

Group 03: Parking Monitoring System

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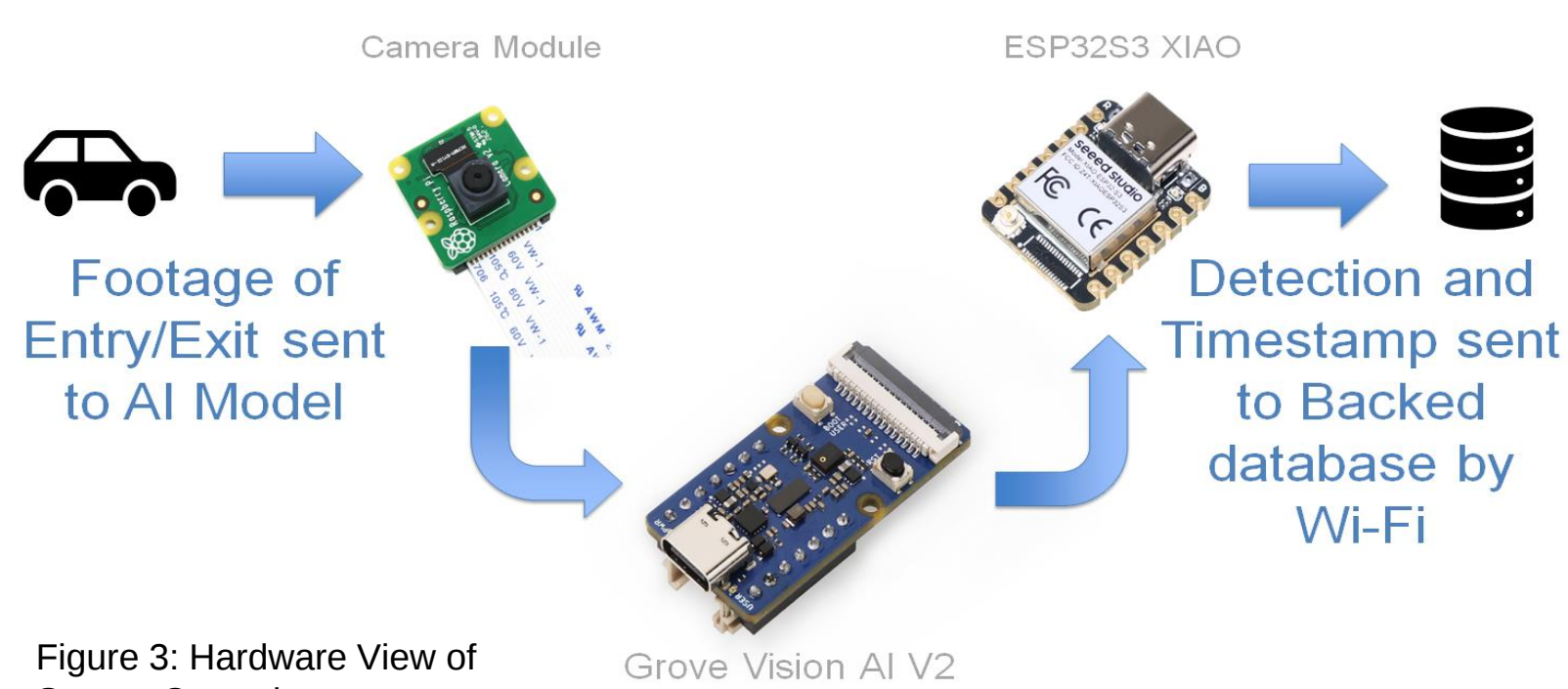
Mentor: Dr. Emil Jovanov, Sponsor: PRIME TOOL LLC

Project Overview

Parking options are often full - campus settings, festival events, or hospitals for example. Time is wasted finding parking when none is available. To solve this, The Parking Monitoring System enhances user convenience with real-time parking availability using cameras and AI-based image classification for vehicle detection. The system is inspired by the convenience of mobile ordering.

Proposed Solution

- Use optical sensors to detect entrances/exits from a monitored parking lot.
- Sensors pair together to monitor each parking entrance and exit. Also offer standalone parent configurations.
- Optical Sensor uses AI to detect vehicle.
- Sensors report to backend through Wi-Fi.
- If Wi-Fi unavailable, report saved in local cache.



Wi-Fi:
MQTT or REST
messaging

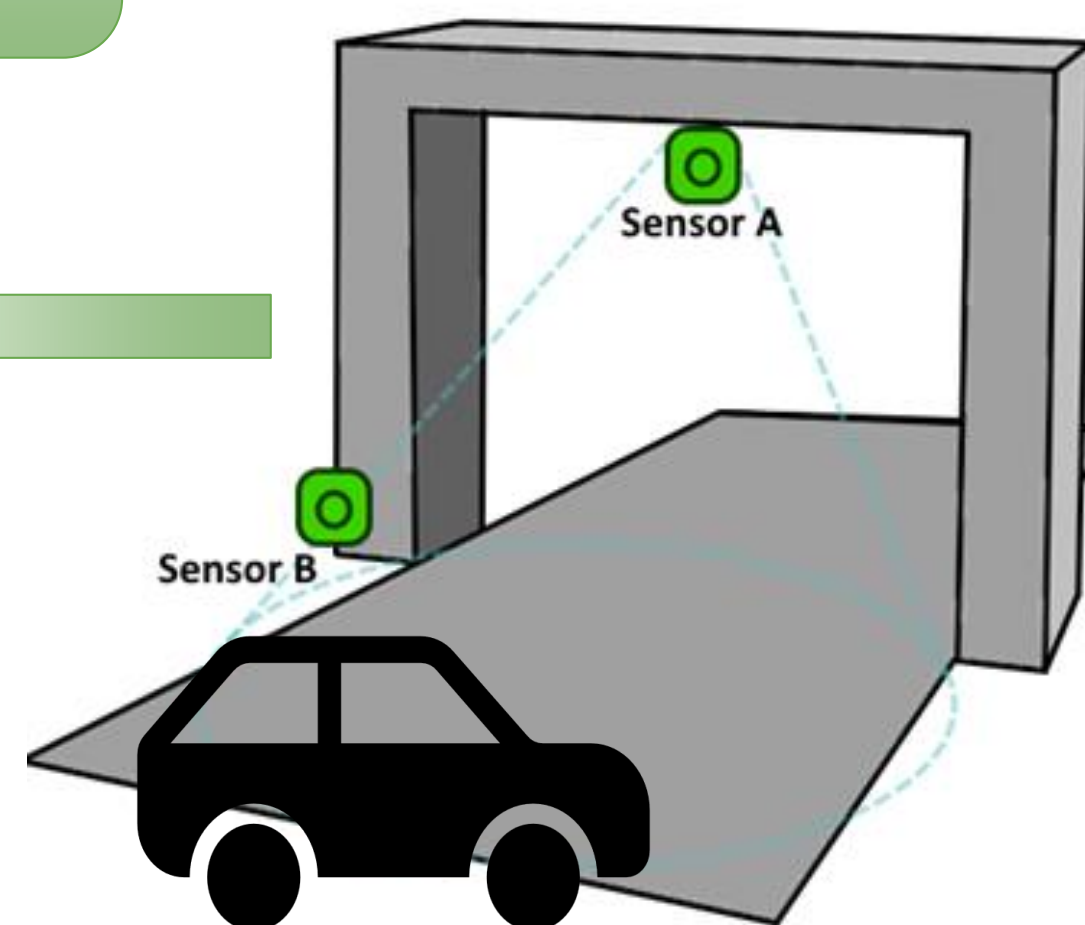
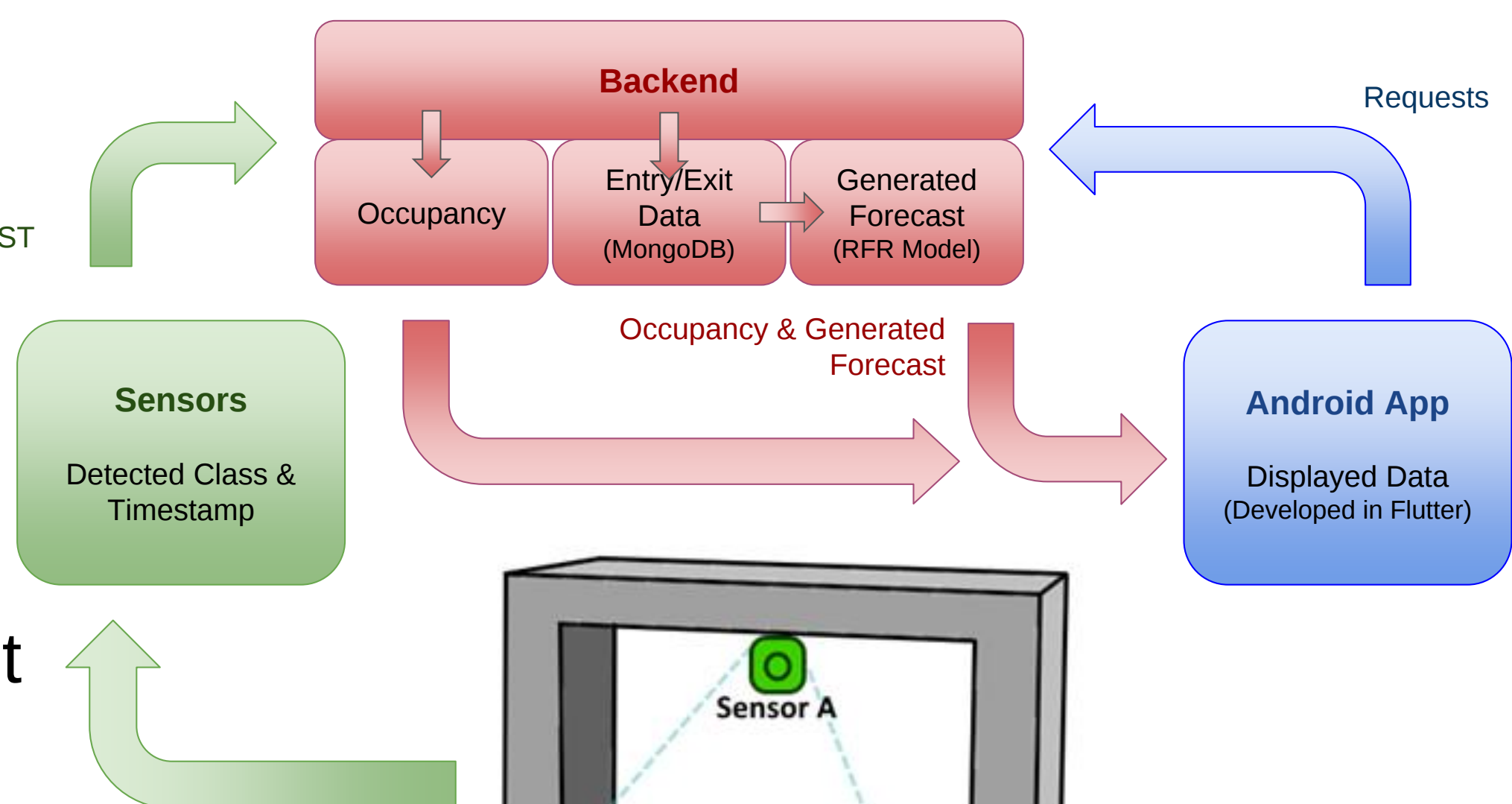


Figure 1: Overall Design

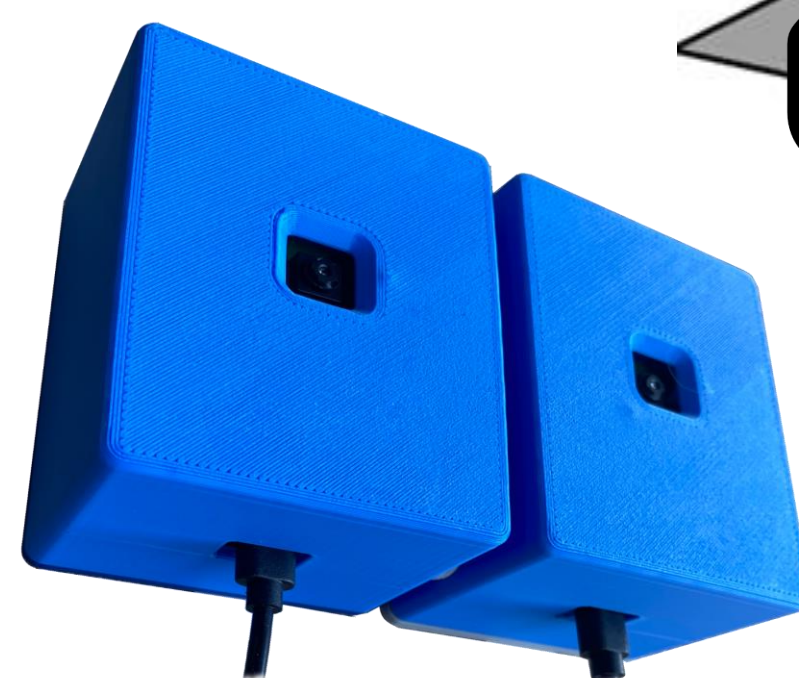


Figure 4: Sensors in case

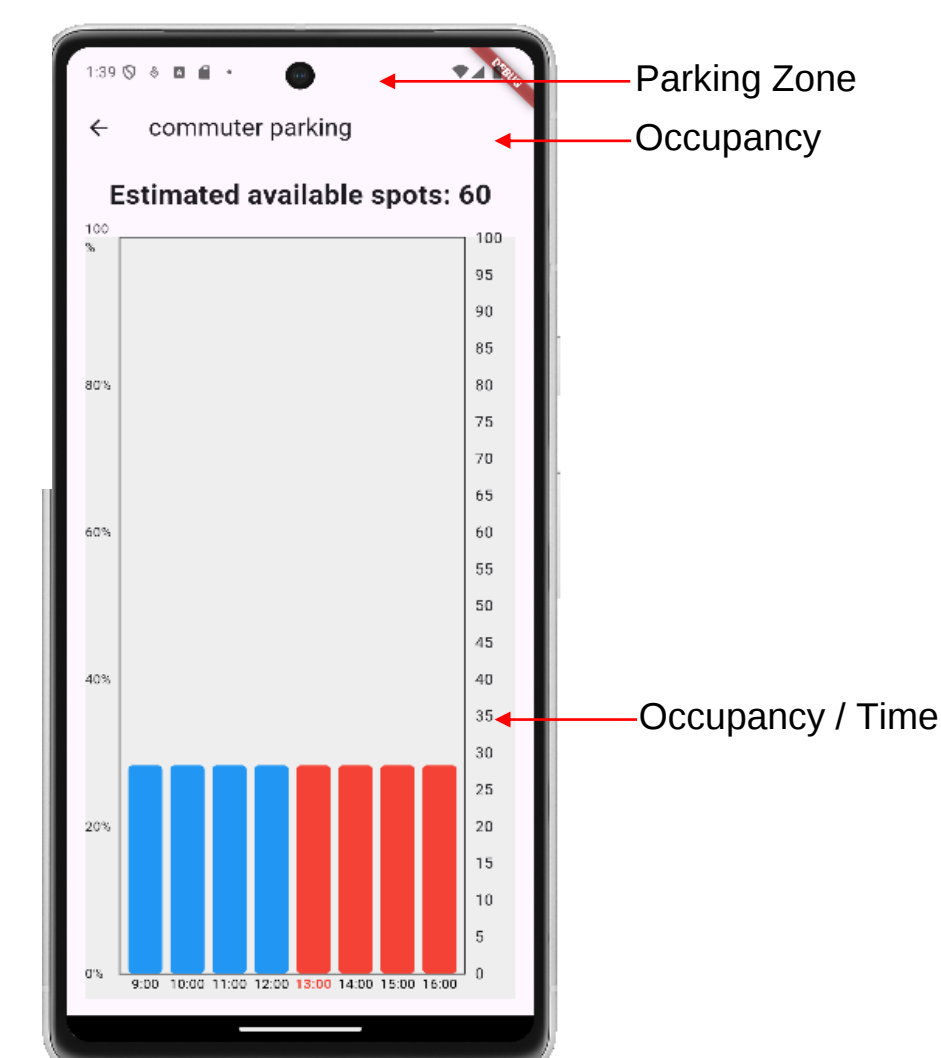


Figure 2: Android App UI

- Backend calculates availability with MongoDB
- Backend uses FastAPI and ML, providing current, historical, and future availability
- Mobile app provides easy access to current, historical, predicted availability

Results

- System can detect vehicles with a >90% accuracy.
- Backup battery can sustain the system for 9 hours.
- Sensors cache entry/exit events in case of a Wi-Fi outage.
- Low cost of \$40 per sensor and quick, configurable settings enable portability to wherever there is WiFi

References

- [1]https://parkable.com/en-us/parking-management-system?utm_source=capterra&gdmcid=d126fcd9-f1f8-45ed-a8f4-ef8302fd5bf7
- [2]<https://patents.google.com/patent/US10121172B2/en?q=US10121172B2>

Background

There are existing projects and patents similar to our project such as Parkable [1] and patent US10121172B2 which is A parking lot management system that includes capturing image data and time of entry of a vehicle entering the parking lot. [2]

Conclusions

Parking is a major issue at colleges, hospitals, airports, and events like festivals. Current solutions are often suboptimal due to high costs and limited features. This system aims to offer a versatile parking solution, saving users time and frustration. The Parking Monitor System tightly integrates hardware, software, and machine learning, making it robust and reliable.

Acknowledgements

We would like to thank PRIMETOOL LLC for their contributions and for our mentor Dr. Emil Jovanov and Dr. Buren E. Wells for their advice and insight to our project.