ACTIA–Senion Summer Project

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Project Introduction

With automated forklifts becoming more feasible, the need for robust indoor positioning is ever so pressing. As demonstrated by this summer project, this is possible by inserting the software StepInsideSDK from Senion into the custom built computer TGU-R Access made by ACTIA-Nordic.

Linux

TGU-R Access. Picture from *https://www.actia.com/en/solutions/electronic-vehicle-management/telematics-and-connectivity/off-highway-telematics-connectivity*

Problem Definition

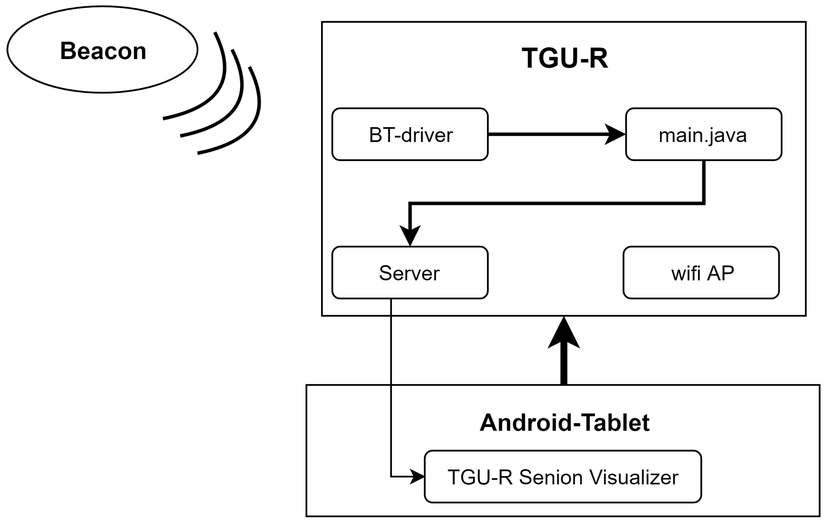
StepInsideSDK is originally designed for use in Android and iOS phones with all software architecture that implies. In order to make it work on an embedded Linux platform such as the TGU-R, a special Java version was developed by Senion. This version made it possible to use an arbitrary BLE source and made the use of accelerometers and gyroscopes optional.
The remaining problems solved by the authors are summarised below:

Problems

- Construct a Bluetooth driver on the TGU-R to collect transmissions from the BLE beacons from Senion.
- Extract data, RSSI value and timestamp from each BLE message.
- Enable use of java based Applications and code.
- Feed StepIndideSDK with the extracted information.
- Visualise result.
- Log all data.
- Run application on TGU-R boot.

Solution

The implementation is divided into fairly discrete modules since it made the development simpler.
Bluetooth driver: First, a C++ based Bluetooth driver gather and interpret BLE transmissions. These are serialised using `json` format and sent to to the main program *main.java*.
Main file: This program run StepInsideSDK with the provided BLE data and returns serialised position information, also in `json` format.
Server: The positional information received from StepInsideSDK is sent to a receiving client, in this case over a local wifi access point.
Wifi communication: For simplicity a local wifi access point is established on the TGU-R. This allow data to be transferred wirelessly to clients without the need to log into a network from the TGU-R.
Visualisation: An Android tablet was fed the positional information via the Server and visualised the moving position on a map of Senion's office.



Flowchart of data through application as described in Solution above

Future improvements

- Have the TGU-R connect to an existing Wifi network instead of creating one.
- Switch the Server/Client relationship such that the TGU-R operates as a client.
- Use more sensors for positioning, such as accelerometers and gyroscopes.