# WiFi AP Recovery

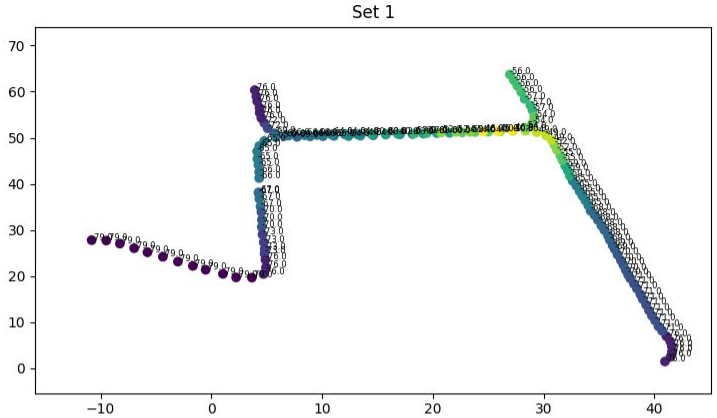
M. Padmal

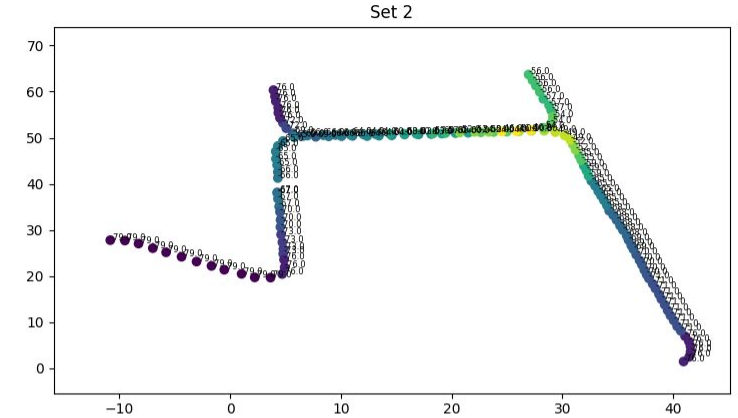
# Approaches

1. Filtering out the data set to obtain the neighbourhood having minimum RSSI values. Inside that interval, middle position is the estimated location of AP
2. Using triangulation techniques backed by cartesian geometry and FSPL(Free Space Path Loss) equation to pinpoint an estimated location for AP

# First Approach

- Filter out RSSI data set to identify the interval where the minimum values are present
- Mark the middle value as the estimated AP position in the pose map


Set 1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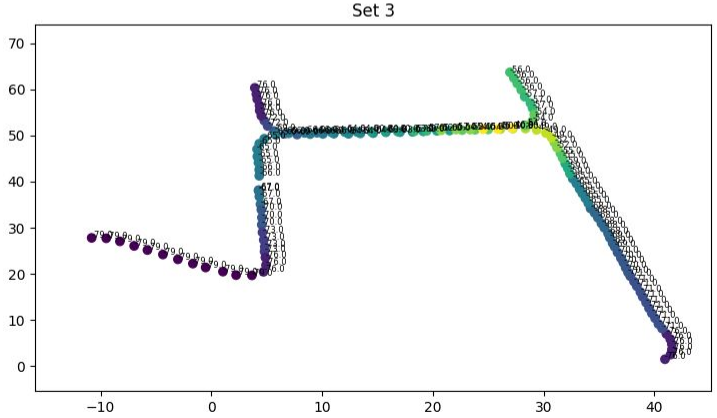
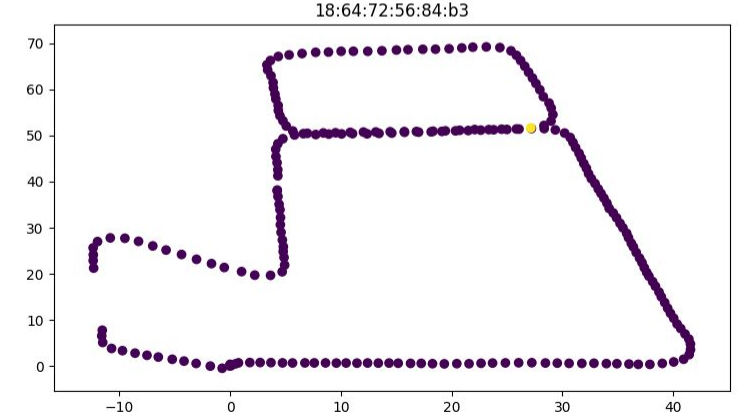
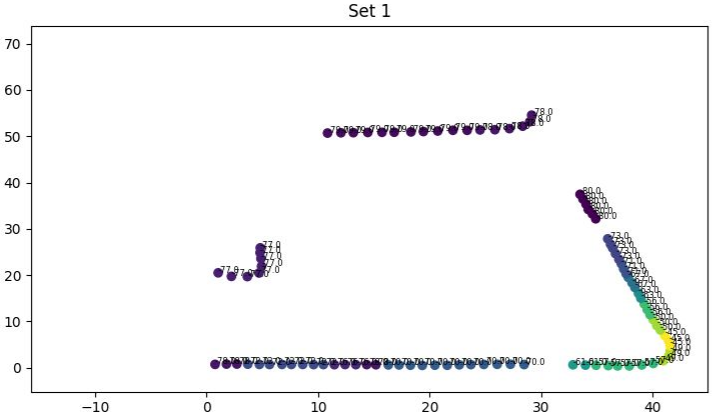
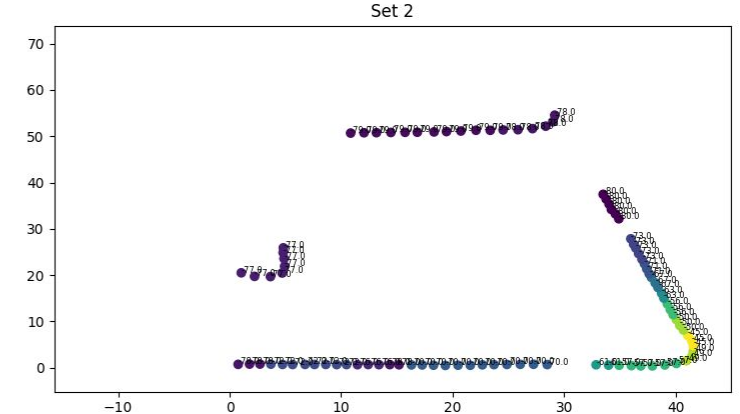

Set 3


18:64:72:56:84:b3


Set 1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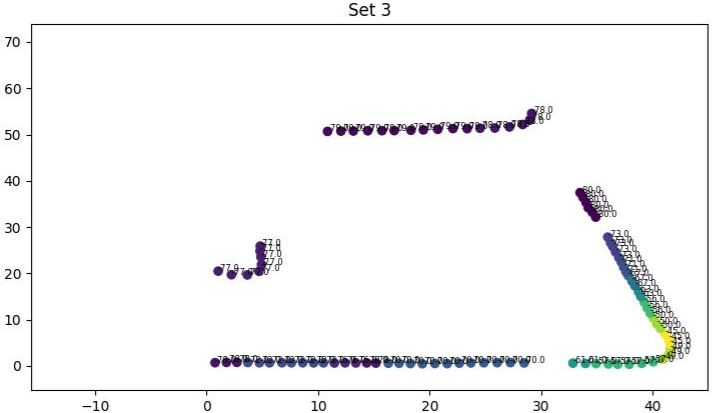
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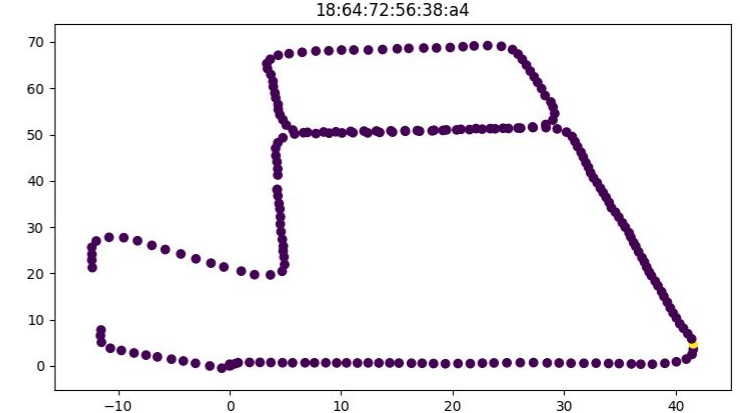

18:64:72:56:38:a4

# Issues related to First Approach

- AP location is estimated to be on the track where user walked.

# Second Approach - I

- Select three points on the pose data set
  - Middle position of the data set
  - 1/6th position of the data set
  - 5/6th position of the data set

- Use FSPL equation to calculate distance from AP and draw three circles
- Calculate intersections and choose the point where distance is minimum from minimum RSSI value recorded pose

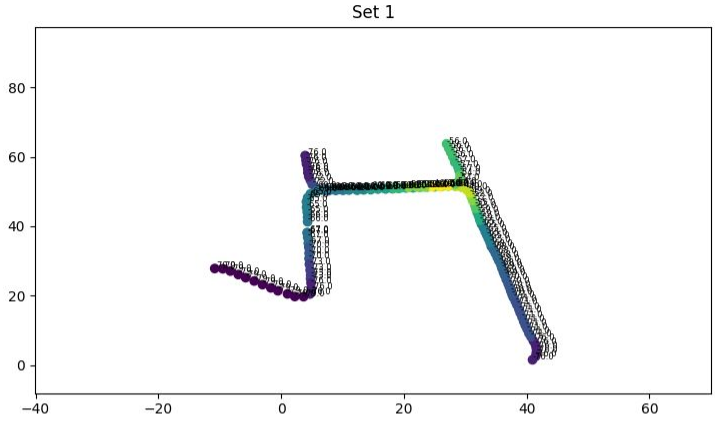
# FSPL Equation

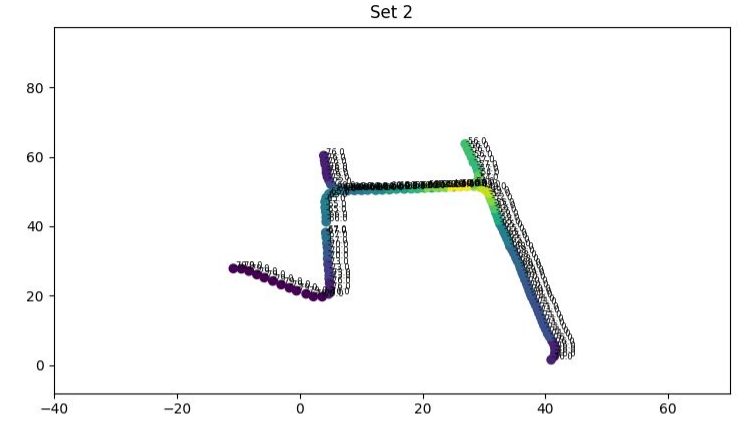
$$
\begin{aligned}
\mathrm{FSPL(dB)} &= 10\log_{10}\left(\left(\frac{4\pi df}{c}\right)^2\right) \\
&= 20\log_{10}\left(\frac{4\pi df}{c}\right) \\
&= 20\log_{10}(d) + 20\log_{10}(f) + 20\log_{10}\left(\frac{4\pi}{c}\right) \\
&= 20\log_{10}(d) + 20\log_{10}(f) - 147.55
\end{aligned}
$$

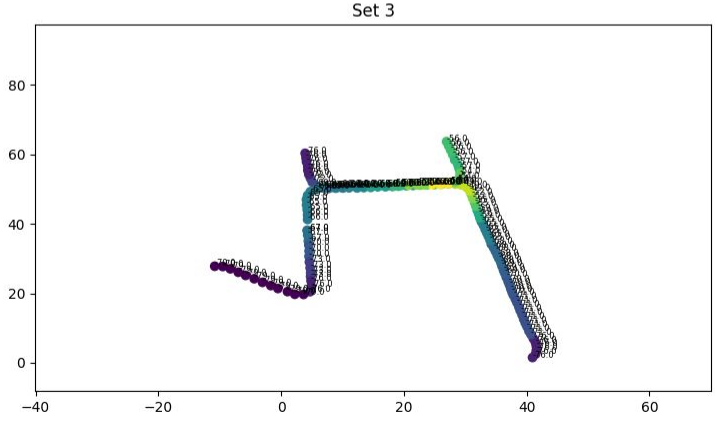
f - Frequency of channel

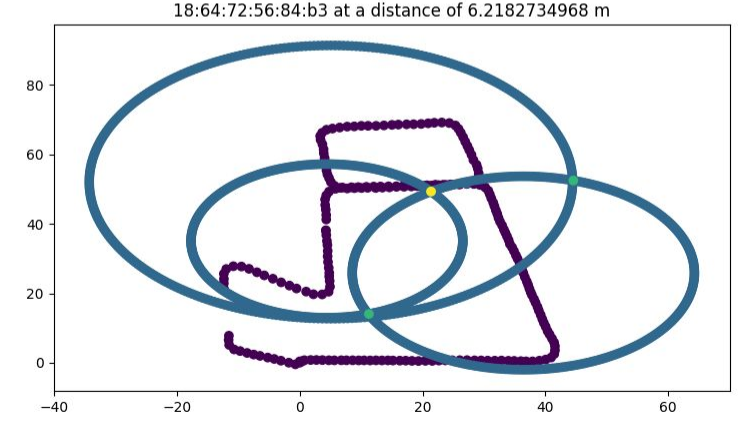
FSPL - RSSI value

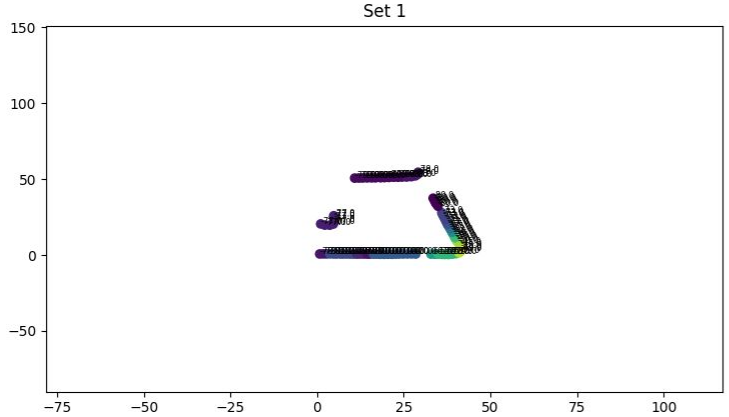
d - Distance from AP to pose

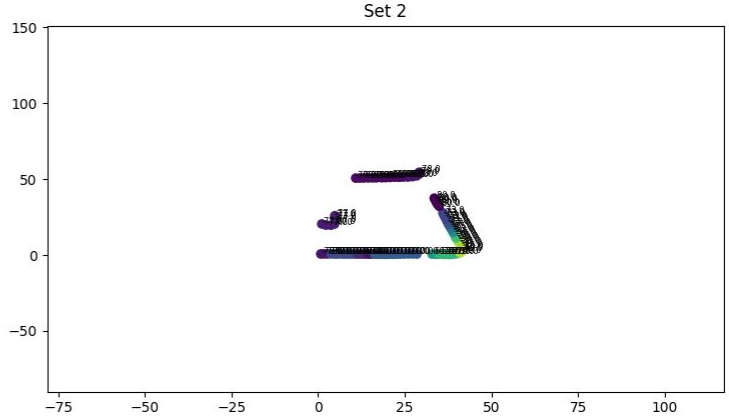

Set 1
80
60
40
20
0
−40
−20
0
20
40
60

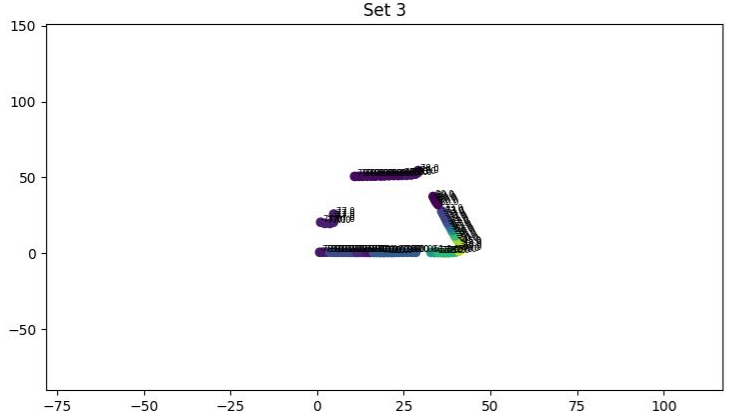

Set 2
80
60
40
20
0
−40
−20
0
20
40
60

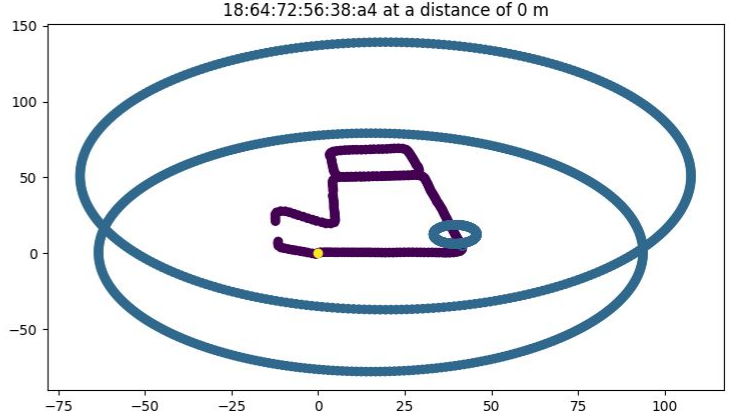

Set 3
80
60
40
20
0
−40
−20
0
20
40
60


18:64:72:56:84:b3 at a distance of 6.2182734968 m
80
60
40
20
0
−40
−20
0
20
40
60


Set 1
150
100
50
0
−50
−75
−50
−25
0
25
50
75
100


Set 2
150
100
50
0
−50
−75
−50
−25
0
25
50
75
100


Set 3
150
100
50
0
−50
−75
−50
−25
0
25
50
75
100


18:64:72:56:38:a4 at a distance of 0 m
150
100
50
0
−50
−75
−50
−25
0
25
50
75
100

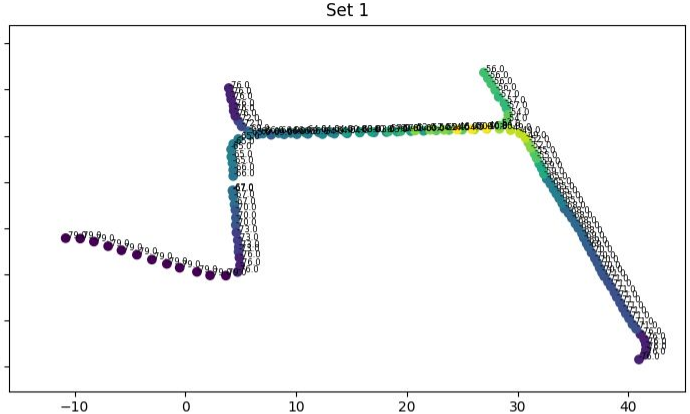
# Issues related to 2nd Approach - I

1. FSPL is different when there are walls and other objects in between.
2. Selected point may lie very far from the AP reducing accuracy of the calculation

# Second Approach - II

- Select three points nearer to the minimum RSSI recorded pose
  - 5 points away from minimum RSSI pose
  - Minimum RSSI pose
  - 5 points away from minimum RSSI pose

- Use FSPL equation to calculate distance from AP and draw three circles
- Calculate intersections and choose the point where distance is minimum from minimum RSSI value recorded pose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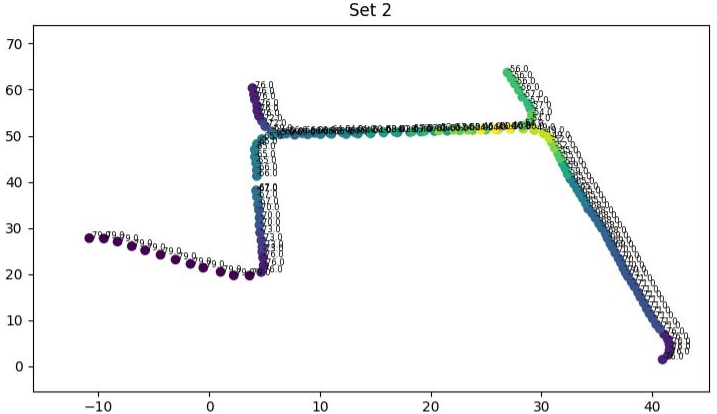
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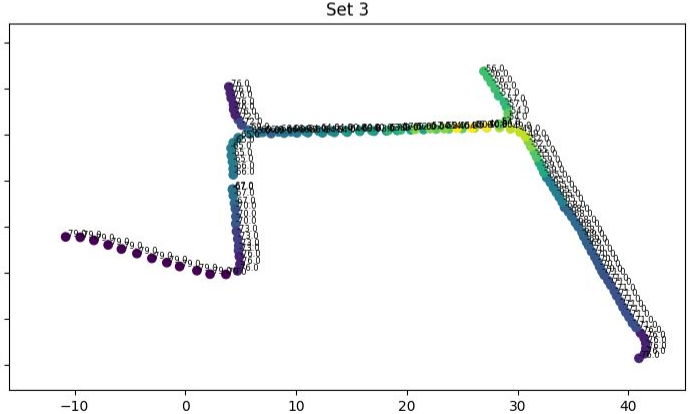
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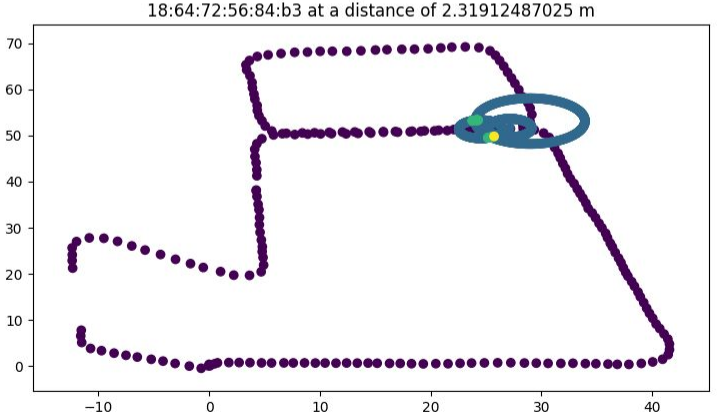
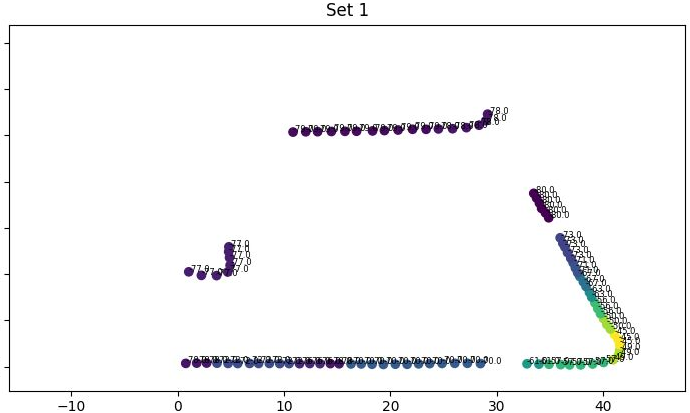
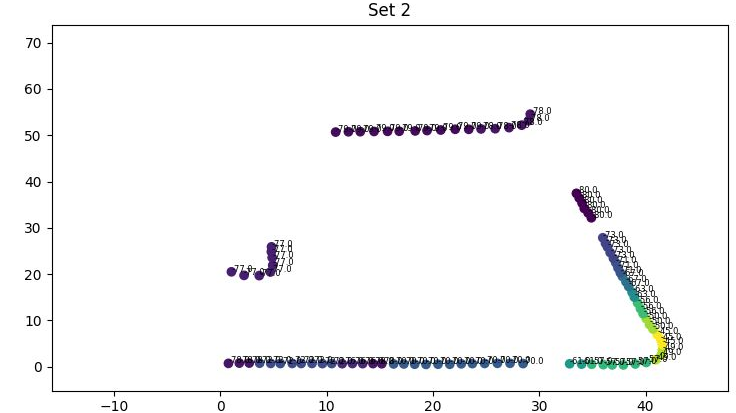

18:64:72:56:84:b3 at a distance of 2.31912487025 m


Set 1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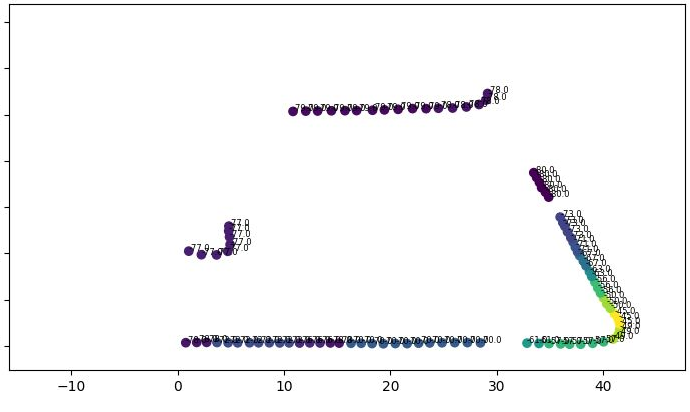
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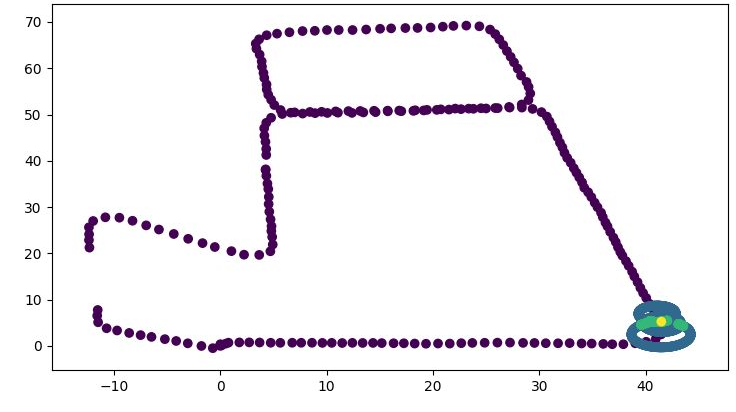
18:64:72:56:38:a4 at a distance of 0.46993972729 m