SE 491-sdmay19-27

Smartphone Tracking App for Microsoft HoloLens

Week 6

10/13/18 - 10/19/18
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*
Cory Johannes - *Report Management*

Summary:

The goal of this week was to split up tasks by forming three teams. Team1 worked on create an algorithm to track an individual's footsteps and estimating the distance that they walked by using the accelerometer sensor. Team2 worked on implementing the Bluetooth sensor to connect with the android device. Team 3 worked on researching IPSN conference articles to learn more techniques that can be used to help meet the +/- 1 meter accuracy requirement and help find other advanced techniques that team 1 and team 2 can implement.

Pending Issues:

Due to the team switching to the android application, the backend server API development has slowed down. Our client requested during the weekly team meeting that we use their server. This will be another setback for our backend team because they have already set up software on the Iowa state servers. The android team is currently investigating the best way to filter the gyroscope data from the phone's sensor. Without solving this problem, determining the heading of the user is inaccurate.

Past Week accomplishments

- Travis Harbaugh -
    - Design Document section 1.2, 2.2
        - 1.2: Explained Project Overview, Project Motivation And project outcome
        - 2.2 section explained the advantages and Disadvantages of:
            - Mobile: Cross platform vs Native, iOS vs Android

                - Backend: internal and external databases
                - HoloLens vs Google Glasses vs Magic Leap
        - Met with Client
            - Learned how they geolocated the 3D model of their building into the Mapbox framework.
        - Android Bluetooth
            - Started implementing the Bluetooth sensor on the android application. Created a service that scans for different Bluetooth devices and pair it with them.
            - Queried for paired Bluetooth devices on the phone to verify if the device that was found in the scan is already paired with the android device.
            - Created an explicit intent to allow other bluetooth device to discover mobile device.
            - Create a Bluetooth socket to connect with a RFCOMM channel.
- Ben Homes
    - Researched various articles from IPSN conference based on:
        - Bluetooth localization through RSSI values and path loss function
            - We could do this
        - Kalman filter implementation for Gyroscope Data
            - This is possible also
        - Localization using illuminance from light sources
            - This is not possible
        - Quaternion rotations and their advantages over euler angles
    - Implemented Rotation Vector sensor on phone. This sensor uses quaternions to predict a body's orientation with respect to the cardinal directions.
    - After comparing distance estimation algorithms last week, we have decided to use Ryan's implementation of the step tracking algorithm. It runs in real time, without the need for a buffer.
- Anthony House
    - Worked on a new API endpoint for Ben. Started collecting some small data.
    - Working on a real time visualization on the web end
    - Using ChartJS to help with visualization
- Ryan Quigley
    - Worked on a pedometer and distance estimation.
- Jose Lopez
    - Worked on website
        - Can graph x and y position of person on Durham map
- Cory Johannes -
    - Researched Mapbox for Unity
        - Overview- uses, details
        - Is effectively free mapping utility, highly customizable, offers a lot of different selections for data
    - Began looking into articles supplied by Daji

- Spent time looking for articles on competition entries for localization, couldn't find any.

Individual Contributions:

Team Member	Contribution	Weekly Hours	Total Hours
Ben Holmes	Experimented with using gyroscope to track orientation from an initial position Researched methods of using Bluetooth and RSSI values. I have found many articles referencing triangulation, and bluetooth beacons, but little that use sound	15	45
Anthony House	Web stuff listed above	4	29
Ryan Quigley	Pedometer with distance estimation	5	28
Jose Lopez	Website Graph x and y positions on Durham map	5	22
Travis Harbaugh	Design document Met with Client Android Bluetooth	10	72
Cory Johannes	Research	3	18

Plans for Next Week:

- Travis Harbaugh
  - Continue to work on the bluetooth implementation.
    - Implement bluetooth to send and receive data between the two devices. I will be using the RFCOMM protocol provided by the Android framework.
  - Work on on fixing the project plan and creating a test plan for the design doc.
- Ben Holmes
  - Work with Ryan to combine his step tracking system, with my system for orientation estimations. Then we will have our basic Dead Reckoning System.
  - After that will also need to add data collection methods to our app.

    - Later we will add Bluetooth, sound and Wifi triangulation.
- Anthony House
    - Client doesn't want us to focus on the website again this week.
    - Won't be working on the website anymore, so switching over to mobile development
    - Not sure what we'll be working on yet. It will be split between dev and research
- Ryan Quigley
    - Work on calibration for pedometer.
    - Research documents related to pedestrian dead reckoning.
- Jose Lopez
    - Research documents from Daji
- Cory Johannes
    - Research documents recommended by Daji