**Project Planning**

Project: Smart Park

Team: ViMex

Fall 2021

# **Summary:**

The “Smart Park” application will be implemented at Wichita State University and will allow students to find a parking space that is currently available to them. The purpose of this application will be to minimize the time it takes to find a parking spot for students. The application will display a map of the campus parking lot with the available and unavailable parking spots. The student will then be able to access an open parking spot that is closest to their destination. This will be achieved with the use of a Raspberry Pi gateway that will send data collected from various sensors to Google Firebase. The data will be sent utilizing a LoRa signal network with real-time updates. The iOS application that will be used for this project will be developed in Swift and will be available for students to download in the app store.

# **Scope:**

## Section 1: Criteria

* The objective of this application is to assist university members in finding a parking spot in an efficient amount of time
* Weekly reports will be submitted, including each individual member and a collective report updating the state of the project.
* The team is split up between working on the front-end and back-end of the app. Members in each group will have to do their respective research.
* A prototype will be created with all the functionalities that were described in this document
* Smart Park will work with LoraWan to further expand the functionality of the app and data readability
* Records of tests for grading the user-friendliness of the UI will be submitted
* Documentations of written documents (DFD, class diagram, sketches) for the project will be provided if needed upon the completion of the project.
* The team will present the project to the public with a demonstration upon completion.

## Section 2: Legal Analysis

* 8-15,111. Text messaging, prohibited; exceptions (5) a person receiving a message related to the operation or navigation of the motor vehicle.
* Getting licensed with Apple to be able to publish an iOS app
* Possible Prior Patent: *US7893847B2*
* Apple legal rules for app publishing <https://developer.apple.com/app-store/review/guidelines/#legal>

# **Tasks and Deliverables:**

This section will identify the major features, tasks, requirements, and deliverables for the final product. The tasks and deliverables are broken down into two sections project planning/management and build and construction/implementation/testing. Each phase has its own tasks and deliverables. The successful completion of this SOW requires that all deliverables and tasks in each sub-section have been completed/submitted.

## Section 1: Project Planning/Management

| **Requirement** | **Description** | **Deadline** |
| --- | --- | --- |
| **Weekly Reports** | **As per Agile methodologies, weekly meetings, scrums, and reports will take place in order to identify tasks and requirements each member has worked on the previous week and will continue to work on in the current week. Discussions pertaining to any questions, issues, and problems that the team has encountered will also be held during these meetings.**  **JIRA and GitHub branches will be updated according to task fulfillment.** | **Weekly** |
| **Technical Research** | **Research related to the infrastructure on both the hardware and software side will be conducted to determine the implementation of the project.** | **9/26/2021** |
| **Project Research Midterm Presentation** | **Summarizes all research up until the first midterm report.** | **10/8/2021** |

## Section 2: Build & Construction/Implementation/Testing

| **Requirement** | **Description** | **Deadline** |
| --- | --- | --- |
| **Prototype** | **Sensor and gateway hardware must be researched and purchased for configuration.**  **Determine mobile application and software infrastructure.** | **09/26/21** |
| **Build** | **An operational sensor must be built for signal transmission and application testing.**  **Send data through Raspberry Pi gateway to Google Firebase.** | **10/03/21** |
| **Testing** | **All hardware intended for agricultural environments must be tested and researched for durability (temperature range, detection and signal range, battery life).**  **Test calls to the Google Firebase database from Rest API using Docker containers.** | **10/16/21** |
| **Fabrication** | **Hardware packaging must be researched for housing gateways and sensors.**  **Create a user interface for the mobile application and make calls to Rest API to receive data from the database.** | **10/16/21** |
| **Documentation** | **Record of all data and test results. Collection of out-sourced product manuals and designs.**  **Ensure code documentation is thoroughly commented.** | **10/31/21** |
| **Deployment** | **Fully operational prototype smart park system packaged for demo/showcase** | **11/07/21** |
| **Conclusion** | **Work statement, preparation for add ons and polishing of system. Planning for installation of Go Create parking lot (senior Design II).** | **12/08/21** |

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# **Work Performance:**

## Section 1: Metrics & Software Development Model

Regular updates to JIRA tasks and weekly scrums will be used/held to determine project performance and milestones. Through the usage of story pointing an Agile practice and JIRA feature, we can determine weekly performance. Code and documentation will be reviewed by all members to ensure clean code.

Hardware milestones will be tracked through the use of Tasks Lists a feature of Microsoft Teams. Receipts will be held to conduct a cost-benefit analysis.

Sept 12th - Sept 26th

* Conduct software stack, hardware research, and order parts to begin prototyping and software testing.

Sept 26th - Oct 3rd

* While waiting for parts to arrive, attain an iOS Apple Store Developer license, and create a presentation for the midterm assessment.

Oct 3rd - Oct 17th

* Create and begin implementing tech designs for the mobile application.

Oct 17th - Oct 31st

* Finish testing and have Google Firebase database cohesive with hardware, and UI design completed.

Oct 31st - Nov 14th

* Finish creating REST API and front-end UI.

Nov 14th - Nov 28th

* Prototype finished.

Nov 28th - Dec 12th

* End of Senior Design I, complete redesign for any changes, release MVP.

# **Acceptance Criteria:**

For the UI:

* Downloadable from the Apple App Store
* Displaying WSU parking lot/current location
* User able to see taken/open parking spaces
* Able to swipe and zoom around
* Colors are acceptable for colorblind people

For the hardware:

* Sensor must detect an object above it of different heights
* May use more than one sensor type
* Electrical components must be durable for the agricultural environment
* Must send signals and data in near real time
* Must send data to the Google Firebase through Raspberry Pi gateway
* Programmed diagnostics

Assumptions for the users

* The users will be using an iOS phone
* The users will be able to download the app on the app store available in the US
* The users will not hold the phone in their hands while using the app
* The users must know the location where the app is applicable

# **Special Skills:**

## Section 1: The team must have knowledge in python programming, an understanding of how to utilize an Arduino for data collection, learning how to configure a Raspberry Pi for gateway setup and data transmission, and an understanding of cloud database technology to store the data. The team must also know swift to develop the iOS application.

## Section 2: The team demonstrates a solid understanding of software development skills and diverse backgrounds in programming languages. The team also demonstrates knowledge in database tools and application development. Members have experience in hardware, electrical components, and sensors which are essential to sending and retrieving data.

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