CHAPTER 5
Smart–parking management algorithms in smart city

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ABSTRACT

In fact, such infrastructure empowers drivers and parking facility managers with advanced such as available slots and current parking fee. In view of the deficiency of traditional entrance guard control, a more convenient intelligent entrance guard control system suitable for smart parking system is designed. The management control center is built by cloud server, and the hardware controller is designed with Arduino UNO and IR Sensor which is an embedded development board with low power consumption and high performance. The functions of user management, device management and unlocked control are realized. The response performance and safety performance of the system are optimized and the response time is reduced. smart gate is one of the most useful things to use in companies, industries, colleges and schools for smart parking system.. Automatic gates are important and very useful because it helps save time, reduces the human force applied to the opening and closing of the manual gate which saves energy and also saves gate operators from health hazards caused by exposing themselves to harsh weather conditions in the course of operating the manual gate. The gate was designed, constructed and mounted, the control unit and power supply unit were also designed and implemented. These various units were incorporated and implemented. The automatic gate was tested for speed and efficiency and from the generated results, it can be said that the gate is 90% efficient. The smart gate senses an object either human or vehicular within a distance of 0.42m to 0.52m and operates at a speed of 0.186m/s. The smart gate has helped reduce the stress of opening and closing the gate where buttons are pressed rather than the usual manpower used in operating the gate. This has made life easier and more comfortable. The gate can be further improved my adding a scanning device to perform the searching operation done by the securities thereby making their work easier and more comfortable.

Keywords: UNO and IR Sensor, Automatic gates, smart gate senses etc

INTRODUCTION

Day by day all operations handled by man becoming an automated, in this regard one of the operations like opening of gate/door in unman condition, it is to be opened by automatically when person comes near to the door/gate. This senses the presence of man/object near to it and gate is automatically opened and closed by itself. The time can be derived by user in program as delay. here we are trying to do a small project on smart parking gate using Arduino and IR Sensor. it will be a very cool and very interesting project and can be use this for car garage, parking gates, as well as main gate. This can be also used in smart parking system it is an IOT based parking system is a centralized management that enables drivers to be in attention while crossing a sensor path of a parking lot or main gate. It is reliable and it reduces manual work and manual errors. It is easy implemented and inexpensive thus the system can be used in the large scale. In case if any incident happens between the sensor path immediately the buzzer alarm system starts to ring.

PROBLEM STATEMENT

Each company in our country use their gate, but it is not secured. The gates monitored by the security guard. "Inefficient and congested parking management in urban areas, resulting in wasted time, increased traffic, and frustration for drivers, necessitates the development of a smart parking system that optimizes parking space utilization, enhances the overall parking experience, and reduces traffic congestion and pollution." The smart gates came from foreign countries because of this; the user can move away faster and it is very much helpful , it reduces time as well as it is well secured . For example when a car enters into a shopping mall or any place the car is based on sensor and IR SENSOR detetcts the vehicle by moving towards the gate which is implemented with IR SENSOR . It is more help and it can improve the country to the next gen . There is many manual parking system by issuing tickets and it takes more time and it causes many incidents to reduce this we use alarm. by using the smart parking and smart gate system we can move faster and the incidents will reduce. This senses the presence of man/object near to it. The time can belayed by user presence we are trying to do a small project on smart parking gate using Arduino and IR Sensor. it will be a very cool and very interesting project and can be use this for car garage, parking gates, as well as main gate. This can be also used in smart parking system it is an IOT based parking system is a centralized management that enables drivers to be in attention while crossing a sensor path of a parking lot or main gate. It is reliable and it reduces manual work and manual errors. It is easy implemented and inexpensive thus the system can be used in the large scale. In case if any incident happens between the sensor path immediately the buzzer alarm system starts to ring.

PROBLEM DESCRIPTION

 If there is a technical issue or system error there will be more issues by Leaving the drivers to wait for longer time and there will be a gate issue to enter the parking area .So smart parking using ir sensor will overcome these issues and it will make the drivers a cool support.

Parking guidance:In a larger Parking lot ,garage system alart the available parking space if there is no availability they are moved towards the nearby available slots.

BACKGROUND

Now a days people uses more vehicles and there is an needs for inventory in smart ways to handle the traffic on parking lot so we have come with an inventory of smart parking sensors which help us to overcome the issues. he background for smart parking systems can be traced back to the increasing challenges faced by urban areas in managing their parking infrastructure. As cities grow and vehicle ownership rises, parking

spaces become scarce, and the process of finding and accessing available parking spots becomes time-consuming and frustrating for drivers. Inefficient parking management can lead to traffic congestion, increased pollution, and decreased quality of life for residents. The concept of smart parking emerged as a solution to address these issues by utilizing technology and data-driven approaches. Smart parking systems leverage various technologies such as sensors, real-time data analysis, and connectivity to provide real-time information about parking space availability, optimize parking operations, and enhance the overall parking experience.

OBJECTIVES

Urbanization and increasing vehicle ownership: Rapid urbanization and population growth have resulted in higher vehicle ownership rates, leading to a greater demand for parking spaces. Traffic congestion and pollution: Inefficient parking contributes to traffic congestion as drivers circle around in search of available spots. This congestion leads to increased fuel consumption, emissions, and overall pollution levels.

Advancements in technology: The development of various technologies such as wireless sensors, the Internet of Things (IoT), data analytics, and mobile applications has made it feasible to collect and analyze real-time parking data, improving parking management and user experience.

Cost and revenue management: Effective parking management can help generate revenue for municipalities and businesses, ensuring the efficient utilization of parking resources and reducing costs associated with parking enforcement and maintenance.

COMPONENTS REQUIRED

Components Required for Building smart sensor :-

□   Arduino Uno

□   IR Sensor

□   Jumper Wires

□   Uno cable

□   Servo motor

□   LCD (16x2)

□   I2C MODULE

□   Buzzer(12 volt)

□   PC Board

Arduino Uno : Arduino Uno is a microcontroller board based on the ATmega328P (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 (CSTCE16M0V53-R0), 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 ACto- DC adapter or battery to get started.

IR Sensor : An infrared (IR) sensor is an electronic device that measures and detects infrared radiation in its surrounding environment.IR sensors are now widely used in motion detectors, which are used in building services to switch on lamps or in alarm systems to detect unwelcome guests.

Jumper Wires : A jump wire (also known as jumper, jumper wire, DuPont wire) is an electrical wire, or group of them in a cable, with a connector or pin at each end (or sometimes without them simply "tinned"), which is normally used to interconnect the components of a breadboard or other prototype or test circuit, internally or with other equipment or components, without soldering.Individual jump wires are fitted by inserting their "end connectors" into the slots provided in a breadboard, the header connector of a circuit board, or a piece of test equipment.

Uno Cable : A jump wire (also known as jumper, jumper wire, DuPont wire) is an electrical wire, or group of them in a cable, with a connector or pin at each end (or sometimes without them – simply "tinned"), which is normally used to interconnect the components of a breadboard or other prototype or test circuit, internally or with other equipment or components, without soldering.Individual jump wires are fitted by inserting their "end connectors" into the slots provided in a breadboard, the header connector of a circuit board, or a piece of test equipment.

LCD : 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. The 16 x 2 intelligent alphanumeric dot matrix display is capable of displaying 224 different characters and symbols.

Servo Motor: A servo motor is a type of motor that can rotate with great precision. Normally this type of motor consists of a control circuit that provides feedback on the current position of the motor shaft, this feedback allows the servo motors to rotate with great precision. If you want to rotate an object at some specific angles or distance, then you use a servo motor. It is just made up of a simple motor which runs through a servo mechanism.

I2C module : I2C (Inter-Integrated Circuit; pronounced as "eye-squared-C"), alternatively known as I2C or IIC, is a synchronous, multi-master/multi-slave (controller/target), packet switched, singleended, serial communication bus I2C_LCD is an easy-to-use display module, It can make display easier. Using it can reduce the difficulty of make, so that makers can focus on the core of the work. We developed the Arduino library for I2C_LCD, user just need a few lines of the code can achieve complex graphics anFig d text display features.

Buzzer : A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric (piezo for short). Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke.

PC BOARD : A printed circuit board, or PC board, or PCB, is a non-conductive material with conductive lines printed or etched. Electronic components are mounted on the board and the traces connect the components together to form a working circuit or assembly.

WORKING PROCEDURE

Sensor-based Detection: Smart parking systems utilize various sensors (such as ultrasonic sensors, infrared sensors, or magnetic sensors) installed in parking spaces to detect the occupancy status of each spot. These sensors can detect whether a parking spot is vacant or occupied.

Data Collection and Processing: The sensor data is collected and processed in real-time to determine the availability of parking spaces. The collected data is then transmitted to a centralized system for analysis and further processing.

Availability Display: The parking system communicates the availability of parking spaces to the users through various means. This can include electronic signage, mobile applications, or a website that provides real-time information about the number of available parking spots in different areas or parking lots.

Navigation and Guidance: Smart parking systems can provide navigation and guidance to drivers by directing them to the nearest available parking spots. This can be achieved through mobile apps or digital signage systems that display real-time directions to vacant spots.

Reservation and Payment: Some smart parking systems offer the option to reserve parking spaces in advance, allowing users to secure a spot before arriving at the parking facility. Additionally, payment methods integrated into the system enable users to make cashless transactions and pay for their parking time conveniently.

Monitoring and Enforcement: The smart parking system may include surveillance cameras to monitor parking areas and enforce parking regulations. These cameras can capture images or video footage to identify any unauthorized parking or violations.

Data Analytics and Optimization: The collected parking data can be analyzed to gain insights into parking patterns, usage trends, and occupancy rates. This information helps in optimizing parking operations, improving resource allocation, and planning for future infrastructure requirements.

Integration with Smart City Infrastructure: Smart parking systems can be integrated with other smart city infrastructure, such as traffic management systems, public transportation networks, and electric vehicle charging stations. This integration allows for better coordination and efficient utilization of urban resources.
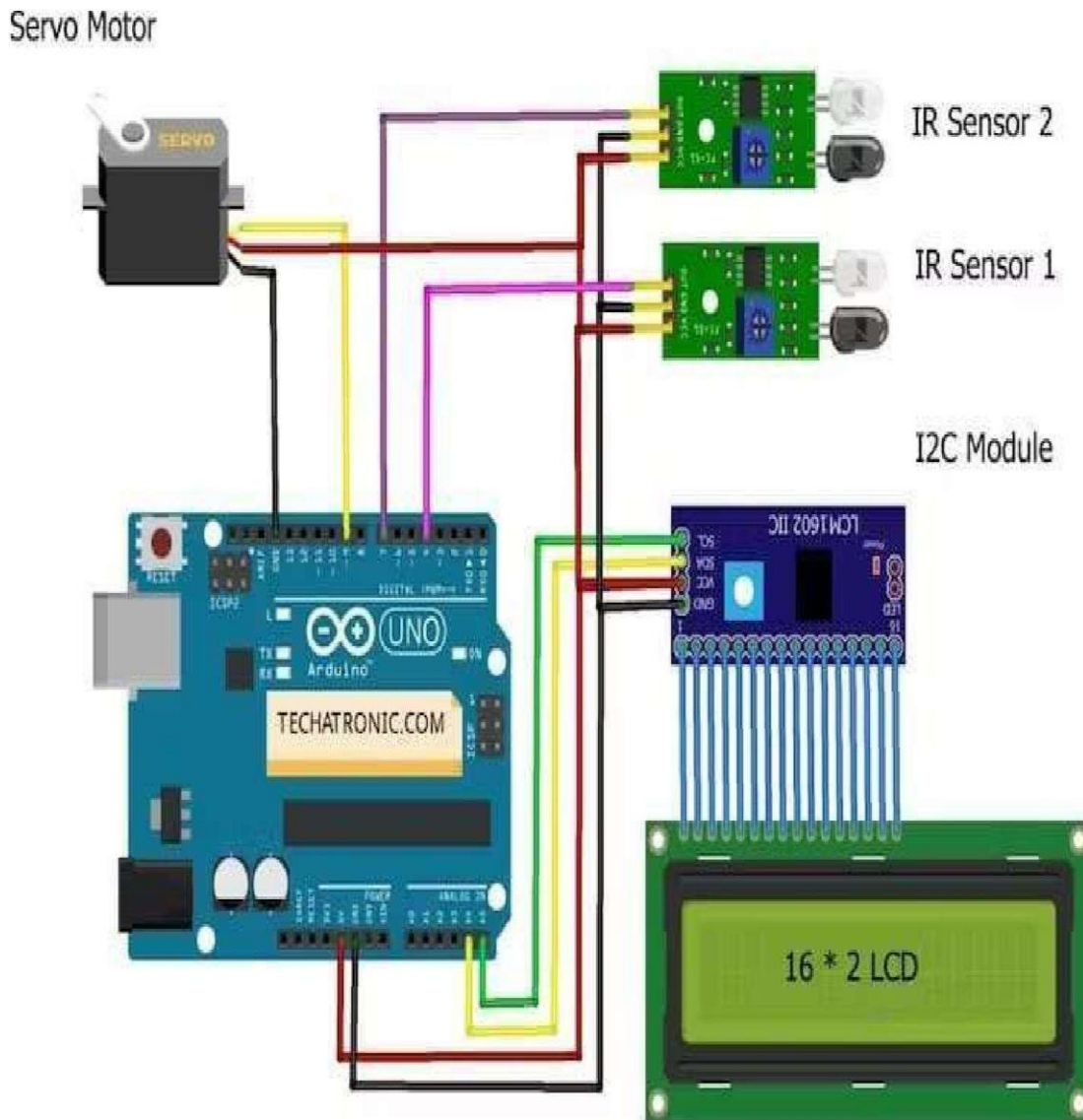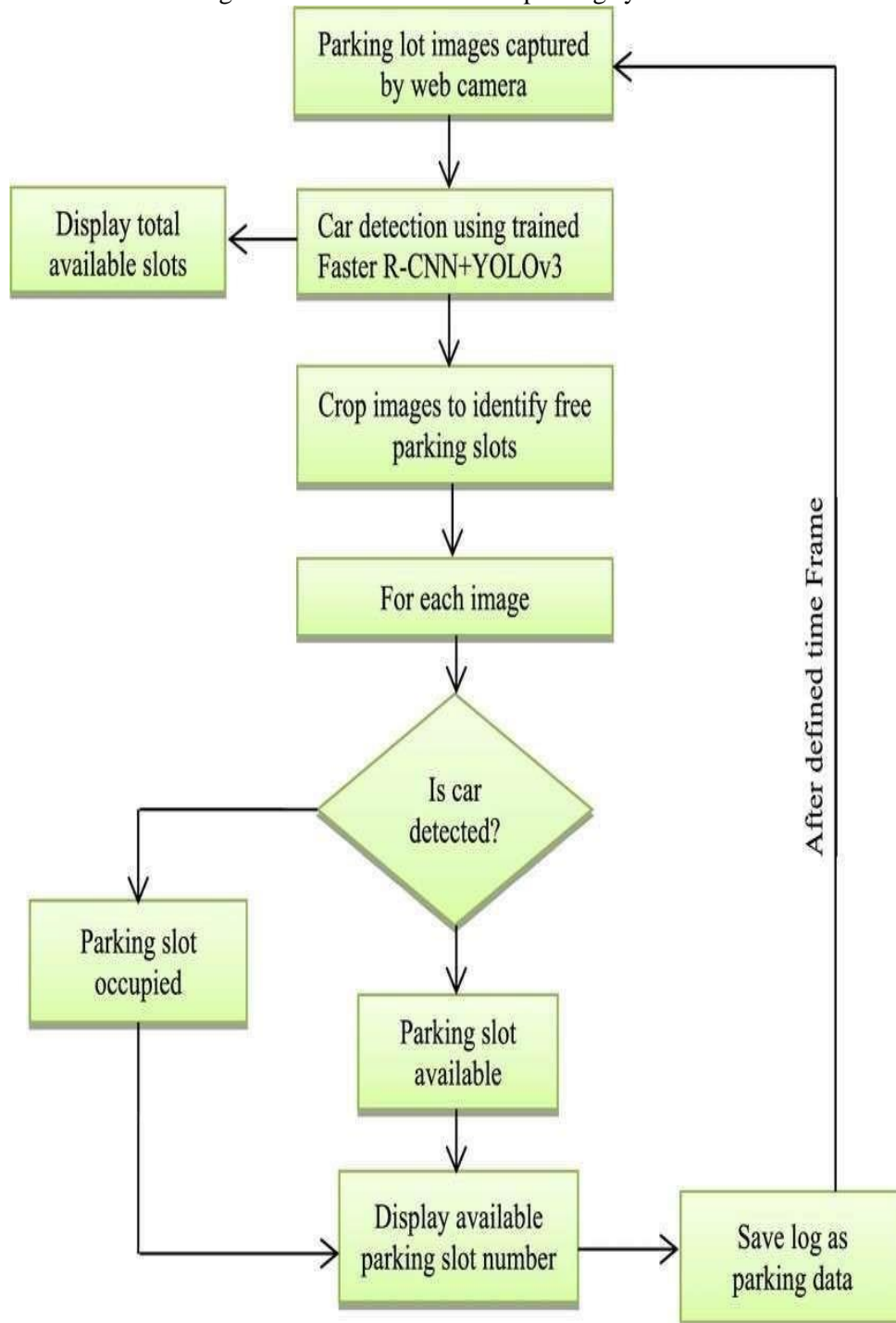
BLOCK DIAGRAM :

Fig :5.1 CIRCUIT DAIGRAM FOR SMART PARKING SYSTEM

FLOW CHART :

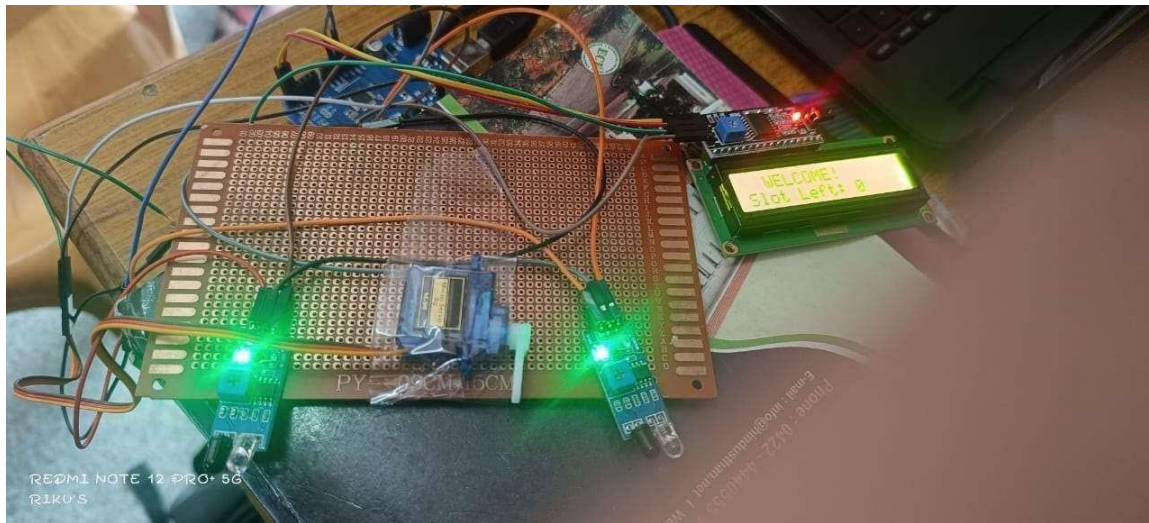Fig .5.2: Flow chart for smart parking system

FINAL OUTPUTS

Fig : 7.1 Final output (slot 1)

CONCLUSION

This is going to help people in parking slots and reduce the mess around them the development of this technology in wired sensors the sensor-based Applications has made it feasible collect and analyze real-time parking spaces improving parking management the concept of smart parking technology and data driven approach. Smart parking system will provide real-time information about parking space.

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