**Ideation Phase**

**Defining the Problem Statements**

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| **Date** | **26-09-2023** |
| **Team ID** | **670** |
| **TEAM NAME** | **Proj\_223439\_Team\_2** |
| **Project Name** | **Smart Parking System Using IOT** |

**Smart Parking System Using IOT**

**Problem Definition and Design Thinking**

**Introduction**

Finding a secure parking space is now considered to be a highly difficult and time-consuming process in modern cities. Finding the secure parking lot on time is becoming increasingly challenging due to negative effects on traffic congestion, air pollution, climate change, etc. As a result, the Smart Parking System (SPS) was seen as the only practical solution to address those problems and create a comprehensive smart mobility system.

We will describe the problem statement, the procedures necessary to solve it, and the design thinking methodology that will direct our project in this document.

**Problem Statement**

Objective: Develop a IOT model that can provide parking slots in nearby area with a high level of accuracy.

Data: Utilize IoT sensors and cameras to collect real-time data on parking slot occupancy and transmit this information to a cloud-based platform. This data will be used for real-time parking slot availability and historical analysis.

**Key Challenges:**

1. Cost of Deployment: Deployment costs can be high when installing IoT sensors, connection infrastructure, and backend systems.
2. Sensor Reliability: In order to identify the presence of vehicles in parking spaces, IoT parking systems rely on sensors.
3. Data Privacy and Security: The issues can be brought up by the collection and storage of information on parking patterns and vehicle movements.
4. Scalability: It might be difficult to scale the infrastructure to keep up with growth as the number of IoT users and devices grows.
5. Traffic Management IoT parking systems can assist with parking availability, but they might not be able to handle more significant traffic management issues, like congestion in and around parking lots.

**Design Thinking Approach**

**Empathize:**

Before solving the problem, it's essential to understand the needs and pain points of users, including drivers, parking lot operators, and city planners. Gather insights into their parking-related challenges and expectations.

**Actions:**

- Conduct surveys or interviews with drivers to understand their parking preferences and frustrations.

- Engage with parking lot operators and city planners to identify their objectives in optimizing parking space usage.

- Analyze traffic and congestion data in urban areas to identify high-demand parking zones.

**Define:**

Based on user insights, define clear objectives and success criteria for the IoT-based Smart Parking System.

**Objectives:**

- Achieve a real-time parking slot availability accuracy of at least 95%.

- Reduce average search time for parking by 50%.

- Enhance traffic flow around parking lots by minimizing queues and congestion.

**Ideate:**

Brainstorm potential solutions and approaches to address the problem of smart parking using IoT.

**Actions:**

- Explore different IoT sensor technologies (ultrasonic, infrared, cameras) for accurate vehicle detection.

- Consider integrating mobile apps and digital signage for real-time parking guidance.

- Investigate data analytics techniques to predict parking demand patterns.

- Explore sustainable transportation incentives (e.g., reserved spots for electric vehicles).

Create a prototype of the machine learning model and the user interface for price prediction.

**Prototype:**

Create a prototype of the IoT-based Smart Parking System, including sensor integration, data processing, and user interfaces.

**Actions:**

- Develop and test IoT sensor prototypes for vehicle detection.

- Create a cloud-based platform to collect and process parking data.

- Design a user-friendly mobile app or web interface for drivers to access parking information.

**Test**

Evaluate the model's performance using appropriate metrics and gather feedback from users.

**Actions:**

- Develop and test IoT sensor prototypes for vehicle detection.

- Create a cloud-based platform to collect and process parking data.

- Design a user-friendly mobile app or web interface for drivers to access parking information.

**Implement:**

Once the prototype meets the defined objectives and receives positive feedback, proceed with full implementation.

**Actions:**

- Deploy IoT sensors in a parking lot for real-world testing.

- Measure accuracy in detecting available parking spaces.

- Collect feedback from drivers on the usability of the mobile app or web interface.

**Iterate**

Continuously improve the system based on user feedback and emerging technologies.

**Actions:**

- Monitor real-time data and optimize parking guidance algorithms.

- Gather user feedback on the system's effectiveness and user experience.

- Stay updated on IoT advancements to enhance sensor accuracy and reduce costs.

**Conclusion**

In this document, we've shown how we plan to use an IoT-based Smart Parking System to optimize parking spot consumption. We seek to develop a trustworthy and user-friendly application that handles urban parking difficulties while supporting traffic management and sustainability objectives by empathizing with users, defining clear objectives, coming up with creative ideas, developing, testing, implementing, and iterating.