OpenHPS: Single Floor Fingerprinting and Trajectory Dataset

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Description

This dataset contains fingerprint information of WLAN access points and BLE beacons with a known
position and IMU sensor data. Data was collected on the floor of the Web and Information Systems Engineering (WISE) Lab at the VUB (Pleinlaan 9, 3rd floor) with 110 training reference points and 30 test data points. Each reference point was recorded for 20 seconds in four different orientations. In this README document we go in depth into how the data was collected and the structure of the dataset.

Collection

Data was collected using an Android application created using react-native, OpenHPS and @openhps/react-native which includes a BLE, WLAN and IMU source.

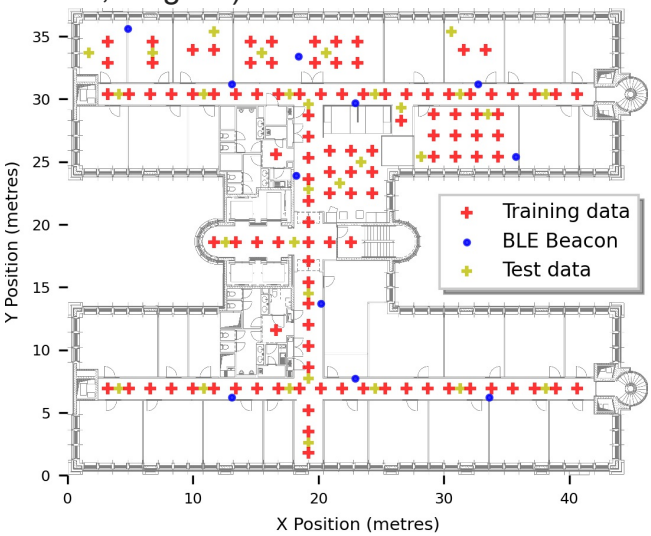
Parameter	
Recording date	2021-03-07 (Sunday)
Device	OnePlus 5T
Android Version	8.1.0
Total BLE Beacons	11
Total detected WLAN access points	220
Total stable WLAN access points	199
Training datapoint duration	20s (per orientation)
Training datapoint orientations	4
Training datapoints	110 (=440 fingerprints)
Training WLAN data	2653 (~6 scans per fingerprint)
Training BLE advertisements	7153 (~16 advertisements per fingerprint)
Test datapoint duration	20s (per orientation)
Test datapoint orientations	4
Test datapoints	30 (=120 fingerprints)
Test WLAN data	732 (~6 scans per fingerprint)

Test BLE data	1782 (~15 advertisements per fingerprint)

Data was collected on a Sunday, limiting the amount of interference from other researchers in the lab (e.g. no change in open/closed doors, no personal Wi-Fi hotspots).

Environment

For our dataset environment we used the floor of our research lab (Pleinlaan 9 floor 3, 1050 Elsene, Belgium).



The internal structure of the offices is created by using metal ferromagnetic walls. This causes several issues with the compass and direction obtained during the creation of the dataset and should be taken into account. Our accompanied floor plan (see misc directory) has its origin on the bottom left and retains the aspect ratio of the real indoor floor (46.275m * 37.27m).

Data

wlan_fingerprints

Column	Description	Example
TIMESTAMP	Epoch timestamp (ms) when the data was collected	1614426288947
X	X position (min 0, max 44.33)	18.54
Y	Y position (min 0, max 37.27)	25.56
ORIENTATION	Orientation (degrees) relative to the top of the floor plan	90
[**WAP_***]	Wireless access point (numbered)	WAP_001

ble_fingerprints

Column	Description	Example
TIMESTAMP	Epoch timestamp (ms) when the data was collected	1614426290136

X	X position (min 0, max 44.33)	18.54
Y	Y position (min 0, max 37.27)	25.56
ORIENTATION	Orientation (degrees) relative to the top of the floor plan	90
[**BEACON_***]	BLE iTAG beacon (numbered)	BEACON_01

ble_beacons

Each BLE beacon uses a generic iTAG device in their idle advertising state. Our capture device
detected an RSSI of -68 at 1 metre distance, which is used in the multilateration examples.

Column	Description	Example
ID	Identifier of the beacon (used in fingerprint CSV files)	BEACON_01
X	X position (in metres)	12.59
Y	Y position (in metres)	31.16
Z	Z position (in metres)	1.6

wlan_aps

In the wireless access point dataset, individual access points are anonymised. However, we provide information such as the frequency (which indirectly also provides the channel), SSID group and a manual verification on whether or not this network is provided by the university.

Column	Description	Example
ID	Wireless access point identifier in fingerprint CSV files (identified based on BSSID)	WAP_1
FREQUENCY	Broadcasting frequency (Hz)	2462
SSID_ID	Anonymised SSID identifier (used to group multiple BSSIDs with the same SSID)	1
STABLE	Manually verification if the SSID is a university access point (1=true, 0=false)	1

Note: An access point was considered stable if the SSID matched university, department or research lab access point SSIDs. This also includes public access points such as eduroam.

Unknown networks (with an unknown SSID) are removed from the processed training and test data, but
are still included in the raw datasets. These unknown SSIDs were identified as parked cars, printers,
mobile hotspots and IoT devices.

Contents

- `/wlan_aps.csv`: Wireless access point information
- `/ble_beacons.csv`: BLE beacon positions
- `/misc`: Miscelanieous resources
    - `/misc/floorplan.png`: PNG version of the floorplan
    - `/misc/floorplan_medium.png`: PNG version of the floorplan (medium quality)
    - `/misc/datapoints.svg`: Training and test data points visualisation
    - `/misc/datapoints.csv`: Training data points CSV
    - `/misc/testdatapoints.csv`: Test data points CSV
    - `/misc/spaces.geo.json`: GeoJSON feature collection of symbolic spaces
    - `/misc/documentation.css`: README documentation CSS (unrelated to the dataset)
- `/train`: Training data points (110 in 4 orientations)
    - `/train/raw`: Raw unprocessed data points (not aggregated)
        - `/train/raw/wlan_fingerprints.csv`: Raw WLAN fingerprints
        - `/train/raw/imu_fingerprints.csv`: Raw IMU data collection
        - `/train/raw/ble_fingerprints.csv`: Raw BLE fingerprints
    - `/train/aggregated`: Processed aggregated data points
        - `/train/aggregated/wlan_fingerprints.csv`: WLAN fingerprints
        - `/train/aggregated/ble_fingerprints.csv`: BLE fingerprints
        - `/train/aggregated/imu_fingerprints.csv`: IMU data collection
        - `/train/aggregated/wlan-ble_fingerprints.csv`: WLAN and BLE fingerprints merged
- `/test`: Test data points (30 in 4 orientations)
    - `/test/raw`: Raw unprocessed test data points (not aggregated)
        - `/test/raw/wlan_fingerprints.csv`: Raw WLAN fingerprints
        - `/test/raw/imu_fingerprints.csv`: Raw IMU data collection
        - `/test/raw/ble_fingerprints.csv`: Raw BLE fingerprints
    - `/test/aggregated`: Processed aggregated data points
        - `/test/aggregated/wlan_fingerprints.csv`: WLAN fingerprints
        - `/test/aggregated/ble_fingerprints.csv`: BLE fingerprints
        - `/test/aggregated/imu_fingerprints.csv`: IMU data collection
        - `/test/aggregated/wlan-ble_fingerprints.csv`: WLAN and

BLE fingerprints merged

- `/trajectories`: Test trajectories (10)
  - `/trajectories/???`: Trajectory directory, ??? is the name of the trajectory
    - `/trajectories/???/???_ble.csv`: BLE advertisements received during the trajectory
    - `/trajectories/???/???_imu.csv`: IMU data from the trajectory
    - `/trajectories/???/???_wlan.csv`: WLAN signals received during the trajectory

License