Diagram

Description automatically generated

GUI Flowchart

* Map regularly displays location on startup along with detected tags (if available)
* If a tag is detected on the localization area, users can choose which tag to observe.
* Upon selecting tag, its map coordinates are displayed as well as its distances from other tags
* If users want to observe another tag, they can select it again from the drop-down menu

Localization Data

* Input data is RSSI values coming from Arduino Xbee coordinator serial communication. The data contains the address of the reader, the reference number of the detected tag, as well as its RSSI reading to the reader.

e.g

Serial input: 7E 0 13 10 14 0 13 A2 0 41 26 3B B7 FF FE 0 0 68 65 6C 6C 6F BA

Reader Address  
Tag Reference Number  
RSSI value

* RSSI values are filtered using Gaussian filtering.
* Filtered RSSI values are converted to distance value using Shadowing model

Text

Description automatically generated

A = -32 dB (reference RSSI reading at 1m)

RSSI = RSSI reading from serial port

n = 2.189 (environmental factor)

d = tag-to-reader distance

Constants A and n will have different values depending on the reader  
  
Reader 1 will use A =-32 dB & n=2.189

Reader 2 will use A =-37 dB & n=2.64

Reader 3 will use A = -35 dB& n=2.5

* Distance value is used in 3D trilateration formula

A picture containing shape

Description automatically generated

dn = tag-to-reader distance

(xn yn zn) = reader coordinates

(x y z) = unknown tag coordinates

* Distance values are filtered through extended Kalman filter
* Unknown tag coordinates are mapped and its distances from other tags are computed using 2d distance formula. Text

  Description automatically generated

d = distance between tag 1 and tag 2

xn yn = 2d coordinates of tag n