

Report Date: 07/15/2022

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From: BEST (Beacon-based Evacuation System and Technology)

Bacon Beacon

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### Summary

Q-Learning Algorithm successfully implemented on Server, field test on iOS succeeded. However, to improve the accuracy of the real-world, a number of targets of beacons to classification needed. Implementation of the Flask-SocketIO library was tested, and still working on it. Working on the Design and Experiment section of the article started. Collecting real data of Neural Network models needed.

### What “BEST” completed this week

- Tensorflow lite successfully ported on iOS and Android Device[1] [2], working fairly good
  - 99% of accuracy when using Gradient Boost Model
  - 90% of accuracy when using Neural Network
  - However, there were problems at porting tensorflow to tensorflow lite for mobile devices [3]
- Flask-SocketIO implemented [4]
  - Rather than using a multiprocess model, Flask-socketIO can handle both of them.
  - A problem occurred when communicating between Flask-socketIO and swift-socketIO.
- Design and Experiments part of Article started
  - Start drafts on the design and experiment part of article

### Things to do by next week

- Augmented Reality at iOS and Android devices need to be started [5]
  - Need study for Augmented Reality, and start thinking about Reality OS and implementation of Apple documents
- Collection of real world data needed
  - As implementation about neural network models finished, need to collect real world data for the evaluation part of the article
- Design and evaluation draft needed to be done
  - As many functions of our project work, draft can be written. Need to organize what we have done, and write the rest of the article by using that data

### Problems or challenges:

- Tensorflow lite was not successfully ported
  - RSSI of 21 beacons were used for training phase, and testing phase. Collect it for 5 minutes for every 30 cells.
  - 99% accuracy was shown up, which was not as good for real world data because of overfitting problem
  - Asked Prof. Anthony for solution about our problem, and he said that too much beacons were used for localization
  - Collecting RSSI of 5 strong signal beacons cause accuracy of 90%, and classification in real world works better than collecting all data [11] [12]
- Divided the area of K-SW building for indoor localization and evacuation algorithms
  - Tended to divide into 2.75m x 2.75m for K-SW building, but after measuring the real length of the building, concluded that it does not fit when we divide into that.
  - Divide the area with a flexible rectangle, and train with that data
- Q-learning algorithm does not works well as thought
  - The main reason was when calculate every cells for start, the Q-Table value changes that user cannot get the effective route to escape
  - Not using an individual q-table for the solution of that problem. However, the time takes too long when slicing the area into 2.75m x 2.75m square
  - By adopting a graph based on the area mentioned at Problems or challenges, it takes below 2 seconds to suggest the evacuation route [3]
- Q-learning algorithm is not as fast as Dijkstra algorithm
  - When collecting data for evaluation part, noticed that Dijkstra algorithm is 20 times faster than Q-Learning algorithm
  - Asked Dr. Matson for a solution, and heard the reason to use reinforced learning for escape algorithms
  - Not only suggesting the shortest path, BEST now suggests different paths to make people evacuate without congestion

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