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Internet of Things Enhanced Intelligent Guidance System for Smart Cities Using Artificial Intelligence

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***Abstract*— Nowadays we are all living very busy with scheduled time on every task to perform in our lives, in the processing time plays a critical role on this every task, and all manual and systematic operations are performed through smart devices including day starting to the ending point of time, we are all literally depending on technological applications with an effective way, Smart Technologies play a very cumbersome role on every second in our continuously updated useful AI Technologies.**

In this paper, we proposed a new system to implementation for the user-friendly environment in order to encourage IoT enhanced Intelligent Guided System for Smart Cities in the smartest way to communicate with multiple channels at the unique roof, by saving them time spent during traveling period, user can easily spend their time comfortably, with live tracking, and a user wants to know current area live News and pollution statistics, including weather condition and Air Quality indexing along with future predictions. Additionally, we are also providing a facility to find out nearby user desired places like Movie Theatres, Banks, Hotels, Fuel Stations, Police Stations, Financial and Shopping places, Medical and Healthcare, and theft detection along with Intelligent Smart Parking system applying techniques of Artificial Intelligence.

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I. INTRODUCTION

Artificial Intelligence has been everywhere for certain a long time in a few hypothetical structures and convoluted frameworks; anyhow, just twilight advances in computational services and Big Data consume empowered AI to accomplish extraordinary outcomes in a steadily developing quantity of areas. For instance, AI has colossally progressed the spaces of Computer Vision, Healthcare and clinical applications, NLP, ML, and a few different areas.

Figure.1: Intelligent Smart Guided System

Artificial Intelligence can be characterized as the ability of a computer to imitate the intelligence of human behavior or knowledge of while improving proceeding its own performance. Artificial Intelligence isn't just advanced mechanics like Robotics, intellectual behavior of an autonomous machine that defines the brain of the machine and non

the thing body, They can drive a vehicle without humans, play a games, and performs various complicated tasks too.

Artificial Intelligence is a field that falls at the crossing points of a few different areas, including ML, DL, NLP and Data Security and Privacy. ML is the capacity of an algorithm to improvement from earlier information to create acute mechanism on the right choices in different circumstances that it consumes never challenged. ML algorithms are empowered thru preparing a computational method, which is the way toward presenting an algorithm to a vast data set to predict future performances and behaviors etc. The way toward gaining from earlier data sets is known as Supervised Learning.

The Internet of Things (IoT) is an important topic in technology industry, policy, and engineering circles and has become headline news in both the specialty press and the popular media. This technology is embodied in a wide spectrum of networked products, systems, and sensors, which take advantage of advancements in computing power, electronics miniaturization, and network interconnections to offer new capabilities not previously possible [1]. An abundance of conferences, reports, and news articles discuss and debate the prospective impact of the "IoT revolution" from new market opportunities and business models to concerns about security, privacy, and technical interoperability.

The large-scale implementation of IoT devices promises to transform many aspects of the way we live. For consumers, new IoT products like Internet-enabled appliances, home automation components, and energy management devices are moving us toward a vision of the "smart home", offering more security and energy efficiency. Other personal IoT devices like wearable fitness and health monitoring devices and network enabled medical devices are transforming the way healthcare services are delivered [2]. This technology promises to be beneficial for people with disabilities and the elderly, enabling improved levels of independence and quality of life at a reasonable cost.

IoT systems like networked vehicles, intelligent traffic systems, and sensors embedded in roads and bridges move us closer to the idea of "smart cities", which help minimize congestion and energy consumption. IoT technology offers the possibility to transform agriculture, industry, and energy production and distribution by increasing the availability of information along the value chain of production using networked sensors. However, IoT raises many issues and challenges that need to be considered and addressed in order for potential benefits to be realized. A number of companies and research organizations have offered a wide range of projections about the potential impact of IoT on the Internet and the economy during the next five to ten years.

In the 1990s, advances in wireless technology allowed "Machine–to–Machine" (M2M) enterprise and industrial solutions for equipment monitoring and operation to become widespread [3]. Many of these early M2M solutions, however, were based on closed purpose–built networks and proprietary or industry–specific standards,15 rather than on Internet Protocol (IP)–based networks and Internet standards. Using IP to connect devices other than computers to the Internet is not a new idea.

The first Internet "device" an IP–enabled toaster that could be turned on and off over the Internet—was featured at an Internet conference in 1990.16 Over the next several years, other "things" were IP–enabled, including a soda machine 17 at Carnegie Mellon University in the US and a coffee pot in the Trojan Room at the University of Cambridge in the UK (which remained Internet–connected until 2001). From these whimsical beginnings, a robust field of research and development into "smart object networking"19 helped create the foundation for today's Internet of Things.

Vehicle parking system commanded by android application" is a miniature model of vehicle parking system that can regulate and manage number of vehicle that can be parked in given space at any given time based on the availability of parking slot. The main motto of our project is to make the people easier to book their parking slot with the mobile in a simple manner. Additionally, we are also providing nearby places like

- **Hospitals:-**The user can check the hospitals near his place while, travelling to his destination

- **Movie Theatres:-**The user can also check the movie theatres
- **Banks:-**The user can also check the banks near his place
- **Hotels:-** In the similar manner user can also check nearby hotels
- **Fuel Stations:-** User can also check the fuel stations near his destination
- **Educational Institutions:-** User can also check the nearby educational institutions
- **Police stations:-** User can also check the nearby police stations
- **Government Offices:-** User can also check the nearby government offices.
- **ATM Centres:-** User can also check the nearby ATM centers
- **Medical Services:-** User can also check nearby medical services
- **Shopping malls:-** User can also check the nearby shopping malls
- **Car Service Stations:-** User can also check the nearby car service stations
- **News:-** He can also check the current affairs, national and international news
- **Pollution:-** The user can also check pollution levels of his location and his destination.The user can check the major pollutants of ground level are Ozone,O3,Particle Pollution,PM2.5,PM10, Carbon Monoxide(CO),Sulphur Dioxide(SO2), Nitrogen Dioxide(NO2),apart from these there are also air pollutants NH3, CO2, Temperature, Humidity,Pressure.The gas sensors that are to be used are MQ5 (for smoke), MQ135 (CO2), MQ7 (CO), and DHT11 for temperature and humidity, DUST sensors
- **Weather:-**The user can also check the temperature,humidity,etc of his current location to his destination in the means of centigrade and Fahrenheit .This makes user to plan his travel
- **Theft Detection:**The user can find the theft vehicle by using GPS.So that the others cannot rob the users vehicle
- **Security:** While security considerations are not new in the context of information technology, the attributes of many IoT implementations present new and unique security challenges. Addressing these challenges and ensuring security in IoT products and services must be a fundamental priority. Users need to trust that IoT devices and related data services are secure from vulnerabilities, especially as this technology become more pervasive and integrated into our daily lives.

These article centers around the method of transferring obtained information on the web with the goal that the gadget can be utilized to remotely screen climate parameters and in the long run examine environmental change designs like temperature, humidity, Atmospheric Pressure [4]. The paper also discusses the basic concept of Internet of Things and its potential applications, especially for weather monitoring. Monitoring air quality is a necessary activity in many industrial and urban areas of our planet.

In this paper, we deal with air quality forecasting by using machine learning approaches to predict the timely concentration of air pollutants (example: Methane, Butane, LPG, Smoke). Machine learning, as one of the most popular techniques, is able to efficiently train a model on the data from the sensors by using optimization algorithms.

Although there exist some works applying machine learning to air quality prediction, most of the prior studies are restricted to several-year data and In this work, we propose refined models to predict the hourly air pollution concentration on the basis of sensor collective data of previous days by formulating the prediction over hours as a multi-task learning.

The aim of the paper here is the investigation of applicability of machine learning techniques for air quality forecasting in operational conditions, along with focuses on applicability of machine learning algorithms in operational conditions of air quality monitoring for predictions.

Pollution detection and regular monitoring is extremely significant errand in this day and age of in our existing world. To make a better and more secure condition for individual, creatures, and plants. We have to screen and control the contamination through the Internet of things innovation.

This investigation proposes air contamination

and checking model which distinguishes contamination in air based on information mining calculation. The sensor System is used to recognize the sensor regards from different gas sensors. Remote sensors are utilized to ascertain the level of unsafe gases presents noticeable all around that, at last, gives a decrease in contamination.

This framework not just computes the poisons present noticeable all around yet, in addition, we can figure to maintain a strategic distance from future contamination in and can send the notification message to the specific dirtied region. Here we consider basically the concoction Industry close Delhi and the metro urban communities. The displayed gadget has been intended for remote checking of climate various environments.

A. Device-to-Device Communications:

The device-to-device communication model represents two or more devices that directly connect and communicate between one another, rather than through an intermediary application server. These devices communicate over many types of networks, including IP networks or the Internet. Often, however these devices use protocols like Bluetooth, Z-Wave, or ZigBee to establish direct device-to-device communications.

These device-to-device networks allow devices that adhere to a particular communication protocol to communicate and exchange messages to achieve their function [5]. This communication model is commonly used in applications like home automation systems, which typically use small data packets of information to communicate between devices with relatively low data rate requirements. Residential IoT devices like light bulbs, light switches, thermostats, and door locks normally send small amounts of information to each other (e.g. a door lock status message or turn on light command) in a home automation scenario.

As the population increased in the metropolitan cities, the usage of vehicles got increased. Finding a parking space in most areas, especially during the rush hours, is difficult for drivers. Interdisciplinary parking may result in damage to the vehicle. Thus there is a need to provide sufficient parking spaces coupled with plenty of slots to help the user park his vehicle safely.

Basically parking system is one of the most adopted and fastest growing solution of smart city. Currently, most of the existing vehicle parking system do not have a systematic system. Most of them are manually managed and a little inefficient. Every user's demands should be like Users friendly,Should be more efficient, and they should provide more security. The idea behind our Android Application-"valid spot" is to help the user for online parking booking.

In this application user can view various parking areas also he can select it to view whether parking slot is available or not. If the parking slot is available in parking then user can book it for some specific time slot also, this system provides an additional feature of cancelling the bookings. It also utilize the open ground for parking with security. So, it will solve the parking and traffic problem. In this there is no need to use additional costly camera and scanner device for verification purpose. In this system Registration certificate (R.C) book is mandatory use for verification purpose, so it reduce the extra cost also.

B. Device-to-Gateway Model

In the device-to-gateway model, or more typically, the device-to-application-layer gateway (ALG) model, the IoT device connects through an ALG service as a conduit to reach a cloud service. In simpler terms, this means that there is application software operating on a local gateway device, which acts as an intermediary between the device and the cloud service and provides security and other functionality such as data or protocol translation.

In many cases, the local gateway device is a smartphone running an app to communicate with a device and relay data to a cloud service. This is often the model employed with popular consumer items like personal fitness trackers. These devices do not have the native ability to connect directly to a cloud service, so they frequently rely on smart phone app software to serve as an intermediary gateway to connect the fitness device to the cloud [6]. The other form of this device-to-gateway model is the emergence of "hub" devices in home automation applications. These are devices that serve as a local gateway between individual IoT devices and a cloud service, but they can also

bridge the interoperability gap between devices themselves.

C. Back-End Data-Sharing Model

The back-end data-sharing model refers to a communication architecture that enables users to export and analyze smart object data from a cloud service in combination with data from other sources.

This architecture supports "the user's desire for granting access to the uploaded sensor data to third parties". This approach is an extension of the single device-to-cloud communication model, which can lead to data silos where "IoT devices upload data only to a single application service provider". A back-end sharing architecture allows the data collected from single IoT device data streams to be aggregated and analysed.

II. BACKGROUND

The first electromagnetic cloaking device was produced in 2006, using gradient-index meta materials. This has led to the burgeoning field of transformation optics (and now transformation acoustics), where the propagation of waves is precisely manipulated by controlling the behavior of the material through which the light (sound) is travelling.

The enormous benefits and immeasurable possibilities of connecting various devices and networks together, this has attracted many companies to put eloquent efforts to address important issues and challenges. Starting from the 3 millennium wireless sensor networks created an interest from industries and research aspects.

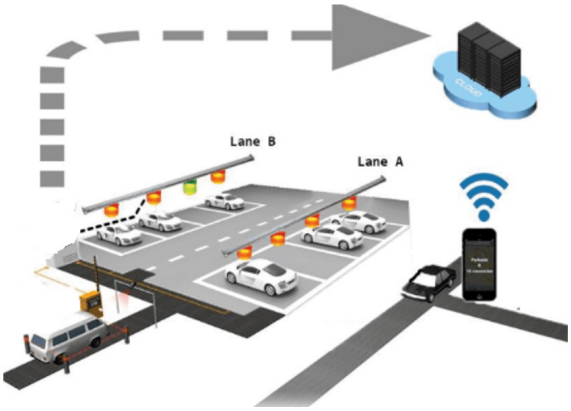

Figure.2: IoT based Vehicle Parking System

The origin of WSNs can be seen in military and heavy industrial applications, far removed from the light industrial and consumer WSN applications that are prevalent today. The first wireless network that bore any real resemblance to a modern WSN is the Sound Surveillance System (SOSUS), developed by the United States Military in the 1950s to detect and track Soviet submarines [7]. This network used submerged acoustic sensors – hydrophones – distributed in the Atlantic and Pacific oceans. This sensing technology is still in service today, albeit serving more peaceful functions of monitoring undersea wildlife and volcanic activity.

A. Literature Survey

Literature survey is the primary step in the process of proposing a new methodology in particular subject or research area. Advancement in technology made researchers think about the vehicle parking in the aspect to control the congestion of the vehicles in the parking space. This chapter is further divided into six sections.Objective of literature survey To study both IoT and Android Studio with improved information and communication processes.

To study Advance technology about IoT in the aspect of monitoring and controlling the vehicle parking with the android application. To study how to predict the weather conditions through sensor into local server and display information on the android application.

Objective of literature survey

- To study both IoT and Android Studio with improved information and communication processes.
- To study Advance technology about IoT in the aspect of monitoring and controlling the vehicle parking with the android application.
- To study how to predict the weather conditions through sensor into local server and display information on the android application.
- To study how to collect pollution data through sensor and transfer into local server and to display information on the android application.

To study how to collect pollution data through sensor and transfer into local server and to display information on the android application. Survey on vehicle parking technology In today's world parking lots have become redundant and needs

lot of manpower to handle and maintain it. These parking lots are not user friendly and do not provide data regarding availability of free spaces. Many researchers have contributed to this issue and formalized with various methods to better optimize the parking slot to serve the needs.

The proposed smart parking reservation system using short message services (SMS), for that he uses Global System for Mobile (GSM) with microcontroller to enhance security. The ZigBee technique is used along with the GSM module for parking management and reservation. The author uses Global Positioning System (GPS) and Android platform to show available parking spaces. However, reservation for the same is not available.

Smart parking systems based on Global Positioning Systems GPS Global Positioning Systems (GPS) technology (also known as Satnav) is used to determine and track a vehicle's precise location. In this domain, it is used to offer information about the location and availability of parking spaces at the destination. This technique proposed in (Pullola et al. 2007; Chon et al 2002; Hanifet al. 2010). Chon et al presented a location-based system called NAPA. The server in the system associates buildings on the campus with parking lots in the order of distances to the building.

After locating the nearest available parking lot, the user sends the NAPA server a message that he/she has parked. Then the server updates the information about the lot accordingly. When the user leaves the parking lot, the NAPA server can automatically charge the appropriate parking fee if necessary. (Hanif et al. 2010) proposed a new smart parking system using SMS services.

This system is capable of finding parking spaces in specific car park areas. A parking reservation system is developed in such a way that users can book their parking spots over short message services (SMS) using the GPS. The SMS is processed by a wireless communication instrumentation device called a micro-RTU (Remote Terminal Unit). The proposed prototype have the following specification; the circuit has a simple design, the reliability level is high, and the system accuracy is excellent.

Survey on Wireless Sensor Networks In an architectural overview of a sensor node, networking standards, protocol stack, communication protocol architecture, the performance modelling of wireless sensor network through radio energy model is provided. In the following, advantages, applications, challenges of wireless sensor networks have been described. A wireless sensor network consist of specially distributed self-governing sensors to monitor physical or environmental conditions such as temperature, humidity, sound, vibrations, pressure etc and it also passes the information through network to a main location. Wireless sensor network (WSN) is built up of a group of several hundred or thousands of sensor nodes, where each node is connected to one sensor node.

Radio transceiver with an internal antenna or connection of an external antenna, a micro controller, an electronic circuit for interfacing with sensors and an energy source are some typical parts of a single sensor network node. Each sensor network node can be composed of various sensors that are used to collect data is transferred to the user through network and also control some physical processes. WSN uses a star topology with an advanced multi hop wireless mesh topology network. WSN consist of basic 3 components i.e., sensor nodes, user and interconnected backbone.

B. Survey on the Detection:

Vehicle theft detection concentrates mainly on the various lock system or monitoring and controlling of vehicle from a remote location. These types of devices cannot be practically implied as there are various shortcomings and the logics needs to be revised. A sensor based vehicle theft detection system along with some features like fire detection is implemented in the vehicle [4]. Two android devices communicate with each other one from the vehicle and the other is with the owner of the vehicle. A password lock is used to control the vehicle. When a user tries to access the vehicle the intended uses needs to be authorized only then the vehicle ignition can be turned on.

Constant surveillance of any object is maintained on car. Remote monitoring of vehicle is streamed through the surveillance pad [5]. An event detection module consists of event detection sensor and event detection logic. Whenever the ignition is started the location is updated in the pad. Password locks with remote ignition cut-off

mechanisms are used with the controller of the vehicle [8]. If any incorrect password is encountered more than three times then the engine is cut off and the vehicle cannot be accessed anymore. When any event of theft has occurred is alerts the nearby user with a buzzer sound.

A brief review on weather predictions is presented:

Weather prediction has many different problems. Even the simplest weather predictions are not perfect. The one-day forecast typically falls within two degrees of the actual temperature. Although this in accuracy is not bad, as predictions are made for further in time. Also, when predicting precipitation, accuracy can be even worse. Furthermore, weather prediction, in areas where the climate lacks consistency, is off by even more.

For example, in a place like New England where temperatures have great variance the temperature predictions are more inaccurate than a place like the tropics. Inaccuracies in weather prediction have different effects on different people. To some people, these inaccuracies may mean getting wet on the walk to the car or having to take off an extra layer of clothes, but to others, these inaccuracies can lead to unnecessary evacuations, home damage, and possibly death. Better weather prediction would allow for better knowledge of when evacuation is needed, when people need to board up their homes, and when and where people are most going to need help. Inaccurate weather prediction systems must be improved when so much is at stake. However, in order to understand what needs to be improved, it is important to understand how weather is currently predicted.

A brief review on pollution prediction is presented:

Air pollution at the interurban scale (i.e., within a city scale) has increased for a variety of reasons. First, the contribution of traffic pollution has grown, and most studies agree that the demand for transportation will exceed improvements to emission reduction technologies. Regardless of regulatory interventions, higher exposure to traffic pollution with distinct interurban gradients maybe seen around major roads and highways.

Recent exposure studies have shown that for some pollutants associated with traffic, such as nitrogen dioxide (NO2) and ultra fine particles, variation within cities may exceed variations between cities Some studies from the United Kingdom (UK) indicate two- to three-fold differences in NO2 within distances of 50 m or less while US studies suggest ultra fine particles are elevated above background concentrations until about 300 m of highways

III. RELATED WORK

The Internet of Things is an emerging topic of technical, social, and economic significance. Consumer products, durable goods, cars and trucks, industrial and utility components, sensors, and other everyday objects are being combined with Internet connectivity and powerful data analytic capabilities that promise to transform the way we work, live, and play. At the same time, however, the Internet of Things raises significant challenges that could stand in the way of realizing its potential benefits.

Attention-grabbing headlines about the hacking of Internet-connected devices, surveillance concerns, and privacy fears already have captured public attention. Technical challenges remain and new policy, legal and development challenges are emerging. This overview document is designed to help the Internet Society community navigate the dialogue surrounding the Internet of Things in light of the competing predictions about its promises and perils.

The Internet of Things engages a broad set of ideas that are complex and intertwined from different perspectives. Key concepts that serve as a foundation for exploring the opportunities and challenges of IoT include:

IoT Definitions: The term Internet of Things generally refers to scenarios where network connectivity and computing capability extends to objects, sensors and everyday items not normally considered computers, allowing these devices to generate, exchange and consume data with minimal human intervention. There is, however, no single, universal definition.

Enabling Technologies: The concept of combining computers, sensors, and networks to monitor and control devices has existed for decades.

The recent confluence of several technology market trends, however, is bringing the Internet of Things closer to widespread reality. These include Ubiquitous Connectivity, Widespread Adoption of IP-based Networking, Computing Economics, Miniaturization, Advances in Data Analytic, and the Rise of Cloud Computing.

Connectivity Models: IoT implementations use different technical communications models, each with its own characteristics. Four common communications models described by the Internet Architecture Board include: Device-to-Device, Device-to-Cloud, Device-to-Gateway, and Back-End Data-Sharing. These models highlight the flexibility in the ways that IoT devices can connect and provide value to the user.

Transformations Potential: If the projections and trends towards IoT become reality, it may force a shift in thinking about the implications and issues in a world where the most common interaction with the Internet comes from passive engagement with connected objects rather than active engagement with content. The potential realization of this outcome a "hyper connected world" is testament to the general-purpose nature of the Internet architecture itself, which does not place inherent limitations on the applications or services that can make use of the technology.

Five key IOT issue areas are examined to explore some of the most pressing challenges and questions related to the technology. These include security, privacy, interoperability and standards; legal, regulatory, and rights; and emerging economies and development.

Security: While security considerations are not new in the context of information technology, the attributes of many IoT implementations present new and unique security challenges. Addressing these challenges and ensuring security in IoT products and services must be a fundamental priority. Users need to trust that IoT devices and related data services are secure from vulnerabilities, especially as this technology become more pervasive and integrated into our daily lives. Poorly secured IoT devices and services can serve as potential entry points for cyber attack and expose user data to theft by leaving data streams inadequately protected.

The interconnected nature of IoT devices means that every poorly secured device that is connected online potentially affects the security and resilience of the Internet globally. This challenge is amplified by other considerations like the mass-scale deployment of homogeneous IoT devices, the ability of some devices to automatically connect to other devices, and the likelihood of fielding these devices in unconditional environments. As a matter of principle, developers and users of IoT devices and systems have a collective obligation to ensure they do not expose users and the Internet itself to potential harm. Accordingly, a collaborative approach to security will be needed to develop effective and appropriate solutions to IoT security challenges that are well suited to the scale and complexity of the issues.

Privacy: The full potential of the Internet of Things depends on strategies that respect individual privacy choices across a broad spectrum of expectations. The data streams and user specificity afforded by IoT devices can unlock incredible and unique value to IoT users, but concerns about privacy and potential harms might hold back full adoption of the Internet of Things. This means that privacy rights and respect for user privacy expectations are integral to ensuring user trust and confidence in the Internet, connected devices, and related services.

Indeed, the Internet of Things is redefining the debate about privacy issues, as many implementations can dramatically change the ways personal data is collected, analyzed, used, and protected. For example, IoT amplifies concerns about the potential for increased surveillance and tracking, difficulty in being able to opt out of certain data collection, and the strength of aggregating IoT data streams to paint detailed digital portraits of users. While these are important challenges, they are not insurmountable. In order to realize the opportunities, strategies will need to be developed to respect individual privacy choices across a broad spectrum of expectations, while still fostering innovation in new technology and services.

Interoperability / Standards: A fragmented environment of proprietary IoT technical implementations will inhibit value for users and industry. While full interoperability across products and

services is not always feasible or necessary, purchasers may be hesitant to buy IoT products and services if there is integration inflexibility, high ownership complexity, and concern over vendor lock-in.

Internet Society: In addition, poorly designed and configured IoT devices may have negative consequences for the networking resources they connect to and the broader Internet. Appropriate standards, reference models, and best practices also will help curb the proliferation of devices that may act in disrupted ways to the Internet. The use of generic, open, and widely available standards as technical building blocks for IoT devices and services (such as the Internet Protocol) will support greater user benefits, innovation, and economic opportunity.

Legal, Regulatory and Rights: The use of IoT devices raises many new regulatory and legal questions as well as amplifies existing legal issues around the Internet. The questions are wide in scope, and the rapid rate of change in IoT technology frequently outpaces the ability of the associated policy, legal, and regulatory structures to adapt. One set of issues surrounds cross border data flows, which occur when IoT devices collect data about people in one jurisdiction and transmit it to another jurisdiction with different data protection laws for processing. Further, data collected by IoT devices is sometimes susceptible to misuse, potentially causing discriminatory outcomes for some users.

Other legal issues with IoT devices include the conflict between law enforcement surveillance and civil rights; data retention and destruction policies; and legal liability for unintended uses, security breaches or privacy lapses. While the legal and regulatory challenges are broad and complex in scope, adopting the guiding Internet Society principles of promoting a user's ability to connect, speak, innovate, share, choose, and trust are core considerations for evolving IoT laws and regulations that enable user rights.

Emerging Economy and Development Issues: The Internet of Things holds significant promise for delivering social and economic benefits to emerging and developing economies. This includes areas such as sustainable agriculture, water quality and use, healthcare, industrialization, and environmental management, among others. As such, IoT holds promise as a tool in achieving the United Nations Sustainable Development Goals.

The broad scope of IoT challenges will not be unique to industrialized countries. Developing regions also will need to respond to realize the potential benefits of IoT. In addition, the unique needs and challenges of implementation in less-developed regions will need to be addressed, including infrastructure readiness, market and investment incentives, technical skill requirements, and policy resources.

The Internet of Things is happening now. It promises to offer a revolutionary, fully connected "smart" world as the relationships between objects, their environment, and people become more tightly intertwined. Yet the issues and challenges associated with IoT need to be considered and addressed in order for the potential benefits for individuals, society, and the economy to be realized. Ultimately, solutions for maximizing the benefits of the Internet of Things while minimizing the risks will not be found by engaging in a polarized debate that pits the promises of IoT against its possible perils. Rather, it will take informed engagement, dialogue, and collaboration across a range of stakeholders to plot the most effective ways forward.

A. Working Principle

The enormous benefits and immeasurable possibilities of connecting various devices and networks together, this has attracted many companies to put eloquent efforts to address important issues and challenges. Starting from the 3 millennium wireless sensor networks created an interest from industries and research aspects.

The origin of WSNs can be seen in military and heavy industrial applications, far removed from the light industrial and consumer WSN applications that are prevalent today. The first wireless network that bore any real resemblance to a modern WSN is the Sound Surveillance System (SOSUS), developed by the United States Military in the 1950s to detect and track Soviet submarines.

This network used submerged acoustic sensors – hydrophones – distributed in the Atlantic and Pacific oceans. This sensing technology is still in service today, albeit serving more peaceful func-

tions of monitoring undersea wildlife and volcanic activity.

Figure.3: Smart Parking Module

A wireless sensor network consist of specially distributed self-governing sensors to monitor physical or environmental conditions such as temperature, humidity, sound, vibrations, pressure etc and it also passes the information through network to a main location. Wireless sensor network (WSN) is built up of a group of several hundred or thousands of sensor nodes, where each node is connected to one sensor node.

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The basic requirements of WSN are as follows:

- **Scalability-** WSN must be capable of being easily expanded or upgraded on demand.
- **Reliability-** WSN must be worth trusting and it should provide what is needed for the user.
- **Responsiveness-** WSN should quickly react in the desired or positive way
- **Mobility-** WSN must be able to move from one place to another.
- **Power efficiency-** WSN must be power efficient.

Different with traditional cloak which deflects light around the core of the cloak to make the object inside invisible, our cloak guides the light to penetrate the core of the cloak but without striking some region of the cloak shell - the so called 'folded region'.

Android application is connected to the Google firebase and the hardware component NodeMCU transmits the data to firebase and that data is utilised by the android application Hardware gives the status of the parking slots available or not t the user in android application [8]. If slot is available user click on the book slot option and goes the confirmation page.confirmation page consists of the slot number, date,Username.And if once the confirmation is done the user is receives a PIN and slot is reserved for the user.

Once the user goes to the Parking area his/her has to verified by the Authorizer one who present at the parking area gate entrance. The person one who booked the slot has verify his/her PIN with Authorizer at the gate entrance to enter into the Parking area. If the PIN is valid his/her allowed to park their vehicle in that parking area. If the PIN is Invalid his/her not allowed to the Parking area

From the above screen the user can selects the parking area according to the user requirement, the selects the Parking slot .He can be able to select if only the slot is available. Available slot is displayed in green color.Already booked is displayed in red Color.

Ardunio IDE

The Arduino integrated development environment (IDE) is a cross-platform application (for Windows, macOS, Linux) that is written in the programming language Java. It is used to write and upload programs to Arduino compatible boards, but also, with the help of 3rd party cores, other vendor development boards.

The source code for the IDE is released under the GNU General Public License, version 2.The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures. User-written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub main() into an executable cyclic executive program with the GNU tool chain, also included with the IDE Distribution.

B. *Environment Setup:*

The core of this unit is the data acquisition card i.e. the microcontroller. Arduino NodeMCU Esp8266 is the microcontroller used in the system to which the sensors are interfaced to it using breadboard and connecting wires.

Back-End Data-Sharing Model

The back-end data-sharing model refers to a communication architecture that enables users to export and analyze smart object data from a cloud service in combination with data from other sources.

This architecture supports "the [user's] desire for granting access to the uploaded sensor data to third parties". This approach is an extension of the single device-to-cloud communication model, which can lead to data silos where "IoT devices upload data only to a single application service provider".

A back-end sharing architecture allows the data collected from single IoT device data streams to be aggregated and analysed.For example, a corporate user in charge of an office complex would be interested in consolidating and analyzing the energy consumption and utilities data produced by all the IoT sensors and Internet-enabled utility systems on the premises. Often in the single device-to-cloud model, the data each IoT sensor or system produces sits in a stand-alone data silo. An effective back-end data sharing architecture would allow the company to easily access and analyze the data in the cloud produced by the whole spectrum of devices in the building.

Theft detection: UART GPS NEO-6M is an hardware component that connect to the Microcontroller and the microcontroller process the data to the android application.UART GPS NEO-6M gets the longitude and latitude details of the UART GPS NEO-6M located location and send that coordinates to the microcontroller. Microcontroller transmits that coordinates the firebase and android application fetches that coordinates from firebase.

Applications of the Event Cloak include the possibility to achieve 'interrupt-without-interrupt' in data channels that converge at a node. A primary calculation can be temporarily suspended to process priority information from another channel.

C. *Firebase Cloud Messaging :*

Formerly known as Google Cloud Messaging (GCM), Firebase Cloud Messaging (FCM) is a cross-platform solution for messages and notifications for Android, iOS, and web applications, which as of 2016 can be used at no cost.

Firebase Auth: Firebase Auth is a service that can authenticate users using only client-side code. It supports social login providers Facebook, GitHub, Twitter and Google (and Google Play Games). Additionally, it includes a user management system whereby developers can enable user authentication with email and password login stored with Firebase.

Real-Time Database: Firebase provides a real-time database and backend as a service. The service provides application developers an API that allows application data to be synchronized across clients and stored on Firebase cloud. The company provides client libraries that enable integration with Android, iOS, JavaScript, Java, Objective-C, Swift and Node.js applications. The database is also accessible through a REST API and bindings for several JavaScript frameworks such as AngularJS, React, Ember.js and Backbone.js.The REST API uses the Server-Sent Events protocol, which is an API for creating HTTP connections for receiving push notifications from a server. Developers using the real-time database can secure their data by using the company's server-side-enforced security rules. Cloud Fire store which is Firebase next generation of the Real-time Database was released for beta use.

Firebase Stroage: Firebase Storage provides secure file uploads and downloads for Firebase apps, regardless of network quality. The developer can use it to store images, audio, video, or other user-generated content. Firebase Storage is backed by Google Cloud Storage.

Firebase Hosting: Firebase Hosting is a static and dynamic web hosting service that launched on May 13, 2014. It supports hosting static files such as CSS, HTML, JavaScript and other files, as well as support through Cloud Functions.The service delivers files over a content delivery network (CDN) through HTTP Secure (HTTPS) and Secure Sockets Layer encryption (SSL). Firebase partners with Fastly, a CDN, to provide the CDN

backing Firebase Hosting. The company states that Firebase Hosting grew out of customer requests; developers were using Firebase for its real-time database but needed a place to host their content.

Node-MCU: NodeMCU is an open source IoT platform. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module.The term "NodeMCU" by default refers to the firmware rather than the development kits. The firmware uses the Lua scripting language. It is based on the eLua project, and built on the Espressif Non-OS SDK for ESP8266. It uses many open source projects, such as lua-cjson and SPIFFS.

D. Pollution Detection

To detect the pollution from the environment gas sensors are used. We used three types of gas sensors like MQ-6 Gas Sensor, MQ-2 Gas Sensor, MQ-3 Gas Sensors to detect pollution from environment. These sensors detect pollution and transmits data to microcontroller.And the microcontroller process the data to firebase. Now use is able fetch the pollution details from the firebase. If pollution is detected in environment sensor puts the value to high or else it puts the value to low.

This project presents an IOT based vehicle theft detection system. As there are many systems used till date to detect the robbed vehicle, proposed system overcomes most of the limitations of existing systems and methods. In this mechanism as soon as the dc motor starts i.e., vehicle theft occurs, Arduino activates GPS, GSM and sends an alert message to the owner and the longitude and latitude readings of vehicle are posted using internet of things with the help of Wi-Fi module. The entire mechanism can be operated with a switch for user convenience.

The Internet of Things (IoT) is an important topic in technology industry, policy, and engineering circles and has become headline news in both the specialty press and the popular media. This technology is embedded in a wide spectrum of networked products, systems, and sensors, which take advantage of advancements in computing power, electronics miniaturization, and network interconnections to offer new capabilities not previously possible.

An abundance of conferences, reports, and news articles discuss and debate the prospective impact of the "IoT revolution" from new market opportunities and business models to concerns about security, privacy, and technical interoperability.

The large-scale implementation of IoT devices promises to transform many aspects of the way we live. .IoT systems like networked vehicles, intelligent traffic systems, and sensors embedded in roads and bridges move us closer to the idea of "smart cities", which help minimize congestion and energy consumption. Smart Parking system can also be included with arduino interlinked with mobile application (Android).

E. Testing

The purpose of testing is to discover errors. Testing is the process of trying to discover every conceivable fault or weakness in a work product. It provides a way to check the functionality of components. sub-assemblies, assemblies and/or a finished product It is the process of exercising software with the intent of ensuring that the Software system meets its requirements and user expectations and does not fail in an unacceptable manner. There are various types of test. Each test type addresses a specific testing requirement.

Validation Testing: In this, requirements established as part of software requirement analysis are validated against the software that has been constructed i.e., validation succeeds when software functions in a manner that can reasonably expected by the customer. I made sure I have covered all the requirements that were discussed earlier at the start of the project. And also confirmed that the application works just the way it has to.

IV. PROPOSED SYSTEM

The design of the proposed system and the system architecture has been discussed. Proposed system architecture has been IoT Based Vehicle Parking System.

1) The Sign-up Activity where the user has to register his details with his Name, E-mail, Phone number, Password, and Vehicle Number. The Login Activity where if the user is already a had an account, he/she can simply log in through phone number and password or can log in with an OTP.

2) The weather pop-up activity of the guest user where he can get the weather predictions of the current and destination locations, and the booking pop-up activity the user can book the parking slot as a guest user to his destination location.
3) It shows the User's current location and you can find the nearby places by searching the desired places. From the User wants to find the nearby restaurants on the screen the nearby restaurants displayed.
4) where you can find the nearby parking slots by their name, location, and Distance, and you can select the slot for 2 or 4-wheeler of the particular destination location.
5) We can find the data of the weather of the current location as humidity
6) The pollution monitor displays the pollution of the current and destination location.
7) You can select the slot for 2 or 4-wheeler of the particular destination location and if the vehicle was robbed the theft vehicle can get detected with the GPS tracking.
8) The Live T.V Activity is the live screening
9) We can refer the application through WhatsApp, G-mail, Facebook, and messaging
10) the profile Activity where we can create the user's profile, and we can edit the profile picture and add the personal details such as Name, Mail ID, Phone number and Vehicle number.
11) where you can find the nearby parking slots by their name, location, and Distance.

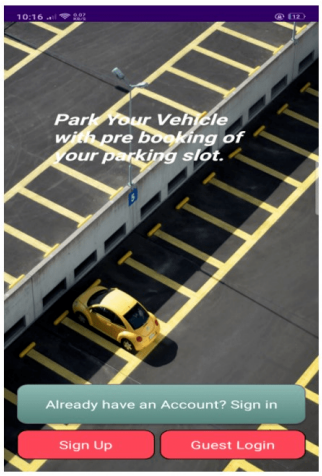

Figure.4: Login

Application for Smart parking system

The proposed system is an Android Application which mainly consists of three modules. The user can choose a parking space that is nearest to his destination after getting login to the application. After the user books a particular slot the administrator updates the status of that respective parking slot to "RESERVED". If the user doesn't arrive to the parking slot within 20 minutes from the time of booking his booking will be cancelled and the status is updated to "EMPTY".

Vehicle Parking System is based on the client-server architecture. It's economically beneficial since it doesn't require any heavy infrastructure. It is neither sensitive to temperature change nor affected by any extreme air turbulence. The main objectives of Vehicle Parking System (VPS) application is to provide the following:

1) Smart, ubiquitous, user friendly automated parking system application that minimizes user's time and avoid traffic congestion in metropolitan cities.
2) To ensure safe and secure parking slots within limited area, which is of most urge.

A. *Methodology*

This module of the application deals with the user interface/user experience. This module provides the user with the flexibility of registering, logging in, booking. If the user is new to the application then, the user must register in the application by providing the user's details. After the registration, the user logs in using the user-id and password. Once the user logs in , then the user browses the parking slot then books that parking slot. Administrator Module This is the operative module of the application. It works in the backend for managing the database and performs various operations on it.

The administrator stores all the user's data in the database as soon as he gets registered with the application. Administrator maintains the details of all parking slots (both empty and reserved) , user details in database and the modification on these data is only can be done by the administrator [10]. The administrator also provides the payment method to the user. Booking Module This is the main module of the application and it deals with

the booking of the parking slot. When the user is ready for booking then the booking module comes in the scenario to provide user the necessary information for booking. The available slot,book the slot and the necessary processing in regards to these, are done by this booking module The slot allocation method follows a sequence as stated below:

- **Step 1:** Initially the slot selection is made by the user from his mobile phone. He checks for the availability of a parking slot that is nearest to his location. If it is available, he moves to the next stage or else go to the initial state.
- **Step 2:** Transfers request for parking slot from the mobile using Android application.
- **Step 3:** The Parking Control Unit (PCU) gets the slot number requested by the user.
- **Step 4:** The requested slot is reserved in the parking area.
- **Step 5:** After reserving a particular slot by the user then the status of that respective slot will be marked as RED=RESERVED and the remaining will be GREEN=EMPTY.
- **Step 6:** As soon as the vehicle gets entered into the parking slot.
- **Step 7:** Once the user confirmed his/her slot and done with booking the user receives an OTP.
- **Step 8:** The User has to verify his / her OTP with the Authorizer who is located at the parking area to enter into parking area.
- **Step 9:** If once the OTP Authentication is successful his/her is granted with permission to there vehicle in the previously booked slot.

B. Proposed Solution

We had tried our level best to provide best solutions to the mentioned Solution for Vehicle Parking

1) We are showing number of slots available to the user in the mobile application before he reach his destination.
2) We are providing the directions to the user to reach his parking destination.
3) We are providing the parking slots based on following some specifications like Type of vehicle and Size of the vehicle and with perfect authentication of the registered vehicle.
4) We are providing individual slots to the vehicles near to their destination, So users can save their time and their energy
5) As we are providing some confined area to park their vehicle and authentication service so that others cannot enter into the parking slot so that there will be no damage to the vehicle.
6) We are providing theft detection system with live tracking so that user can protect his vehicle.
7) It makes easier to reach their destination easier
8) The people can check the nearby places like hospitals,hotels,railway stations etc near while travelling to their destination.
9) The people can check the weather conditions of his location and destination.

C. Smart Parking System

Smart Parking System is a solution to the existing traffic congestion, to reduce drivers' frustration by providing information about the occupancy status of the parking spaces [9]. The project development went smoothly while teaching me many best practices in programming using the current trending technologies like Android Studio and REST APIs. I could see that all the initial requirements of the project are achieved and also I tried doing minor data analysis on the parking spaces occupancy statuses.

The first electromagnetic cloaking device was produced in 2006, using gradient-index metamaterials. This has led to the burgeoning field of transformation optics (and now transformation acoustics),

The problems are identified based on various persons perspectives.They are

1) The list numbers increase with each entry we add
2) The drivers does not know the exact location of parking lots
3) Drivers does not know whether their vehicle fit in that place
4) The people may find very difficult to park their vehicle in rush places.
5) The people may face difficulty to take there if they parked at first where other vehicles may have been a problem to them

6) There are also some situations where our vehicle get scratches
7) While people going some functions or any parties people generally search for the parking slots
8) The people who are new to the city generally search for addresses for nearby hospitals or other emergency services
9) The people have some requirements like to check the weather and pollution conditions Problem Specification

D. *Problem Specifications:*

This effect can be created by embedding a periodic configuration of dielectrics in a metal, for example. The problems are identified based on various persons perspectives.They are

1) They are having limited number of parking slots for the people.
2) The drivers does not know the exact location of parking lots.
3) Drivers does not know whether their vehicle fit in that place.
4) The people may find very difficult to park their vehicle in rush places.
5) The people may face difficulty to take there if they parked at first where other vehicles may have been a problem to them.
6) There are also some situations where our vehicle get scratches.
7) There are also situations our vehicles may get stolen in remote areas and open areas.
8) While people going some functions or any parties people generally search for the parking slots.
9) The people who are new to the city generally search for addresses for nearby hospitals or other emergency services.
10) The people have some requirements like to check the weather and pollution conditions.

E. *Results*

Client Side- Initially, the user need to install smart parking application on his android device. After installation the icon will be displayed on his android mobile screen. Registration and login: If the user is a new user he needs to get registered with the application by giving all his details. The data which is entered by the user is stored on the server. These details consists user name, email, password, address etc. This registration is done only for the first time. After the user gets registered with the application, the user can login by using his/her mobile number. If the user gets successfully login to the application then the user is said to be an authorized user.

Server Side- We have used the Firebase as backend to store the user data and to make use of the various modules that we provided for the users. How the Firebase looks like, Here we have created project with name of parking in the firebase where the user data is stored.

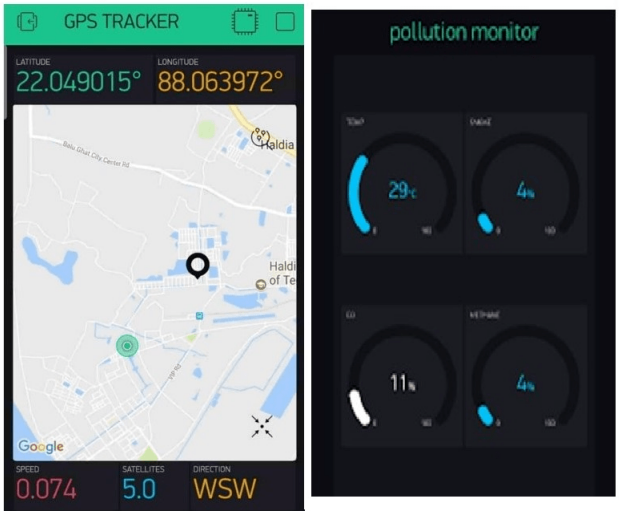

Figure.5: Pollution Detection

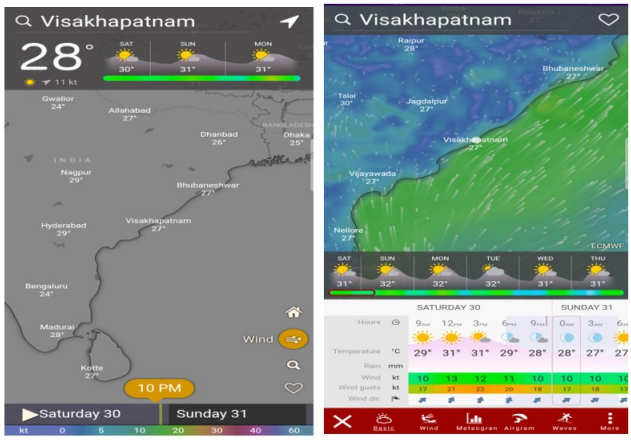

Figure.6: Weather Detection

V. CONCLUSION

Smart Parking System is a solution to the existing traffic congestion, to reduce drivers' frustration by providing information about the occupancy status of the parking spaces. I could see that all

gave me very good experience and exposure in development android application.

This application is an initial step in reaching the effective solution for the daily concern. This project can be extended in multiple ways: To provide a central management system that make sure only authenticated information is sent to the Client, i.e. dealing with the security issues. More analysis can be done using the parking history data by which User can get recommendations or suggestions on parking spaces and their availability trends, and this analysis can be used while reserving a parking space by User or while renting a space, to decide the price of the parking space. We could also do a mobile application through which driver can get the occupancy statuses of the parking spaces.

VI. FUTURE ENHANCEMENT

Present the application is working only for android devices with 3G/4G networks. In Future, we try our level best to provide our application to both windows and iPhone devices. In Future we want to provide user guide to the people which include snapshots and video tutorials which makes user to use the application easy and efficient manner. As the application is prototype version, It might not be able to work for multiple devices simultaneously. After providing real time access to this application, then the application will definitely work for multiple devices.

Present we are using security protocols for the application and cloud database. But after assessing for real time implementation, we provide more encrypted security. As it is a basic version of the application, user need to provide his present location but after including GPS and saucily Technology after logging into the application. It directly gives user location access.

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