KARNATAK LAW SOCIETY’S

GOGTE INSTITUTE OF TECHNOLOGY

UDYAMBAG, BELGAVI-590008

(An Autonomous Institution under Visvesvaraya Technological University Belagavi)

# (APPROVED BY AICTE, NEW DELHI)



Open Book Assignment 1 on

**“SMART PARKING SYSTEM USING IOT”**

*submitted in the partial fulfilment for the academic requirement of*

**6th Semester BE in**

**SENSORS AND SIGNAL CONDITIONING**

Submitted by

|  |  |
| --- | --- |
| **NAME OF THE CANDIDATE** | **USN** |
| Anvita Savadi | 2GI20EC025 |

**GUIDED BY**

**Prof. Praveen Kalkundri**

# KARNATAK LAW SOCIETY’S

**GOGTE INSTITUTE OF TECHNOLOGY**

# UDYAMBAG, BELAGAVI – 590008

(An Autonomous Institution under Visvesvaraya Technological University, Belagavi)

**(APPROVED BY AICTE, NEW DELHI)**

# DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING



**CERTIFICATE**

This is to certify that Anvita Savadi of **6th Semester** bearing **USN:2GI20EC025,** has satisfactorily completed the course in *Open Book Assignment 1 on Sensors and Signal Conditioning*. It can be considered as a bonafide work carried out for partial fulfilment of the academic requirement of 6th Semester B.E. prescribed by KLS Gogte Institute of Technology, Belagavi during the academic year 2022-23.

The report has been approved as it satisfies the academic requirements prescribed for the said degree.

Signature of the Faculty Member Signature of the HOD

Date:

**SMART PARKING SYSTEM USING IOT**

1. **“IoT based smart parking system”**

Authors: Abhirup Khanna and Rishi Anand

In recent times the concept of smart cities have gained grate popularity. Thanks to the evolution of Internet of things the idea of smart city now seems to be achievable. Consistent efforts are being made in the field of IoT in order to maximize the productivity and reliability of urban infrastructure. Problems such as, traffic congestion, limited car parking facilities and road safety are being addressed by IoT. In this paper, we present an IoT based cloud integrated smart parking system.

Citation: Khanna, Abhirup, and Rishi Anand. "IoT based smart parking system." In *2016 international conference on internet of things and applications (IOTA)*, pp. 266-270. IEEE, 2016.

1. **“Smart parking in IoT-enabled cities”**

Authors: Fadi Al-Turjman and Arman Malekloo

The rapid growth in population has led to substantial traffic bottlenecks in recent transportation systems. This not only causes significant air pollution, and waste in time and energy, but also signifies the issue of the auto-park scarcity. In the age of Internet of Things (IoT) and smart city ecosystems, smart parking and relevant innovative solutions are necessary towards more sustainable future cities. Smart parking with the help of sensors embedded in cars and city infrastructures can alleviate the deadlocks in parking problems and provide the best quality of services and profit to citizens.

Citation: Al-Turjman, Fadi, and Arman Malekloo. "Smart parking in IoT-enabled cities: A survey." *Sustainable Cities and Society* 49 (2019): 101608.

1. **“Smart parking using IoT technology”**

Authors: Rachapol Lookmuang; Krit Nambut; Sasiporn Usanavasin

One of the main problems in many big and crowded cities is finding parking spaces for vehicles. With IoT technology and mobile applications, in this paper, we propose a design and development of a real smart parking system that can provide more than just information about vacant spaces but also help user to locate the space where the vehicle can be parked in order to reduce traffics in the parking area. Moreover, we use computer vision to detect vehicle plate number in order to monitor the vehicles in the parking area for enhancing security and also to help user find his/her car when he/she forgets where the car is parked. In our system, we also design the payment process using mobile payment in order to reduce time and remove bottleneck of the payment process at the entry/exit gate of the parking area.

Citation: Lookmuang, Rachapol, Krit Nambut, and Sasiporn Usanavasin. "Smart parking using IoT technology." In *2018 5th International Conference on Business and Industrial research (ICBIR)*, pp. 1-6. IEEE, 2018.

1. **“A smart parking system using IoT”**

Authors: D. Ganesh Gopal, M. Asha Jerlin and M. Abirami

Due to the overcrowding of cities and increase in the number of vehicles finding a free space to park vehicles has become a major issue to the drivers especially in peak hours. Though many traditional approaches and technologies are deployed there have been many flaws are suspected and identified. Though lot of solutions has been proposed over the parking solution problems they have certain limitation and constraints over the devices or technology used as well as the cost factor required for implementation. So considering such factors we have proposed a prototype model to experiment our system which can very effectively optimise the parking solution with low-cost parking solutions.

Citation: Gopal, D. Ganesh, M. Asha Jerlin, and M. Abirami. "A smart parking system using IoT." World Review of Entrepreneurship, Management and Sustainable Development 15, no. 3 (2019): 335-345.

1. **“IOT based car parking management system for smart cities:”**

Authors: Baratam. M Kumar Gandhi, M.Kameswara Rao

Car parking is a major issue in urban areas, causing traffic, waste of time, and money. A prototype using sensor circuits, RFID, and IoT is developed to solve this problem. The system provides parking space availability information, and the IoT maintains a database of parked vehicles. This system also manages theft, allowing drivers to book slots in advance and notify the police if a vehicle is stolen. This prototype increases flexibility and security, making it suitable for airports and multiplexes parks. This prototype aims to develop a car parking management system using IoT technology, enabling remote access to information and online booking. RFID technology detects car identity and helps in theft recovery. The system is suitable for airports, multiplexes, and corporate offices. However, increasing slot numbers may require replacement of wireless sensor networks. An Android application can collect parking information in urban areas.

Citation: Gandhi, BM Kumar, and M. Kameswara Rao. "A prototype for IoT based car parking management system for smart cities." *Indian Journal of Science and Technology* 9.17 (2016)

1. **“IOT of Electric vehicles parking:”**

Authors: Jun Liu, Chong Chen, Z.Liu, and Kittisak Jermsittiparsert

In a near future, electric vehicles (EVs) will constitute considerable part of transportation systems due to their important aspects such as being environment friendly. To manage high number of EVs, developing hydrogen storage-based intelligent parking lots (IPLs) can help power system operators to overcome caused problems by high penetration of EVs.To model uncertainty of power price in the power market and develop optimal bidding curve, the opportunity, deterministic and robustness functions of the information gap decision theory (IGDT) technique has been developed. Obtained results has been presented in three strategies namely risk-taker, risk-neutral, and risk-averse corresponding to opportunity, deterministic, and robustness functions of the IGDT technique. The mixed-integer non-linear programming model is used to formulate the proposed problem which is solved using the GAMS optimization software under DICOPT solver.

Citation: Jun Liu, Chong Chen, Zhenling Liu, Kittisak Jermsittiparsert, Noradin Ghadimi,An IGDT-based risk-involved optimal bidding strategy for hydrogen storage- based intelligent parking lot of electric vehicles, Journal of Energy Storage,Volume 27,2020,

1. **“IOT based Cloud-Intgrated Smart paarking with e-payement service:”**

Authors: Ja Lin Yu, Kwan Hoong Ng, Yu ling Liong and Effariza Hanafi.

With the increasing number of automobiles, there is a high demand for parking spaces especially in indoor environment.Finding a parking space in high density cities becomes more challenging, time consuming and thus leads to traffic congestion. A smart parking system based on the Internet of Things (IoT) incorporating an e-payment services, namely, "Effortless Parking System" (EPS) is proposed in this paper. It refers to a solution applicable to any indoor parking lots that comprises of accessing or leaving a parking lot using e-tickets, locating parking availability with the aid of the implemented mobile application, and e-payment services.The whole parking operation is done solely using a mobile application. Together with vehicle detection sensors system, drivers can easily locate and secure a vacant parking space in the parking lot with the click of a button.

Vehicle ingress and egress are also made more convenient with the implementation of e- ticket mechanism. The proposed system is economical and provides a potential solution for smart cities.

Citation: Yu, Ja Lin, Kwan Hoong Ng, Yu Ling Liong, and Effariza Hanafi. "IoT Based Cloud-Integrated Smart Parking with e-Payment Service." In *Intelligent Computing: Proceedings of the 2020 Computing Conference, Volume 2*, pp. 405-414. Springer International Publishing, 2020.

1. **IOT based smart parking using LoRa:**

Authors: J.J. Barriga, J.Suica ,JL León, A Ulloa, D Portero.

The development and high growth of the Internet of Things (IoT) have improved quality of life and strengthened different areas in society. This paper identifies the most used types of every component and highlights usage trends in the established analysis period. For this purpose, herein we review several works related to smart parking solutions deployment. Trends of usage in terms of sensors, protocols and software solutions are analyzed and discussed in every section. In addition to the trends of usage, this paper determines a guide of complementary features from the type of components that should be considered when implementing a smart parking solution.Based on the reviewed literature, there are a few solutions where LPWAN technologies are used for smart parking implementations, but the most reviewed research papers used LR-WPAN technologies, specifically, ZigBee. There are several types of sensors that can deploy a smart parking solution.Sensors used for retrieving information in smart parking solutions must have real-time and automatic data collection.In addition, we plan to perform a comparative analysis about the effectiveness of LPWAN or LR-WPAN on Smart Parking to propose a formal method to select a sensor based on its technical features and the aim pursued.

Citation: Barriga, Jhonattan J., Juan Sulca, José Luis León, Alejandro Ulloa, Diego Portero, Roberto Andrade, and Sang Guun Yoo. "Smart parking: A literature review from the technological perspective." *Applied Sciences* 9, no. 21 (2019): 4569.