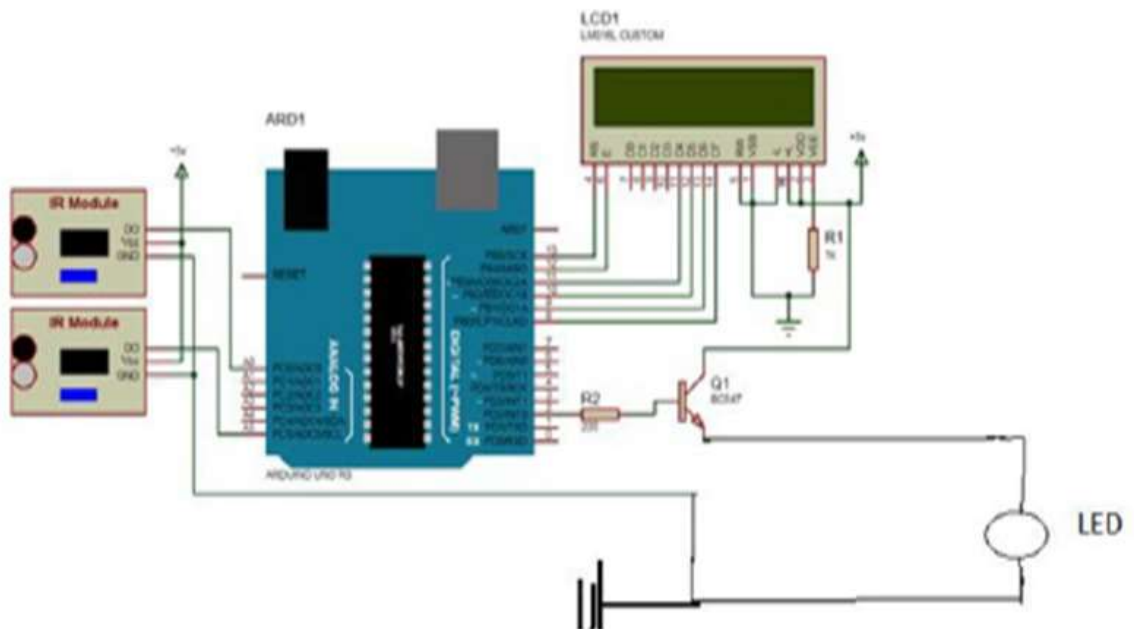


Fig.2. Circuit diagram for concept of counting

Programming Algorithm:

Steps	Description
1	Arduino Uno Environment is set up with suitable library headers
2	Input and output pins are configured for the tasks
3	Servomotors are programmed to rotate when sensors sense any car near them
4	Keep checking the request for the parking from sensor input at the door entry
5	The display is modified for an entry of a car an exit of a car
6	The LED will glow whenever a car is parked in the parking spot
7	The loop is kept active continuously

III. DESCRIPTION OF THE COMPONENTS USED

Arduino UNO:

The Arduino UNO is an open source microcontroller board based on Microchip ATmega328P. It is a low power consuming, low cost open source supported microcontroller for the creative developer and engineers. The board supports digital and analog data input/output (I/O) through pins that may be interfaced to various expansion boards and other circuits. It can accept voltages in the range of 7 to 20 volts. The ATmega328 on the Arduino Uno is programmed after manufacture with a boot loader that allows uploading new code to it without the use of an external hardware programmer.



Servomotor:

A servomotor is a rotary actuator or linear actuator that allows precise positioning (angular or linear) and controls velocity and acceleration. It consists of its own feedback circuitry. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors. The servomotor has application in positioning system and it has its own feedback circuit hence very much suitable for closed loop control system.

Sensors:

An infrared sensor is an electronic instrument that is used to sense certain characteristics of its surroundings. It does this by either emitting or detecting infrared radiation. Infrared sensors are also capable of measuring the heat being emitted by an object and detecting motion. All objects with a temperature above absolute zero emit heat energy in the form of radiation. Usually this radiation isn't visible to the human eye because it radiates at infrared wavelengths, but it can be detected by electronic devices designed for such a purpose.

Lcd Display And Led:

LCD is a 16 pin device with two rows which is capable to accommodate 16 characters each, having 8 data lines and 3 control lines that can be used for control purpose. It is generally used in embedded systems to display various parameters.

LED can be defined as a semiconductor diode which emits light when electric current is passed through it. LED are used for lighting sources.

IV. EXPERIMENTAL SETUP & RESULTS

The experimental show the working of the project. The car comes for parking, the infrared sensor senses it and the entry gate opens and LCD screen shows the counting to 1 from 0. Now the car finds a parking spot and the LED in the spot turns off. This cycle goes on till the parking spot is full. Then the gate will not open. While a car needs to exit the parking, it moves towards the exit gate and the sensor senses and the gate opens. The LED in consecutive parking spot turns on and the LCD screen again turns 0, which is shown in fig.3.

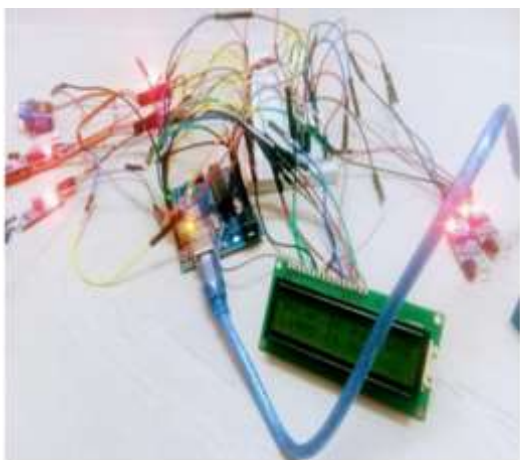


Fig.3. Experimental Setup

V. CONCLUSION

Smart parking lot with counter-mechanism is an

electro-mechanic setup which detects and provides parking space. The smart parking lot with counter presented is a part of a complete security and automated parking system. It is efficient and reliable. This system doesn't require human aid except while maintenance. It provides solution to parking problems. As a scope for improvement for this circuit, the allotment of specific parking space number is used per car. Then random parking can be avoided. Interfacing with IOT peripheral to send and receive the information from remote place and accident prevention circuits adds values to this work. The specific enquiry regarding availability of parking slot and booking can be worked out.

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