The number of possible target paths decreases as the number of detections increases. When is maximized over time over a given area. Therefore, at the CPA†. Multiple sensor detections are used to form a hypothesis for a target’s track by fusing the detection events from several sensors (track-before-detect). Approach: Coverage cone

\[ T = \frac{\pi}{2} \left( L_1 + \frac{d_1}{\delta_s} + L_2 + \frac{d_2}{\delta_s} \right) \]

Optimal Sensor Placement: \( n=10, k=2 \)

Tracking with Limited Information

Each proximity sensor reports its location with one value of the received signal level at the CPA. Multiple sensor detections are used to form a hypothesis for a target’s track by fusing the detection events from several sensors (track-before-detect). Therefore, \( n \) sensors are placed such that the number of tracks detected by \( k \) sensors is maximized over time over a given area.

Straight line track formation given \( k=2 \) CPA detections

Optimal Sensor Placement: \( n=10, k=3 \)

Modeling Sonar Buoy Drift and Dynamic Optimization

Current velocity profile provided by oceanographic models and measurements:

\[ C_{2,1}(v_2 - v_1)^2 = C_{2,1}A_2(v_2 - v_1)^2 \]

[O. S. Hammond, “SoBio/Ne Field Drift Prediction”]

Dynamic computational geometry problem: Optimize track-coverage subject to sensors drift over time, given data about the current field in the area, and with respect to the sensors’ initial location.