Project Title: **ML-based Distance Estimation Using Wi-Fi RSSI Measurements**

Authors

Yifan Ye <yifany@kth.se>

Weaam Bayaa <bayaa@kth.se>

Allocation of responsibilities

Referring to Tasks section, Yifan Ye is responsible for building the model for task1, and collecting data in task2.

Weaam Bayaa is responsible for collecting data in task 1, and building the model in taks2.

Organization

The project will be organized as a two-person project, building upon previously published work and an existing machine learning algorithm. We first collect enough data, then we will build some models for estimating distance from an access point.

Background

This project builds on the idea of distance estimation using RSSI in “Distance Estimation and Localization in WSN using RSSI Measures”[1]. Devices reports Received Signal Strength Indicator (RSSI) measurements in response to beacon message which sent by access point (AP); we will assume use these RSSI measurements in our analysis.

Problem statement

With the rise of Multi-access Edge Computing (MEC) and Internet of Things (IoT) paradigms, Internet Service Providers (ISPs) must consider more intelligent ways to determine the distance of devices from their access points to fulfil the requirements of different use cases. MEC technology will be used to provide services which require very low latency. Accordingly, distance between the device and AP is crucial for those applications (latency will increase proportionally with distance increase). In the other hand, IoT will be used to determine the exact location of fire alarm sensor to take the needed action.

Problem

Devices send RSSI measurements to report the received signal strength from AP. Other positioning information (latitude and longitude) can be sent by the devices using Global Positioning System (GPS). The problem with this approach is that the accuracy of these measurements degrade severely in indoor environment. In addition, even if sensors were installed in outdoor environment, these sensors usually have very low computing power that prevents them from achieving this task. Moreover, the computation of position will result in battery depletion of sensors. Accordingly, main requirements that should be achieved for distance estimation are avoid complex computation in devices side and reduce error measurement of distance.

Purpose

Build models that can be used to estimate devices' distance from an access point in some situations based on RSSI. Using the correlation of RSSI measurements and distance, we will be able to

estimate the distance of devices more accurately and use it in emerging services like location based services.

Goal

The goal is to give several models for estimating devices' distance from an access point in some situation based on RSSI.

Tasks

Task1: For the simplest situation, we go to an empty place with little interference, setting up a wireless signal transmitter, to physically get some RSSI data at various distance, then try to correlate our measurements with ideal Wi-Fi propagation model.

Task2: For a complicated environment, we try use one machine learning algorithm to do the estimation. The data will come from simulation.

Method

The project will use an analytical method to benefit from the statistical measurements that we collect from the simulations and test in environment.

Milestone chart (time schedule)

The project will start on 27 August and end at 26 October. There will be the following milestones and deliverables:

15 September: Collect enough data for task1.

23 September: Finish building the model for task1.

28 September: Use simulation to collect enough data for task2.

15 October: evaluation of model for different features and estimate

the best performing data set.

Before 26 October: submit final report (the report will have been written in parallel with each of the above steps)

References

[1] A. Awad, T. Frunzke and F. Dressler, "Adaptive Distance Estimation and Localization in WSN using RSSI Measures - IEEE Conference Publication", *Ieeexplore.ieee.org*, 2018. [Online]. Available: https://ieeexplore.ieee.org/abstract/document/4341511/. [Accessed: 12- Sep- 2018].