

SE 491-sdmay19-27

Smartphone Tracking App for Microsoft HoloLens

Week 7

10/20/18 - 10/26/18

Client: Optical Operations

Faculty Advisor: Daji Qiao

Team Members:

Ben Holmes - *Android Development*

Anthony House - *Website Development/Security*

Ryan Quigley - *Android Development*

Jose Lopez - *Website Development*

Travis Harbaugh - *Hololens Development/Android Development*

Cory Johannes - *Report Management*

Summary:

- This week we were all asked to find more innovative methods of research
- As a result, some of the previous projects we had been working on were a little sidelined
- Did manage to combine Pedestrian Dead Reckoning and orientation estimates into one app
- Our final project is still lacking data collection, sonar, bluetooth and wifi implementations, but at least it has the PDR and orientation estimations

Pending Issues:

- Optimization of Radio Map representing RSSI values in Durham
- Path loss model fitting to radio map data
- EKF filtering of Gyroscope data
- Ultrasonic implementation and sending signals between paired bluetooth devices via RFCOMM sockets
- Add Data Collection to app template

Past Week accomplishments

- Travis Harbaugh -
 - Project Plan
 - Section 2.3.2: Constraints
 - Section 2.5: Proposed Design

- Section 2.6: Technology Consideration
 - Section 2.13: Test Plan
 - Created a test plan for the projects functional and nonfunctional requirements
 - Designed the verification and validation for each requirement
 - Section 3.1: Project TimeLine
 - Identified specific tacks for each phase of the timeline for both fall and spring semesters
 - Section 3.2: Feasibility Assessment
 - Reviewed client previous team project and their drawbacks and failures and outline the benefits of our project
 - Section 3.5: Financial Requirements
 - Identify our project financial requirements for our project
 - Design Document
 - Updated the test plan
 - Android BlueTooth
 - Send and receive profiles using BLE framework creating Handle Threads
- Ben Homes
 - Researched utilizing RSSI values from access points, and found a method for optimally fitting a path loss model to radio map data using a Simplex minimization technique
 - A. R. Jiménez and F. Seco, "Finding objects using UWB or BLE localization technology: A museum-like use case," 2017 International Conference on Indoor Positioning and Indoor Navigation (IPIN), Sapporo, 2017, pp. 1-8. doi: 10.1109/IPIN.2017.8115865
 - Finally managed to send a small message via an RFCOMM socket between two Android devices. This means in addition to collecting RSSI values from bluetooth devices, we can also communicate by sending specific data
- Anthony House
 - None
- Ryan Quigley -
 - Worked on a calibration method for distance estimation
 - Researched IPIN articles regarding pedestrian dead reckoning
 - Xiao, Z., Wen, H., Markham, A. and Trigoni, N. (2014). *Robust pedestrian dead reckoning (R-PDR) for arbitrary mobile device placement*. [online] Ieeexplore-ieee-org.proxy.lib.iastate.edu. Available at: <https://ieeexplore-ieee-org.proxy.lib.iastate.edu/document/7275483/citations#citations> [Accessed 30 Oct. 2018]
- Jose Lopez
 - Researched 2 documents about light and sound TDOA. They used sound and then used light to convey the time reference of the sound emission
 - Akiyama, Takayuki, et al. "Time-of-arrival-based smartphone localization using visible light communication." 2017 International Conference on Indoor

Positioning and Indoor Navigation (IPIN), 18 Sept. 2017, pp. 1-7,
doi:10.1109/IPIN.2017.8115904

- Cory Johannes
 - Researched localization method using lighting system
 - Article: Indoor Localization Based on Distance-Illuminance Model and Active Control of Lighting Devices
 - Don't feel like it's feasible for our project, would require lamps set up throughout site, which would be flashing as frequently as we wanted to get location data.
 - Sounds like it can be pretty accurate once calibrated- within .5 meters

Individual Contributions:

Team Member	Contribution	Weekly Hours	Total Hours
Ben Holmes	Continued combining our side projects into a single final Step Tracking application. Now our github repo includes the basic Dead Reckoning system which tracks steps and orientation Research of optimally fitting a path loss function to durham radio map values Programmatically created and controlled the flow of data between two Bluetooth devices using RFCOMM sockets	8	53
Anthony House	Had no contributions this week	0	29
Ryan Quigley	Calibration function and researched IPIN articles.	4	32
Jose Lopez	Researched 2 documents about light and sound TDOA and Dead pedestrian reckoning	1	23
Travis Harbaugh	Project plan Design document Android bluetooth	24	96

Cory Johannes	Research	3	21
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Plans for Next Week:

- Travis Harbaugh
 - Continue to work on bluetooth beacon recalibration
 - Build an iBeacon Emitter to test the beacon recalibration application
 - Work on completing the design document
- Ben Holmes
 - Continue researching the Simplex Path Loss model fitting, and Kalman filtering of Gyroscope data
 - Add data collection software to our current version of the android app, so then it will include PDR, orientation estimation, and data collection
 - Continue experimenting with sending data via Bluetooth. Especially time of arrival
- Anthony House
 - Read research articles as instructed by client and faculty instructor
- Ryan Quigley
 - Formalize data to measure distance estimation accuracy
- Jose Lopez
- Cory Johannes