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INTERNET OF THINGS BASED CAR PARKING SYSTEM USING EMBEDDED SYSTEM

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Abstract: *The factor network could be a new challenge that assumes an essential component of our everyday lives. The Internet of Things reduces tasks, effort, time, and human errors due to human negligence. Then, an integrated IoT intelligent parking system was proposed, which is supposed to make it easier for users to avoid getting information in booking full and empty parking spaces and can also reserve parking spaces using electronic software. There are many stages to operation of the entire microcontroller-based intelligent parking system that is, basic frameworks, prototyping, prototyping, framework authoring, testing, and evaluation. This approach uses hardware such as Arduino-Mega, Arduino-UNO, Wi-Fi module, and LCD to detect accessible stop slots, confirm reservations, and infrared sensors that can be used each time a push is stopped and indicate remote accessibility. QR code if applicable, and apps created for recordings. The programming language used is C to design the Arduino and PHP, which can be used for the network interface, even as MySQL for the database server. The Smart Parking app is relied upon to help prevent management agents from calling in data and detect loopholes that prevent openings by holding in. The general benefit is that it would be more talented than expected and prevent the board from being more manageable.*

Keywords: *IoT based car parking system, Android studio, Arduino IDE, Embedded language.*

I. INTRODUCTION

Population growth is a significant concern in urban areas. With the growth of the population, the variety of vehicles increases, and the demand for parking spaces increases. Although more parking centres are being built, there are many usage issues. One of the main problems is the wasted time trying to find parking spaces, which causes street congestion and angry drivers trying to find empty parking

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spaces and has a significant negative impact on the environment. A response is needed to unleash problems for parking users. The solution proposed here allows the Driver to make a reservation online. The device will be able to monitor in real-time and allow users to make parking reservations and bill online[1]. For example, in Israel in 2016, the average time spent searching for a parking space is twenty (20) minutes each time they park, and 55 hours is the average time lost to drivers every 12 months looking for a car. Not only

Time lost trying to find parking. However, 30% of urban site visitors are caused by drivers trying to find parking, and site visitors waste four-point eight billion (4.8) hours. In addition to the time spent searching for parking, three-point nine (three, nine) billion gallons of gasoline are wasted each year, which generates environmental pollution. In a recent survey, researchers found that over 12 months, trying to find parking led to the equivalent of thirty-eight (38) trips around the yard, burning 1.7 liters of fuel and generating 730 tons of carbon dioxide. According to [2], approximately 38,300 drivers have been killed, and 4-part 4 (4) million have been seriously injured while trying to find a parking space. Parking systems that rely entirely on the reputation of a wide variety of license plates run into significant problems because license plate numbers are unique in length, colour, and type depending on countries. These structures are limited to seven alphanumeric characters, of which four are digits, and three are letters, and can only parse a variety of plates with a single row plate number. Therefore, there is a need to scale up a machine that does not rely on license plates to pick up the vehicle.

Nowadays, the idea of smart cities is highly appreciated. Thanks to the Internet of Factors development, the concept of a smart city now seems feasible. Continuous efforts are being made within the discipline of IoT to maximize the productivity and reliability of the city's infrastructure. The Internet of Things addresses traffic congestion, restricted parking lots, and road safety. This paper introduces a cloud-integrated smart parking device based mainly on the Internet of Things. The proposed intelligent parking system consists of implementing an IoT module website to detect and indicate the national availability of each parking space. Mobile software that enables the user to stop testing the provision of a parking space and reserve a parking space is also provided for this reason. The document also describes a higher-level view of the device

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architecture [3]. Towards the end, the document analyses the system's operation in the form of a use case that validates the proposed model. The cloud updates according to the width of the parking area. The cloud service works through the administrator; However, it can also be considered with the help of the consumer to substantiate judgment. Stage 0.33 of the role is the user side. A person receives provisioning SMS notifications via the GSM module. The person interacts with the cloud as well as the parking location. The person is notified when parking lots are total, saving the consumer time [4].

II. LITERATURE SURVEY

Parking area availability is predicted by integrating IoT, cloud computing, and detector networks. Uses the BIRMINGHAM Parking Detector Information Suite to determine the performance of the DLSMN. More information about parking, neighbourhood, car chase, and identification must be available [1]. It helps to find a parking space in a nearby area. It uses golem utility, PHP, and My SQL statements. You don't need any hardware mentioned. Storekeeper involvement is needed to locate vacant parking spaces and bypass the timer. The machine offers some advantages, as no dealer shows where he is standing so often [3]. Parking spaces are detected using a CMOS abuser, supersonic, or magnetic attraction detector. Personalization and search algorithms do not

ZhanlinJi .et.al [5]proposes a general idea of parking lots in intelligent cities using a cloud-based platform. He specializes explicitly in the rationale for finding, allocating, retaining, and presenting a premium parking area. The device relies entirely on automatic threshold rules to find open parking spots. This system has a display plane, internet plane, and fixed power frame, which follow the top-down method. The article explains the implementation and design of the intelligent parking device for campus cars. The parking lot is built of three layers: the utility layer, the communication layer, and the sensor layer. Each parking space is equipped with a sensor that detects the presence of a vehicle. Data about the vehicle's presence in the vicinity is accumulated via a parking meter through a series of sensors. When a user approaches campus, an automated request is sent via the consumer's smartphone to the OSGI Parking Network server to request a free parking spot. The server selects the best area to park the car and will also direct the user to the area through maps. This machine is more suitable for a large university campus. Moreover, it enables a person to find a parking area within a

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university campus. But the service cannot be provided when there is no phone, and the machine cannot be operated to stop the engines on the city roads.

Robin Grodi .et.al, [6] It provides an intelligent parking machine by using WSN (Wireless Sensor Network). It offers a more desirable strategy for reducing search time and cost-effective fees associated with time spent trying to find an empty parking space, backlog of site visitors, and wasted gasoline-related costs. This article divides the parking device into two essential parts: empty parking area detection and person notification. The paper discusses a branch of sensors that can access an empty parking area, such as an induction proximity sensor, active ultrasound sensor, RFID sensor, LIDAR sensor, and camera detection. The sensors are used to want to communicate with the consumer's notification device, which can be accomplished in several ways. A person can receive the notification with the help of connecting the sensor directly to the notification device or by connecting all the sensors to one master coordinator. This master coordinator can display the information or help by allowing the coordinator to handle the facts in the network.

Nazia Bibi et al. [7] introduce a device to know the total number of parking spaces available and pass the records to drivers, allowing vehicles to be easily parked. The device uses a digital internet camera to obtain parking lot images and image processing techniques to verify the presence or absence of a vehicle. The status of the parking area is updated each time the vehicle enters or leaves the space.The frame includes video clips that can be received from the top view of the parking area. This video is divided into frames from which the main body is selected for each section. The vehicle's movement as it enters or leaves the parking area is estimated by subtracting this keyframe. The captured RGB images are converted to grayscale and calibrated to give different coordinates for the parking location and the vehicles. The parking area is divided into equal-sized blocks based entirely on these coordinates. Each grayscale block is converted to binary and then inverted to get the car in white shade and the parking area in black. A boundary fee is calculated on each block to determine whether or not that particular block has a car. If the price is below the limit, the block is loose, and if it is higher, it is occupied. This device is more efficient compared to the ROI detection method and the head-side-based detection method. However, the resolution of the captured images varies with weather conditions.

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Mahendra B M.Et.Al [8] presents an application that combines IoT and cloud computing technology. This work aims to design, test, and implement an "Internet-of-Things-Based Vehicle Parking Device Equipped with Sensors." allowing the user to pre-book a parking spot from a remote area with the help of a mobile app. The device is built with low-value infrared sensors, Raspberry Pi 3b version for real-time data collection. E-parking mobile software developed using Android Studio with a baseband version of Android 4.3. The user, a critical component of the device, is authenticated using a specific identifier: the parking card number. Ultrasonic sensors detect parking space availability. Each sensor is connected to a Wi-Fi chip -Fi.

Hemant Chaudhary et al. [9] explain the architecture and design of an Arduino-based parking machine. What is proposed shall be implemented in areas designated for car parks. This system will provide easy automatic parking control. In addition, its implementation will make the vehicle safe, reduce corruption caused by low human energy, and make the entire parking system computerized to correct errors and reduce time. This machine can reduce street congestion, customer time, human energy, and pollution and protect cars. The downside to this device is that it uses infrared sensors, which are inexpensive.

III. PROPOSED METHODOLOGY

The best thing about creating a smart city is that it is now viable with the advent of the Internet of Things. One of the main issues that smart cities relate to is parking centers. In modern cities, finding available parking spaces for drivers is always challenging, and it tends to become more difficult as the number of private car users increases. This scenario is an opportunity for smart cities to take steps to improve the performance of their parking assets as a result of reducing search times, visitor congestion, and traffic accidents. It can resolve parking problems and visitors' crowding if it informs drivers in advance about parking spaces in and around the intended vacation spot. Recent advances in creating low-cost, low-energy embedded structures are helping construction companies build new packages for the Internet of Things. The intelligent parking device we recommend is implemented by Android application mobile software. The infrared sensor detects that the hole is complete. The infrared sensor isn't empty the way a parking lot is.

SYSTEM ARCHITECTURE

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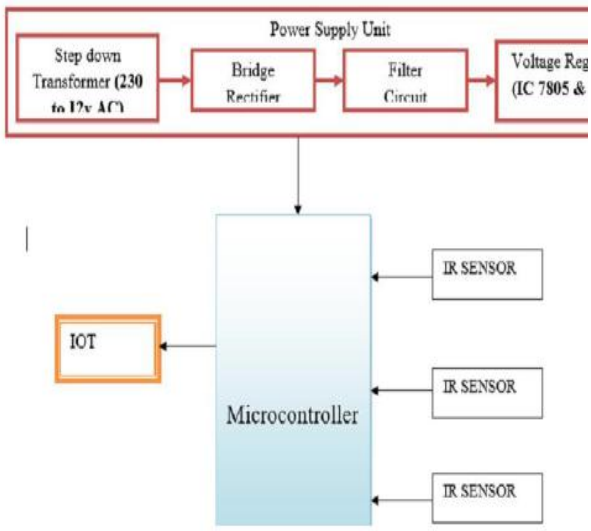

Fig.1 Block Diagram of Smart Car Parking

A) HARDWARE DESCRIPTION

a) MICROCONTROLLER

A microcontroller (MCU for microcontroller) is a small computer on a complex oxide integrated circuit (IC) chip. A microcontroller consists of one or more CPUs (processing cores) with memory and programmable I/O peripherals. Program memory is often capped as RAM, NOR flash, or OTP ROM on a chip, as well as a small amount of RAM. Microcontrollers are designed for embedded applications, unlike microprocessors used in personal computer systems or multi-purpose preferred packages, along with many discrete chips. In modern terminology, a microcontroller looks like a device on a chip (SoC), albeit less advanced. SoCs can also include a microcontroller as one of their components but usually combine it with advanced peripherals such as an image processing unit (GPU), a Wi-Fi module, or one or more processors.

b) IR SENSORS

An infrared (IR) sensor is an electronic device that measures and detects infrared radiation in the surrounding environment. Infrared radiation was spotted by chance with the help of an astronomer named William Herschel in the 19th century. When he measured the temperature of each shade of light (separated by a prism), he noticed that the temperature after the pink light was at its maximum. Infrared is not visible to the human eye because it has a longer wavelength than visible light (although it is in the same electromagnetic spectrum). Anything that emits heat (anything hotter than 5 degrees Kelvin) emits infrared radiation.

c) ESP8266 Microchip

The ESP8266 is a small low-end Wi-Fi chip with a full TCP/IP stack and microcontroller capability, produced with the help of Espressif Systems in Shanghai, China. The chip was first brought to the attention of Western manufacturers in August 2014 with the ESP-01 module, made with the help of a third-party producer, Ai-Thinker. This small module allows microcontrollers to connect to a Wi-Fi community and perform simple

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TCP/IP connections using Hayes-style commands. The ESP8285 is an ESP8266 with 1MB of internal flash, allowing Wi-Fi capable single-chip devices to be built. [4] The ESP32 family of devices has replaced microcontroller chips, including the pin-compatible ESP32-C3.

B) SOFTWARES USED

a) Arduino IDE:

The Arduino Integrated Development Environment (IDE) is a cross-platform utility (for Windows, macOS, and Linux) written with C and C++ capabilities. It is used to write and load applications on Arduino-compatible boards and with the help of a 0.33-part core and other vendor development boards.

b) EMBEDDED C LANGUAGE

Embedded software is computer software written to control machines or devices that are not generally computer systems, usually called embedded structures. They are usually specialized in the exact hardware they are working on and are limited by time and memory. This period is used interchangeably with firmware from time to time. A unique and stable feature is that none or all of the functions of the embedded software are started/managed through a human interface but through hardware interfaces.

c) ANDROID STUDIO

Android Studio is the Certified Integrated Development Environment (IDE) for Google's Android operating system, built on JetBrains' IntelliJ IDEA and designed primarily for out-of-the-box Android development. It is available for download on Windows, macOS, and Linux-based operating systems or as a subscription-based service in 2020. It is an alternative to Eclipse Android Development Tools (E-ADT) as the primary IDE for android native app development.

Android Studio was introduced on May 16, 2013, at Google I/O. It became an early access preview phase starting with version 0.1 in May 2013, then entered the beta level starting with version 0.8, released in June 2014. The first stable build was released in December 2013. 2014, as of version 1.0

IV. RESULTS AND DISCUSSIONS

Therefore, hardware and software configurations are linked to each other and processed for vehicle billing and detection functions. Advanced technology is induced to implement it and finally the results are obtained with an accurate result.

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Fig.2 Infrared Sensor

Fig.5Final Amount to Be Paid

Fig.3 Login or Register Page for Space Availability

Fig.6LCD Displaying Occupied Place

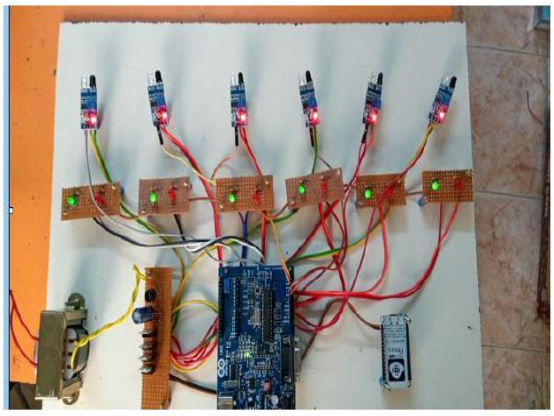

Fig.4 Project Setup

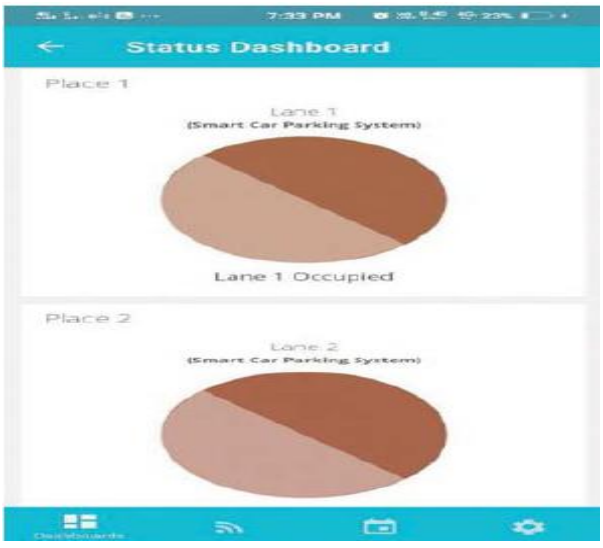

Fig. Database for Storing Space Availability

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V. CONCLUSION

The intelligent parking device, mainly based on IoT, has been implemented through many sensor circuits and the cloud (server). It is a sound car parking system which is prevalent in traffic jams. This business extends further as an intelligent car parking machine with computerized billing.In addition, a fully automated system using a multi-layer parking method. Security procedures, including vehicle number. Tracking the driving force in the face of popularity. It was also ensured that there was no malfunction with the wrong car moving into the allotted space with the help of providing a specific OTP to everyone and ensuring that the same person was parked in the allotted space.Thus, our challenge is to specialize in computerized slots for a large parking area. They define the best way to implement it, and it gets paid. Make it easier to use the parking area with the object grid. Affordable guard frame flanges designed to prevent clogging. Developing this method within the city solves the problem of pollution.

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