

SUTD 2021 50.003 ESC Individual Report

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Contributions to Requirement Formulation & Refinement

I contributed to most of the initial establishment and refinement of the requirements of this project, as well as the initial contact with the client. In particular, the more “exploratory-based” and “research-heavy” direction of the project was set by me.

I helped my groupmates to decide which features to focus on in terms of priority and order of importance, and we agreed to place the algorithms as the main focus of this project. The Android UI and the Firebase integration are additional convenience utilities that would help us achieve what we want with the algorithms, namely: sleek, clean and easy-to-use localization techniques accessible on an Android application.

Contributions to Design

I also contributed to most of the designing process of the project. After some discussion with the group, I decided that we would pursue the direction of implementing 3 different algorithms for the sake of accuracy comparison: KNN, Random Forest and Convolutional Neural Network.

In particular, I also specified the functional ability to zoom in into the image during mapping to be an important feature to be added. This is because the accuracy of the user pinpointing their current locations during mapping would quite heavily affect the prediction and inference accuracy of the algorithms and models, and especially so for my CNN algorithm model.

Contributions to Implementation

My main contribution in terms of implementation would have been the development of the Convolutional Neural Network (CNN) algorithm, as well as integration between the multiple components of our project into the Android application.

I compared several research papers to be able to choose one machine learning algorithm that does not rely too much on “arbitrary decisions” in its implementation methods of fingerprinting the Wi-Fi APs, such as an arbitrary fixed ordering of Wi-Fi APs or setting of hyperparameters without any rational decisions beforehand. However, this does not prevent me from implementing an initial version of the algorithm, which could be improved by collecting more dataset and conducting more testing.

Contribution to Testing

In terms of testing, I have added several unit tests to test the utility functions that I used in the CNN algorithm implementation. While I am not able to fully ascertain the accuracy of the CNN prior to physical testing due to the difficulty of testing the “correctness” of neural networks in general, I was able to ensure that at least the utility functions that we utilize to manipulate and parse the data input and output, as well as the various mathematical functions, are used and are working properly.

In addition to that, we also conducted physical testing during the final stretch of the project. I also have assisted my group to collect data and debug several issues that have arisen due to integration. In particular, I found the appropriate set of dependencies that allow all of the different parts and modules of the project to run smoothly.