Plant Operations Smartphone Tracker, Spring 2016

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Abstract

The Plant Operations Smartphone Tracker (POST) team is charged with building a mobile application that will track water quality data from AguaClara's eleven rural treatment plants in Honduras. This tool, to be implemented as an Android phone application, will be built from start to minimal viable product (MVP) during the spring semester and implemented in Honduras in early summer. Some of the challenges of this team will be to implement a robust data-capture system that works seamlessly with intermittent internet connection and SMS, to design an intuitive UX that displays plant performance data to operators, to connect the app to a custom-built Bluetooth turbidimeter, and to provide detailed recommendations for future improvements. The team hopes this project will become a core part of AguaClara technology and may eventually be used throughout the world to track water treatment plant operations.

Introduction

Literature Review

Previous Work

Methods

Analysis

Conclusions

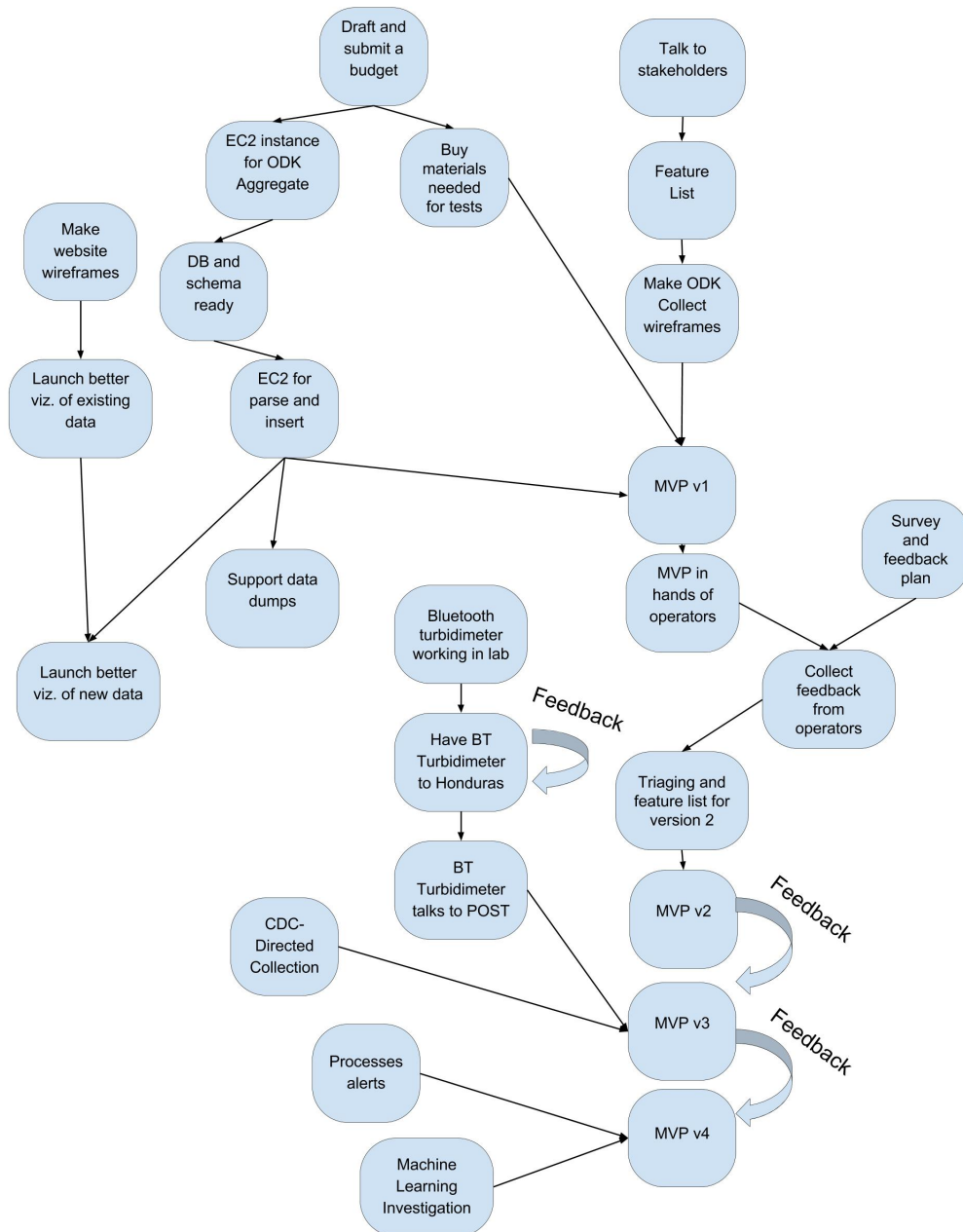# Future Work

Semester Schedule

Task Map

Figure 1: Task Map

Task List

1. Submit a budget - 2/13/2016 - Ethan. Create a budget for AWS, phones for testing (two that simulate operators' phones), another Bluetooth-enabled turbidimeter, and necessary Bluetooth dongles.

2. Talk to stakeholders - 2/13/2016 - Sarah. Discuss our timeline with the various stakeholders and ensure we can submit a build to the operators soon. Also establish channels and methods of communications that we can use for collecting feedback on the POST project.

3. Feature List - 2/13/2016 - Drew. Compile list of critical features for MVP v1 and future features from APP engineers (Walker and Jon), Monroe and water plant operators.

4. Buy materials needed for tests - 2/20/2016 - Ethan. Obtain phones for deployment in Honduras as well as an EC2 instance, Bluetooth turbidimeter, and Bluetooth dongles to be used for future development and testing. Work with AguaClara team member Cristina to process payments and secure items.

5. EC2 instance for ODK aggregate - 2/20/2016 - Steven. Create an Elastic Compute Cloud instance on which ODK can aggregate the collected data.

6. Make ODK Collect Wireframes - 2/20/2016 - Drew. Make drawings showing how the app will be laid out, with concern for its user experience.

7. Make website wireframes - 2/20/2016 - Sarah. Make drawings showing what the websites will look like. Brainstorm potential ways to visualize the data to add value for engineers visiting the Wash4All site. Consider user experience and intuitiveness of design.

8. EC2 for parse and insert - 2/20/2016 - Steven. Create another EC2 instance for parsing and inserting data/queries.

9. DB and schema ready - 2/27/2016 - Steven. Design the schema and create the database in which the data to be collected. Emphasize scalability and efficiency.

10. Survey and feedback plan - 2/27/2016 - Sarah. Decide how to receive feedback about the app from operators. Come up with questions to ask them and ways to ask the questions. Coordinate with Walker and Jon to translate and arrange timing of interactions.

11. MVP v1 - 2/27/2016 - Drew. Have the minimum viable product for the app working.

12. MVP in hands of operators - 2/27/2016 - Ethan. Email the APK to the operators/Walker and Jon and make sure the operators can run and are able to send data back. Continue to monitor to ensure they are using the app once it has been deployed.

13. Collect feedback from operators - 3/5/2016 - Sarah. Implement the survey and feedback plan over the course of a week. Log operator responses and behaviors in a way that is actionable for future refinements of the MVP.

14. Triaging and feature list for version 2 - 3/5/2016 - Drew. Sort through the feedback from operators to decide what needs to be addressed immediately in version 2 and what can wait.

15. Support Data Dumps - 3/12/2016 - Steven. Add a feature to the website that allows people to download data for their own analyses.

16. Launch better visualizations of Wash4All data - 3/12/2016 - Sarah. Launch an updated version of the Wash4All site using d3.js and updated techniques to provide useful visualizations (as specified by the wireframes).

17. Bluetooth turbidimeter working in lab - 3/12/2016 - Ethan. Have the Bluetooth turbidimeter successfully set up in the lab. It should be taking accurate readings and transmitting them to a phone running the Android app.

18. Send BT Turbidimeter to Honduras - 3/19/2016 - Ethan. Send a Bluetooth turbidimeter to a plant in Honduras for beta testing. Remain in contact with the operators at the target plant to resolve any issues and help with installation.

19. MVP v2 - 3/19/2016 - Drew. Launch version 2 of the app, which will fix any known bugs in version 1 and incorporate new features based on operator feedback.

20. Machine Learning Investigation - 3/26/2016 - Sarah. Understand how various machine learning techniques can be applied to the obtained data in order to add value for operators. Potential applications include predicting coagulant doses based on season, flow rate, and influent turbidity. Work towards a proof of concept application for the next MVP.

21. BT Turbidimeter talks to POST - 4/9/2016 - Ethan. Finish resolving issues with the Bluetooth turbidimeter in Honduras. Integrate the turbidimeter and app so that turbidity data can reliably be logged through the Bluetooth connection.

22. CDC-directed collection - 4/9/2016 - Steven. Add instructions to the app detailing the step-by-step process by which operators should collect calibration data for the Chemical Dose Controller (CDC).

23. Processes alerts - 4/16/2016 - Steven. Add a feature to the app that would alert operators when they need to perform certain tasks. For example, the app might create an alert every 24 hours telling the operator to backwash the filter.

24. MVP v3 - 4/16/2016 - Drew. Explanation: Launch version 3 of the app. This version may include automatic integration of data from the Bluetooth turbidimeter and CDC-directed collection.

25. MVP v4 - 5/7/2016 - Drew. Launch version 4 of the app. This version may integrate machine learning algorithms and processes alerts.

Team Roles

- **Team Coordinator:** Ethan Keller

  - As Team Coordinator, Ethan will oversee programming and design tasks. He will craft meeting agendas and act as a point of communication between faculty advisor Nicki Dell and the rest of the team.

- **Design Coordinator:** Sarah Sinclair

  - As Design Coordinator, Sarah will lead efforts to interact with stakeholders and engage in pilot testing of the POST app. She will create wireframes and engage in testing and data collection in order to iteratively improve the POST product. Sarah is also the Designated Proofreader of team reports.

- **Application Coordinator:** Drew Samuels

  - As Application Coordinator, Drew is responsible for the creation of the POST Android application. She will have final say on architectural decisions, and will delegate programming tasks to the team as needed. Drew will also be responsible for taking minutes during meetings.

- **Backend Coordinator:** Steven Niu

  - As Backend Coordinator, Steven will oversee the schema of the databases used in POST. He will have control over the architecture of the backend, and will make decisions about how data should be passed.