Logbook : Smart Parking System

Names:

- Harshal Jivnani (Roll No: 210477)
- Yaman Oza (Roll No: 211186)
- Pulipati Harshvardhan (Roll No: 210792)
- Uday Meena (Roll No: 211119)
- Raushan Kumar (Roll No: 210830)

Project Title: Smart Parking System

Formation of Project Group

Today's Date: 20th August

Team: Cosmic Realities

What we did today?

Our project group is now officially formed. We are a group of five members, all of whom know each other well, are really good friends and have worked together in the past. The members of the group are:

- **Harshal Jivnani**
- **Yaman Oza**
- **Pulipati Harshvardhan**
- **Uday Meena**
- **Raushan Kumar**

Given that we are all wingies and student from same batch of IIT Kanpur, we will collaborate on this project will figure out and work on some strong problems and innovative ideas.

Meet Regarding brainstorming potential problems and project assignment #1

Today's Date: 2nd September

What we did today?

Today we are given our first task, which is to come up with 5 problems that we wish to work on as this project. We all met and discussed few ideas just to give ourselves time and think of really good problems. We all decided we will give each other few days, and we all will come up with one idea each, at least. Next we will meet on 7 September.

Compiling and finalising 5 ideas for presentation

Today's Date: 8th September

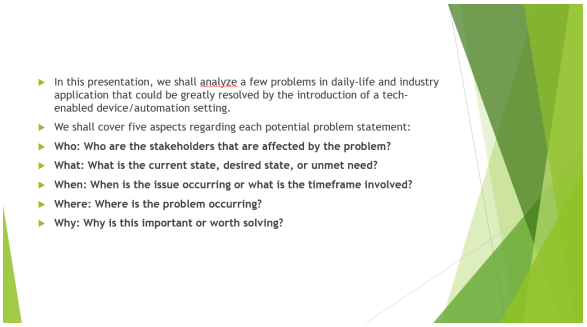
What we did today?

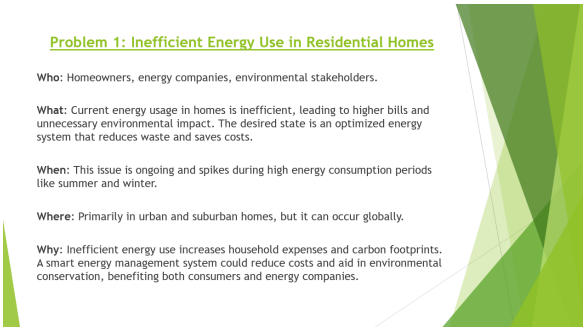
We had originally planned to meet on the 7th of September, but due to quizzes and other commitments, Harshil and Yaman weren't available. So, we decided to meet on the 8th of September instead. Everyone came with one idea each, and some even had multiple ideas. After discussing and brainstorming, we narrowed down to the top five ideas that we would present. We created a PowerPoint presentation and submitted it on the HelloIITK portal. Below are some of the ideas that we discussed:

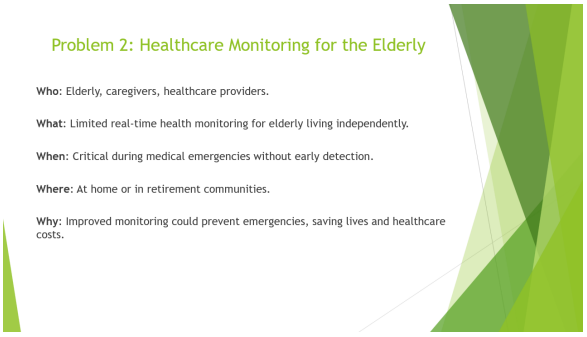
Some Ideas:

- **Smart Posture Corrector**: Enhance wearable posture correction devices by incorporating real-time alerts, ensuring users maintain proper posture throughout the day.
- **Smart Cradle**: Improve the user experience by adding automatic lullabies and real-time health monitoring features to track and ensure a baby's well-being during naps and sleep.
- **IoT-Based Smart Doorbell**: Address data privacy concerns by implementing secure face recognition and motion detection, offering better security and user control in home entry systems.

Finalised Ideas and the PPT:







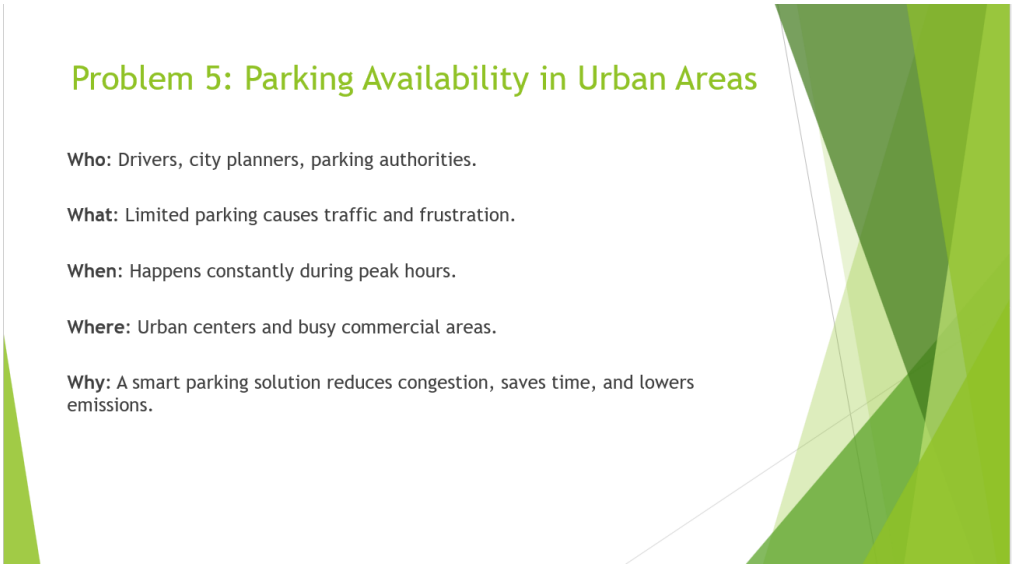
Presented PPT to class and Prof. Amar Behra

Today's Date: 23rd September

What did we do today?

For the last 2-3 classes, we have been dedicating time for project presentations. Sir calls the teams one by one, and each team presents their ideas. We got our chance today. Yaman took the lead in presenting our ideas, supported by the rest of the team. Sir appreciated our smart parking idea and gave us positive feedback. He was particularly impressed with the concept and provided valuable inputs for improvement.

Most Favorite Idea:



Discovery Phase

Today's Date: 28th September

What we did today?

Today marks the beginning of the **Discovery** phase of the **Double Diamond process.** This phase is crucial because it allows us to deeply understand the problem we're solving before jumping into solutions. We started by researching the urban parking problem and gathering insights from real-world scenarios. Our goal here is to frame the problem correctly and gain a comprehensive understanding of the pain points our system will address.

We began by researching existing parking systems, both automated and manual. We learned that many urban parking systems are inefficient due to outdated manual processes. For instance, many parking lots still rely on human guards to direct drivers to available spots. In some cases, drivers waste a lot of time searching for available spaces. These inefficiencies lead to increased congestion, fuel consumption, and pollution.

Next, we reached out to our families and relatives, who are regular car drivers, to understand the problems they face. We got valuable feedback from them, such as how they often circle around looking for parking spots, how difficult it is to find parking during busy hours, and how frustrating it is when parking systems are manual and slow. Harshvardhan also called his uncle, who owns a small mall in Pune, to gather real-world feedback. His uncle shared that the parking system there is entirely manual. The security guard directs vehicles to spots, and when the guard isn't around, drivers are left to search for parking spots themselves, which increases the time spent finding a spot.

What we discussed:

- **Urban parking issues:** congestion, inefficient manual systems, and environmental impact due to long search times.
- **Real-life user problems:** the struggles of finding parking, especially in busy urban areas.
- Insights from Harshvardhan's uncle's mall, which reinforced the need for a more automated and efficient system.

Reflections and Next Steps:

This discovery process was incredibly valuable because it gave us a clearer picture of the real-world problems we are addressing. Now, we have a solid understanding of the parking challenge. Moving forward, we will begin defining the problem more precisely, focusing on how our solution can meet the needs of both car owners and parking lot operators.

Define Phase

Today's Date: 6th October

What we did today?

Today, we moved into the **Define** phase of our project. In this phase, we focused on narrowing down the problem and finalizing the solution to address the challenges discovered in the previous phase. This phase is crucial for ensuring that our project has a clear direction and is aligned with the needs of our users.

We began by reflecting on the insights we gathered during the **Discovery** phase. After understanding the real problems drivers and parking lot owners face, we worked as a team to frame our **problem statement**:

"Design and implement a Smart Parking System using IoT to reduce time spent searching for parking, decrease traffic congestion, and minimize fuel consumption in urban areas."

After defining the problem, we discussed the key features of the system and the most feasible way to solve it. The features we decided to focus on were:

- **Real-time parking spot availability**: Users should be able to see which parking spots are occupied or available.
- **Mobile app/digital screen at entrance integration**: We would build a simple, user-friendly mobile app to help car owners locate nearby free parking spots.
- **Sensor-based detection**: We would use sensors to detect the occupancy of parking spots.
- **Cloud-based processing**: The data from sensors would be transmitted to a cloud system for real-time updates.

We also identified the **stakeholders** who would benefit from this system: car owners, parking lot owners, and city planners. This helped further define the scope of the project and ensure that our solution would meet the needs of everyone involved.

What we discussed:

- Finalizing the **problem statement** based on research.
- Refining the key **features** of the Smart Parking System.
- Defining our **target users**: car owners, parking lot operators, and city planners.

Reflections and Next Steps:

With a clear **problem statement** and defined **features**, we are now ready to move into the **Develop** phase. This will involve prototyping and testing our ideas to build the actual system. We are excited to start developing the solution, focusing on integrating IoT sensors and building a functional prototype.

Develop Phase

Today's Date: 8th October

What we did today?

We are moving into the **Develop** phase today, and it's where we shift from defining the problem to building the solution. In this phase, our main task is to start creating and testing the prototype of the Smart Parking System. Also this phase may take multiple days for us at would require lot learning and experimenting to build a viable solution.

The first major task was to decide on the technology we would use to detect parking spot occupancy. After considering several options, we settled on **ultrasonic sensors**. These sensors are reliable, cost-effective, and work well for detecting the presence of objects (like a car) in a parking spot. Ultrasonic sensors work by emitting sound waves and measuring the time it takes for the waves to reflect back when they hit an object. This allows us to determine whether a parking spot is occupied or vacant.

Once we selected the ultrasonic sensors, we started working on building our first prototype. Harshal and Yaman researched how to connect these sensors to a **microcontroller** and create a simple circuit on a **breadboard**. We found a lot of resources online, including **YouTube tutorials** and **blogs**, that explained how to set up the sensors and microcontroller. These resources were invaluable in helping us understand the process of wiring and connecting the components.

We also focused on the **sensor placement** in the parking lot. After much discussion, we decided to install the sensors in each parking spot to ensure accurate occupancy detection. Once the sensors were connected to the microcontroller, we ran some tests to check if they were working correctly.

What we discussed:

- Why we chose **ultrasonic sensors** for occupancy detection.
- How to set up the **breadboard** circuit and connect the sensors to the **microcontroller**.
- The placement of sensors in the parking lot to maximize detection accuracy.

Reflections and Next Steps:

After assembling the circuit, we tested it, and everything seemed to work fine! The next step is to integrate this system with a basic **mobile app** that will display real-time parking availability. This integration will be crucial for delivering the full functionality of our Smart Parking System.

Ordering Materials for the Prototype

Today's Date: 12th October

What we did today?

Realizing that we needed more components to complete our prototype, we made a list of materials we still needed and placed an order onlinefrom Robocraze with bill around 924Rs. The items we ordered included:

- **Ultrasonic sensors** (for detecting car presence)
- **Microcontrollers** (to process the sensor data)
- **Breadboards and jumper wires** (to connect the circuit)
- **Power supply** (to ensure the sensors have enough power)

We carefully researched and selected reliable suppliers who could deliver the components in time for the next phase of development. The materials are essential for building a fully functional prototype, and we made sure to double-check the delivery timeline to avoid any delays.

What we discussed:

- Finalizing the **list of materials** needed to complete the prototype.
- **Ordering essential components** to continue development.
- Ensuring we have all the **necessary tools** to assemble the final circuit.

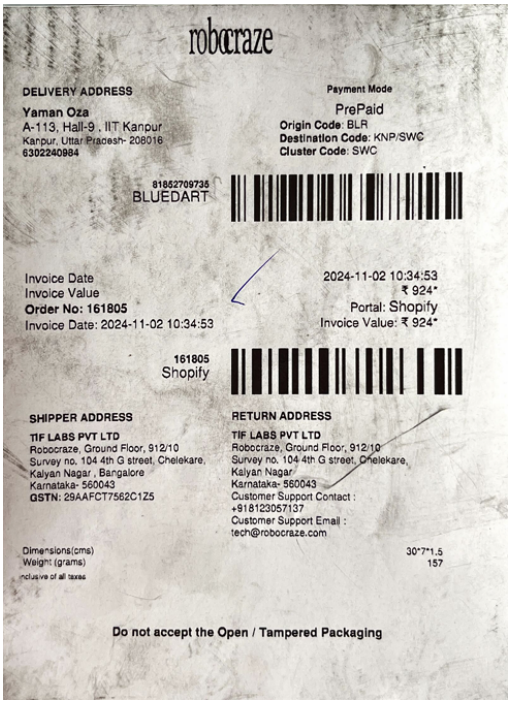
Reflections and Next Steps:

With the order placed, we are excited to get our components and continue building. Once everything arrives, we'll proceed with assembling the final prototype and conducting additional tests to ensure the system works as expected.

Order Received

Today's Date: 17th October

Today we received the order. Yaman collected it. Here are pictures.


robocraze

DELIVERY ADDRESS
Yaman Oza
A-113, Hall-9 , IIT Kanpur
Kanpur, Uttar Pradesh- 208016
6302240984

Payment Mode
PrePaid
Origin Code: BLR
Destination Code: KNP/SWC
Cluster Code: SWC

81852709735
BLUEDART

Invoice Date 2024-11-02 10:34:53
Invoice Value ₹ 924*
Order No: 161805 Portal: Shopify
Invoice Date: 2024-11-02 10:34:53 Invoice Value: ₹ 924*

161805
Shopify

SHIPPER ADDRESS
TIF LABS PVT LTD
Robocraze, Ground Floor, 912/10
Survey no. 104 4th G street, Chelekare,
Kalyan Nagar , Bangalore
Karnataka- 560043
GSTN: 29AAFCT7562C1Z5

RETURN ADDRESS
TIF LABS PVT LTD
Robocraze, Ground Floor, 912/10
Survey no. 104 4th G street, Chelekare,
Kalyan Nagar
Karnataka- 560043
Customer Support Contact :
+918123057137
Customer Support Email :
tech@robocraze.com

Dimensions(cms) 30*7*1.5
Weight (grams) 157
inclusive of all taxes

Do not accept the Open / Tampered Packaging

Learning About Components: Breadboard, PCB, and Ultrasonic Sensors

Today's Date: 20th October

What we did today?

Today, we dedicated the day to **learning** about the essential components we'll be using for our prototype, including **breadboards**, **PCBs**, and **ultrasonic sensors**. Since this is our first time working with some of these materials, we realized it was important to understand how they work and how to properly use them in our project.

We spent several hours on **YouTube** and reading **online tutorials** to understand the following:

- **Breadboard**: We learned how to use a breadboard for prototyping circuits without soldering. We studied the importance of correctly placing components, connecting wires, and understanding the

layout of the breadboard.

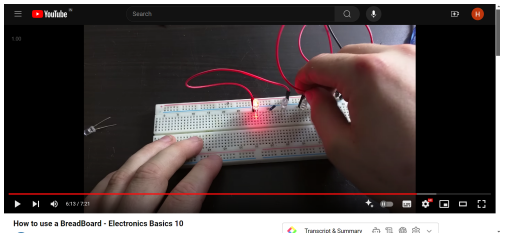
- **Ultrasonic Sensors**: We watched tutorials on how ultrasonic sensors work—emitting sound waves and measuring the time it takes for the waves to bounce back. This would allow us to detect objects and determine if a parking spot is occupied or free. We also learned how to calibrate the sensor for different ranges and environments.
- **PCB (Printed Circuit Board)**: We researched how to design a PCB for more permanent setups. Although we're using a breadboard for the prototype, it's important to understand how the final product might transition to a PCB.

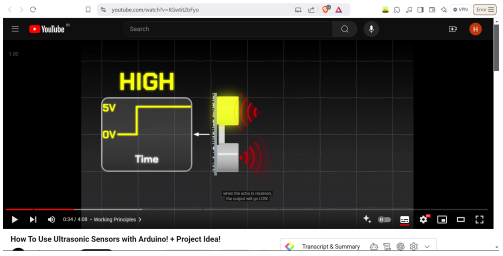
After understanding these components and their use cases, we felt confident in moving forward with the ordering process for the prototype. We had a clear idea of how to proceed with the assembly of the components once they arrived.

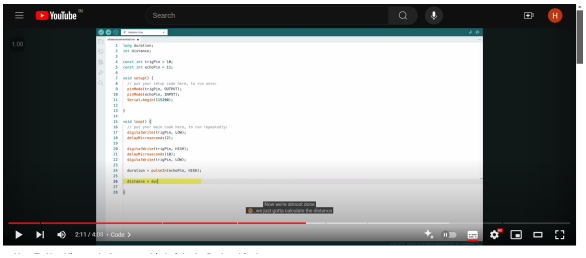
What we discussed:

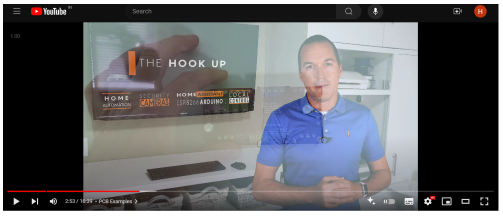
- Watching tutorials on **breadboard wiring** and best practices for circuit assembly.
- Understanding how **ultrasonic sensors** work and how to integrate them with a microcontroller.
- Learning about the **PCBs** and their use in transitioning from a breadboard setup to a more permanent prototype.

Some of Videos we referred to:









Continuing Development: Assembling the Prototype and Testing

Today's Date: 25th October

What we did today?

The components arrived today, and we immediately began assembling the full circuit. We placed the **ultrasonic sensors** in the designated parking spots on the breadboard and connected them to the **microcontroller**. After double-checking the wiring, we powered on the system and began testing.

We ran several tests to see if the sensors were detecting the objects (cars) in their range. Initially, there were some calibration issues, and the sensors didn't register all the objects accurately. After some troubleshooting, we adjusted the sensor **sensitivity** settings, which improved the readings significantly.

We also worked on integrating the circuit with a simple mobile app to visualize the parking spot availability in real-time. The app showed whether each spot was occupied or vacant based on the sensor readings.

What we discussed:

- **Sensor calibration** and adjusting the sensitivity to improve accuracy.
- Testing the **sensor and light integration** to display real-time parking availability.

Here's a smaller entry for the day of assembling the prototype:

Assembling: Final changes in the Prototype

Today's Date: 28th October

What we did today?

Today, we finally **assembled** our prototype! With all the materials arriving and our research complete, we were excited to put everything together. We started by placing the **ultrasonic sensors** on the **breadboard** and connecting them to the **microcontroller**. After making sure all the components were securely attached, we powered up the system.

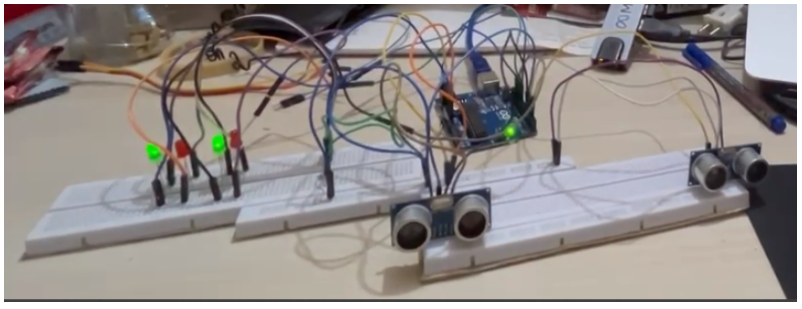
Seeing the circuit come together and realizing that the sensors were working as intended was truly a **joyful moment** for us! The sensors immediately started detecting objects, and the data was visible on the app. It felt great to see our ideas transforming into something tangible.

What we discussed:

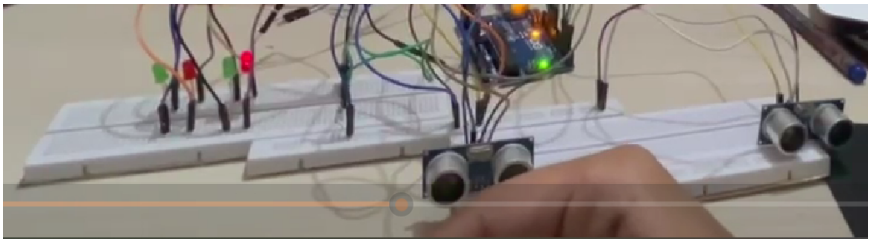
- Ensuring the correct **sensor placement** and secure connections.
- Testing the **first real-time readings** from the sensors.
- Confirming the integration with the mobile app to visualize data.

Here are images of our prototype:

1. **When no obstruction (both light Green)**



2. **When we place a hand on one sensor, the corresponding light turns Red.**



We're excited about how smoothly everything came together today. It's incredibly satisfying to see the prototype working! We keep on improving it on feedback, But for now, we're proud of the progress we've made.

Creating the IPDF (Intellectual Property Disclosure Form)

Today's Date: 5th November

What we did today?

Today, we focused on completing the **Intellectual Property Disclosure Form (IPDF)** for our Smart Parking System project. As we're moving closer to the final stages of development, it's important to document our invention properly for potential patent filing and future commercialization.

We began by carefully filling out the IPDF, which required us to provide detailed information about our project, including:

- **The problem we are solving**: We clearly defined the parking issues in urban areas and how our system addresses them by providing real-time data and efficient space management.
- **Technical details**: We outlined the technical components of our system, including the **ultrasonic sensors**, **microcontrollers**, and **mobile app integration**.
- **Innovative aspects**: We described how our system is different from traditional parking systems, particularly the integration of IoT technology and real-time data processing.

We also worked together to make sure that the form accurately represented the novelty and utility of our invention. This step was crucial, as the information provided would be used to assess the patentability of our work.

What we discussed:

- The key **features** of our Smart Parking System to include in the IPDF.
- How to accurately describe the **innovative aspects** of the system to highlight its potential for patenting.
- Reviewing the **IPDF requirements** and ensuring we met all the necessary criteria.

Here are some of pictures from IPDF:

Indian Institute of Technology Kanpur
www.iitk.ac.in/ipc
Contact No. 6178
Intellectual Property Disclosure Form

1. **Title of the invention: "SMART PARKING"**
2. **Innovator(s) who have contributed or conceived an essential element of the invention, either independently or jointly with others during evolution of the technology concept or reduction to practice:**

i. Name: Jivnari Harshal Prakash
Nationality: Indian
Position: Student
Department Address: Academic Area, IIT Kanpur
Phone: 9022219107
Email: jivnari21@iitk.ac.in; Harshaliitk2023@gmail.com
Course: DES641

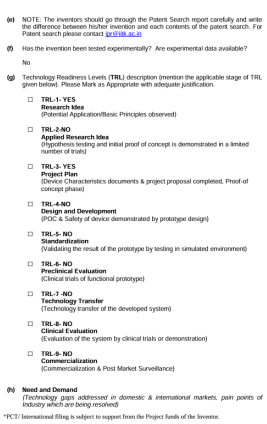
ii. Name: Yaman Manish Oza
Nationality: Indian
Position: Student
Department Address: Academic Area, IIT Kanpur
Phone: +91 6302 240 984
Email: yamanguru21@iitk.ac.in; yamangame12345@gmail.com
Course: DES641

iii. Name: Pulipati Harshvardhan
Nationality: Indian
Position: Student
Department Address: Academic Area, IIT Kanpur
Phone: +91 95697 79220
Email pulipati21@iitk.ac.in; harshvardhanp044@gmail.com
Course: (For Students)

iv. Name: Uday Singh Meena
Nationality: Indian
Position: Student
Department Address: Academic Area, IIT Kanpur
Phone: +91 91882 92806
Email: udaysm21@iitk.ac.in;
Course: DES641

v. Name: Raushan Kumar
Nationality: Indian
Position: Student
Department Address: Academic Area, IIT Kanpur
Phone: +91 91029 81230
Email: raushank21@iitk.ac.in;
Course: DES641

*Inventors are requested to provide their Full Name **(without initials)**, Position **(e.g Professor / Associate Professor / Assistant Professor, Post Doc / Phd / M. Tech / B. Tech Student)**, Phone Number **(Personal)**, Email ID **(Official along with Personal)***



(e) NOTE: The inventors should go through the Patent Search report carefully and write the difference between his/her invention and each contents of the patent search. For Patent search please contact ipr@iitk.ac.in

(f) Has the invention been tested experimentally? Are experimental data available?

No

(g) Technology Readiness Levels (**TRL**) description (mention the applicable stage of TRL given below). Please Mark as Appropriate with adequate justification.

☐ **TRL-1- YES**
Research Idea
(Potential Application/Basic Principles observed)

☐ **TRL-2-NO**
Applied Research Idea
(Hypothesis testing and initial proof of concept is demonstrated in a limited number of trials)

☐ **TRL- 3- YES**
Project Plan
(Device Characteristics documents & project proposal completed, Proof-of concept phase)

☐ **TRL-4-NO**
Design and Development
(POC & Safety of device demonstrated by prototype design)

☐ **TRL- 5- NO**
Standardization
(Validating the result of the prototype by testing in simulated environment)

☐ **TRL-6- NO**
Practical Evaluation
(Clinical trials of functional prototype)

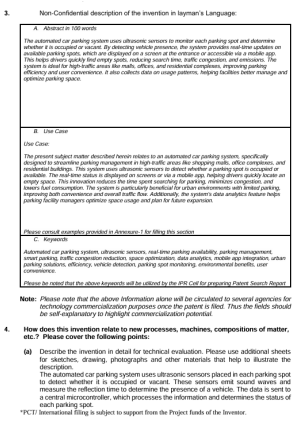
☐ **TRL- 7 -NO**
Technology Transfer
(Technology transfer of the developed system)

☐ **TRL- 8- NO**
Clinical Evaluation
(Evaluation of the system by clinical trials or demonstration)

☐ **TRL- 9- NO**
Commercialization
(Commercialization & Post Market Surveillance)

(h) **Need and Demand**
(Technology gaps addressed in domestic & international markets, pain points of industry which are being resolved)

*PCT/ International filing is subject to support from the Project funds of the Inventor.



3. Non-Confidential description of the invention in layman's Language:

A. Abstract in 100 words

The automated car parking system uses ultrasonic sensors to monitor each parking spot and determine whether it is occupied or vacant. By detecting vehicle presence, the system provides real-time updates on available parking spots, which are displayed on a screen at the entrance or accessible via a mobile app. This helps drivers quickly find empty spots, reducing search time, traffic congestion, and emissions. The system is ideal for high-traffic areas like malls, offices, and residential complexes, improving parking efficiency and user convenience. It also collects data on usage patterns, helping facilities better manage and optimize parking space.

B. Use Case

Use Case:

The present subject matter described herein relates to an automated car parking system, specifically designed to streamline parking management in high-traffic areas like shopping malls, office complexes, and residential buildings. This system uses ultrasonic sensors to detect whether a parking spot is occupied or available. The real-time status is displayed on screens or via a mobile app, helping drivers quickly locate an empty space. This innovation reduces the time spent searching for parking, minimizes congestion, and lowers fuel consumption. The system is particularly beneficial for urban environments with limited parking, improving both convenience and overall traffic flow. Additionally, the system's data analytics feature helps parking facility managers optimize space usage and plan for future expansion.

Please consult examples provided in Annexure-1 for filling this section

C. Keywords

Automated car parking system, ultrasonic sensors, real-time parking availability, parking management, smart parking, traffic congestion reduction, space optimization, data analytics, mobile app integration, urban parking solutions, efficiency, vehicle detection, parking spot monitoring, environmental benefits, user convenience.

Please be noted that the above keywords will be utilized by the IPR Cell for preparing Patent Search Report

Note: *Please note that the above information alone will be circulated to several agencies for technology commercialization purposes once the patent is filed. Thus the fields should be self-explanatory to highlight commercialization potential.*

4. **How does this invention relate to new processes, machines, compositions of matter, etc.? Please cover the following points:**

(a) Describe the invention in detail for technical evaluation. Please use additional sheets for sketches, drawing, photographs and other materials that help to illustrate the description.
The automated car parking system uses ultrasonic sensors placed in each parking spot to detect whether it is occupied or vacant. These sensors emit sound waves and measure the reflection time to determine the presence of a vehicle. The data is sent to a central microcontroller, which processes the information and determines the status of each parking spot.

*PCT/ International filing is subject to support from the Project funds of the Inventor.

Email to IPR Cell Regarding Patent Feasibility

Today's Date: 8th November

What we did today?

In the morning, Harshal sent an email to the **IPR Cell** regarding the patent feasibility of our Smart Parking System and requested feedback on our IPDF. He attached both the **PDF** and **Word document** versions of our **Intellectual Property Disclosure Form (IPDF)**, as required. The email was addressed to the IPR cell at IIT Kanpur for reviewing our proposal and providing their input on the potential for patenting, for transparency he kept all of us in Carbon copy of mail.

Here's a summary of the email Harshal sent:

[DES641] Regarding Patent feasiblity and feedback

To ipr@iitk.ac.in on 07-11-2024 03:53

Details Headers HTML Download all attachments

SMART PARKING IPR FORM.pdf (~268 KB)

IPDF-Format_IITK_updated[1].docx (~124 KB)

Remove all attachments

Dear Sir,
I am Harshal (final year UG student), and along with four other group members (Yaman, Havrshvardhan, Uday, and Roushan), I am part of the Des641 course. We have planned and created a prototype for the "SMART PARKING SYSTEM". We would love to hear your feedback on the same.

PFA PDF and docx file of our proposal.

I appreciate your consideration.

--
Regards,
Harshal Jivnani (210477)
9022219107|jivnani21@iitk.ac.in

This email marks the formal submission of our proposal to the IPR cell for patent evaluation. We are now waiting for their feedback.

Prototype Presentation and Feedback from Prof. Amar Behra

Today's Date: 8th November (Evening)

What we did today?

In the evening, we had the opportunity to present our **Smart Parking System prototype** to **Prof. Behra**. The presentation included a live demonstration of the prototype, where we showcased the working ultrasonic sensors, that shows real-time parking spot availability.

After the presentation, Prof. Behra provided valuable feedback on how we could improve our system. He appreciated the concept and functionality of the Smart Parking System but suggested the following areas for enhancement:

- **System scalability**: We need to think about how our system could be scaled to larger parking lots and multi-level parking structures.
- **User experience**: The app interface could be further optimized for better user interaction, such as adding more intuitive features like parking reservation.
- **Novelty**: Try to include uniqueness in your project to make it presentable.
- **Final changes**: Sir, suggested us to shift to PCB board and make final submission free from wires, with only powerinput visible from outside.

Writing the Final Report for the Smart Parking System

Today's Date: 12th November

What we did today?

Today, we focused on drafting the **final report** for our **Smart Parking System** project. This report will serve as a comprehensive documentation of the entire process, from conceptualization to the final working prototype.

We began by outlining the structure of the report and dividing the sections among ourselves. The key sections we included in the report are:

- **Executive Summary**: We summarized the entire project, the problem we aimed to solve, and how our solution addresses these challenges.
- **Introduction**: This section covers the background of urban parking problems, the need for a smart solution, and the role of IoT in improving parking efficiency.
- **Methodology**: We described the approach we followed, including the design, technology selection, and the steps we took to develop and test the system.
- **System Architecture**: This section explains the technical details of our Smart Parking System, including the use of ultrasonic sensors, mobile app integration, and cloud-based data processing.
- **Results and Testing**: We compiled the findings from our testing phase, including the accuracy of the sensors, mobile app functionality, and overall system performance.
- **Conclusion**: In this section, we highlighted the potential impact of our system, including its scalability, environmental benefits, and future improvements.

Throughout the day, we worked on drafting the sections and ensuring that all technical details were clearly explained. We made sure to include diagrams and charts that illustrate the system architecture and the working process of the Smart Parking System.

What we discussed:

- Outlining the **structure of the final report**.
- Dividing the work among the team members for efficient writing.
- Reviewing **technical details** and adding clear explanations with appropriate visuals.

Finalizing the Report and Preparing for Submission

Today's Date: 13th November

What we did today?

Today, we finalized the **Smart Parking System final report**. We reviewed and refined the sections that were drafted previously. We ensured that everything was well-organized, clear, and concise.

In the morning, we focused on improving the **technical explanation** of how the ultrasonic sensors work, as well as the mobile app interface. We added more details and examples of how the app can guide users to available parking spots in real time.

In the afternoon, we compiled all the sections, making sure that the formatting was consistent and professional. We also added the final **images** of the prototype and **diagrams** of the system architecture.

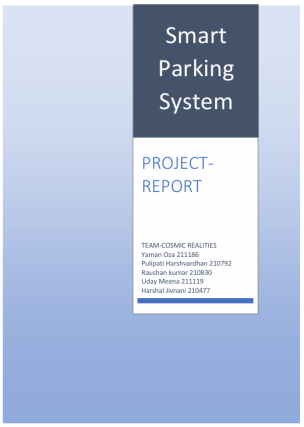
Once the report was ready, we reviewed the entire document one last time to ensure everything was perfect. After the review, we finalized the report and prepared it for submission.

What we discussed:

- **Refining technical explanations** and enhancing the clarity of the report.
- **Formatting the document** to ensure consistency in style and presentation.

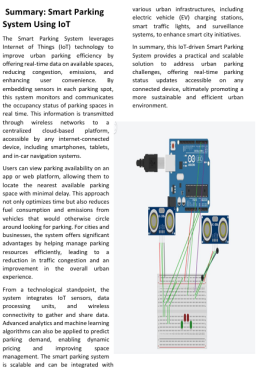
Adding final visuals such as images of the prototype and diagrams of the system architecture.

Here is glimpse of report:


Smart Parking System

PROJECT-REPORT

TEAM-COSMIC REALITIES
Yaman Oza 211186
Pulipati Harshvardhan 210792
Raushan kumar 210830
Uday Meena 211119
Harshal Jivrani 210477

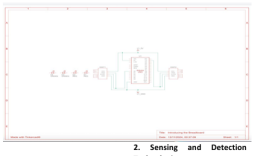

Summary: Smart Parking System Using IoT

The Smart Parking System leverages Internet of Things (IoT) technology to improve urban parking efficiency by offering real-time data on available spaces, reducing congestion, emissions, and enhancing user convenience. By embedding sensors in each parking spot, this system monitors and communicates the occupancy status of parking spaces in real time. This information is transmitted through wireless networks to a centralized cloud-based platform, accessible by any internet-connected device, including smartphones, tablets, and in-car navigation systems.

Users can view parking availability on an app or web platform, allowing them to locate the nearest available parking space with minimal delay. This approach not only optimizes time but also reduces fuel consumption and emissions from vehicles that would otherwise circle around looking for parking. For cities and businesses, the system offers significant advantages by helping manage parking resources efficiently, leading to a reduction in traffic congestion and an improvement in the overall urban experience.

From a technological standpoint, the system integrates IoT sensors, data processing units, and wireless connectivity to gather and share data. Advanced analytics and machine learning algorithms can also be applied to predict parking demand, enabling dynamic pricing and improving space management. The smart parking system is scalable and can be integrated with various urban infrastructures, including electric vehicle (EV) charging stations, smart traffic lights, and surveillance systems, to enhance smart city initiatives.

In summary, this IoT-driven Smart Parking System provides a practical and scalable solution to address urban parking challenges, offering real-time parking status updates accessible on any connected device, ultimately promoting a more sustainable and efficient urban environment.



1.2. System Architecture

The architecture of the Smart Parking System comprises three main layers:

- **Sensing Layer:** Contains IoT sensors deployed in parking spaces to detect occupancy status. These sensors communicate the data to a gateway.
- **Network and Communication Layer:** Ensures secure data transmission from sensors to a centralized cloud server through wireless technologies.
- **Data Processing and Application Layer:** Manages data storage, processing, and analytics. This layer also includes a user interface for real-time access to parking data.

2. Sensing and Detection Technologies

2.1. Sensor Selection

For the system to work effectively, choosing the appropriate sensor type is essential. Commonly used sensors include:

- **Ultrasonic Sensors:** These detect the presence of vehicles by measuring distance. They are widely used due to their affordability and reliability.
- **Magnetic Field Sensors:** Detect disruptions in the earth's magnetic field when a vehicle occupies a space. They are ideal for outdoor environments and have low energy consumption.

Remaining Tasks

1. Final Project
    a. changes we made like PCB instead of breadboard, wiring, frame, cad model, app/web interface ie it functioning.
    b. add images and final remark of it (need final images)
2. Add Bill and it item in ordering material for prototype.
3. add 5-7 handmade rough sketch for discover/define phases
4. add images of pcb/circuit etc at relevant positions