# Automated Survey Completeness Analyzer (ASCA)

ASCA is Python tool for fingerprint coverage assessment. The tool estimates a total fingerprint coverage as well as a separated coverage of BLE, WiFi and magnetic fingerprints.

## Requirements

Python version 3.6 is required to use the tool.

## Interface description

Input point of ASCA tool is the process\_asca() function which is located inside process\_asca.py file.

The function has the following interface:

process\_asca.process\_asca(output\_folder, input\_file\_list)

Where output\_folder – is a output folder r. There is no output if this parameter set as “”.

input\_file\_list – list of input files for processing which contains the names of files that must be processed.

The process\_asca function returns total fingerprint quality metrics which is the worst value from all fingerprint quality metrices calculated for each floor.

## Input file list

ASCA parses the input file list according to the internal patterns based on file extensions as it is defined below:

\*.maggrid – magnetic grid

\*.mfp3 - magnetic fingerprint file

\*.wifigrid – wifi grid

\*.wifi3 - wifi fingerprint file

\*.blegrid – BLE grid

\*.ble3 - BLE fingerprint file

\*venue.json – venue settings file

\*mapN.geojson – one or more geojson-files with survey routs, where N – is physical floor number (one or more digits)

If any grid or fingerprint are not presented in the list, then this fingerprint is not used for total coverage assessment.

There are no requirements for an items sorting and an order into this list.

\*.mfp4, \*.wifi4, \*.ble4 and other format-4 files are supposed to be supported in future

## Fingerprint quality metrics

The following values of fingerprint quality metrics are defined:

* 2 ­­­– "Fine Positioning " – (red + yellow + green coverage) > 95% and (yellow + green coverage) > 90% and green coverage > 60% and MFP uncertainty < 10 meters. This means that databases are ready for real-time positioning and no more data survey is required.
* 1 – "Rough Positioning"– (red + yellow + green coverage) > 90% and (yellow + green coverage) > 60% and green coverage > 20% and MFP uncertainty < 10 meters. This means that databases may be published to test real-time positioning in a coarse positioning mode.
* 0 – No fingerprints are ready for positioning.

## Output files

The process\_asca function generates and saves the following files in the specified output folder:

* ceil\_availability\_N.png – map of fingerprint cell availability according to survey routs for N floor. Here and below N denotes physical floor number.
* ble\_coverage\_N.png – BLE fingerprint coverage map for N floor.
* ble\_corners\_N.json – geographical parameters for BLE coverage map linking with real maps.
* mfp\_coverage\_N.png – magnetic fingerprint coverage map for N floor.
* mfp\_corners\_N.json – geographical parameters for the magnetic coverage map linking with real maps.
* wifi\_coverage\_N.png – WiFi fingerprint coverage map for N floor.
* wifi\_corners\_N.json – geographical parameters for WiFi coverage map linking with real maps.
* total\_coverage\_N.png – total coverage map for N floor. The map represents integral coverage for all available fingerprints of the venue or floor.
* total\_corners\_N.json – geographical parameters for the total coverage map linking with real maps.

## Additional console output

The process\_asca function additionally provides the following output in console for each venue floor:

* red + yellow + green coverage in percentage of available cells;
* yellow + green coverage in percentage of available cells;
* green coverage in percentage of available cells;
* MFP uncertainty in meters.

## Fingerprint coverage map

Coverage map is a visual representation of a fingerprint coverage. Each fingerprint cell is colored in depending on total amount of collected measurement for this cell. The following colors can be presented in the map:

Green – good covered cells; additional survey is not required

Yellow – moderate covered cells

Red – bad covered cells

Grey – very bad covered or uncovered cells

Blue – unavailable cells

## Example of using the ASCA

An example how to use ASCA tool is given in main.py file.

The file should be run for execution as follows:

python main.py input\_folder output\_folder

input\_folder – folder with fingerprint and grid files

output\_folder – folder for ASCA output

main.py creates input file list from file in input\_folder and call process\_asca.process\_asca.

## Deployment strategy

|  |  |  |  |
| --- | --- | --- | --- |
|  | Deploy total coverage maps | Deploy Fingerprints | Survey state |
| 0 – No Fingerprints | Yes | No | Continue survey |
| 1 – "Rough Positioning" | Yes | Yes | Continue survey |
| 2 ­­­– "Fine Positioning " | Yes | Yes | Stop survey |