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

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Summary

As many people were quarantined, There were several difficulties in working. However, we managed to work with distance. Q-Learning Algorithm was decided to be used and data for Machine Learning was collected.

What "BEST" completed this week

- Edit the related work part.
  - After studying the other papers, a Fatal problem in related work was found.
  - Related work should refer to the drawback of previous studies.
  - After change existing contents were moved to methodology.
  - New contents contain various studies' disadvantages.

- Decided to use Q-Learning Algorithm
  - There was Q-Learning based Algorithm for evacuation system, which is better than Dijkstra and A* Algorithm for evacuation algorithm.
  - Code was searched at Github, and learned about how to test Q-Learning algorithms[4].

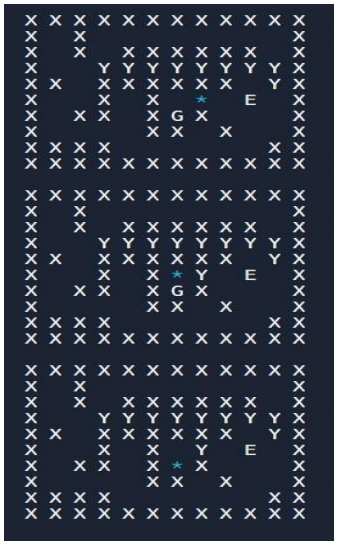

Fig. 1. Simulated Q-Learning algorithms with varying conditions.

Fig. 1. X, Y, G, E represent paths that can not be used, Smoke, Goal, Emergency point respectively.

- Try to get the information of the access point connected with smartphones
    - Android and iOS both can get the device's MAC address to identify the device (user).
    - Android can get the RSSI of the access point, while iOS prohibits getting access point's RSSI by privacy policy.
    - Sended request to Apple to get the RSSI of the access point.
    - If the request is not accepted, three beacons will be used in the Trilateration experiment, instead of two beacons and the access point.

Things to do by next week

- Implement Q-learning algorithm
    - The Q-learning algorithm will be implemented on the server side. In order to do that design will be dealt with first[4].

- Machine learning method seminar
    - RSSI, Localization, Propagation of smoke will be dealt using machine learning methods. These subjects are usually hard to approach with authentic methods because of its varying conditions and factors[1].

- Trilateration Experiment
    - The experiment will be conducted by two Feasybeacon and the access point or three Feasybeacon.
    - Collect the RSSI of the beacons and utilize two beacons with the strongest signal[2].
    - By Applying trilateration, the user's accurate coordinates can be obtained.

- Q-Learning based map
    - As we finish choosing Algorithms, we need to apply to real situation
    - Deciding which learning techniques to use: MAZE, and BE Q algorithm

- Request for the blueprint of the K-SW building
    - The blueprint of the building will be converted into a 2-dimensional graph for the path planning algorithm[4].
    - A blueprint is necessary to compare the actual location and the beacon's estimated location but we still do not have it. Project is delayed because of it.

- Build the Regression model
    - The smartphones receive the signals from the beacons, and the Kalman filter is applied to reduce the fluctuation.
    - The estimated distance between the beacon and the device will be calculated by the Regression model.
    - The Regression model will be imported as Tensorflow Lite [5] model which is optimized to run on the smartphone.

Problems or challenges:

- Covid-19 Incidents

    - 4 of us had covid this week. It was difficult to work from a distance but after some trial and error we found a way to deal with this problem and by using discord we managed to finish our previous plan.

- Preparing for the new way to trilateration
    - We still only have two beacons. AP will be used as the main beacon for the entire room. In order to use AP like that, the RSSI value has to be inspected[3].

- Modifying the paper
    - To improve the concept of each chapter, the entire contents of the related work was changed and made it clear to understand.

References

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[2] K. Shimizu and D. Kushida, "Evacuation Guidance System Using Beacon Information and Dijkstra's Algorithm," *2021 IEEE 3rd Global Conference on Life Sciences and Technologies (LifeTech)*, Mar. 2021, doi: 10.1109/lifetech52111.2021.9391946.

[3] M. Lipka, E. Sippel, and M. Vossiek, "An Extended Kalman Filter for Direct, Real-Time, Phase-Based High Precision Indoor Localization," *IEEE Access*, vol. 7, pp. 25288–25297, 2019, doi: 10.1109/ac-
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