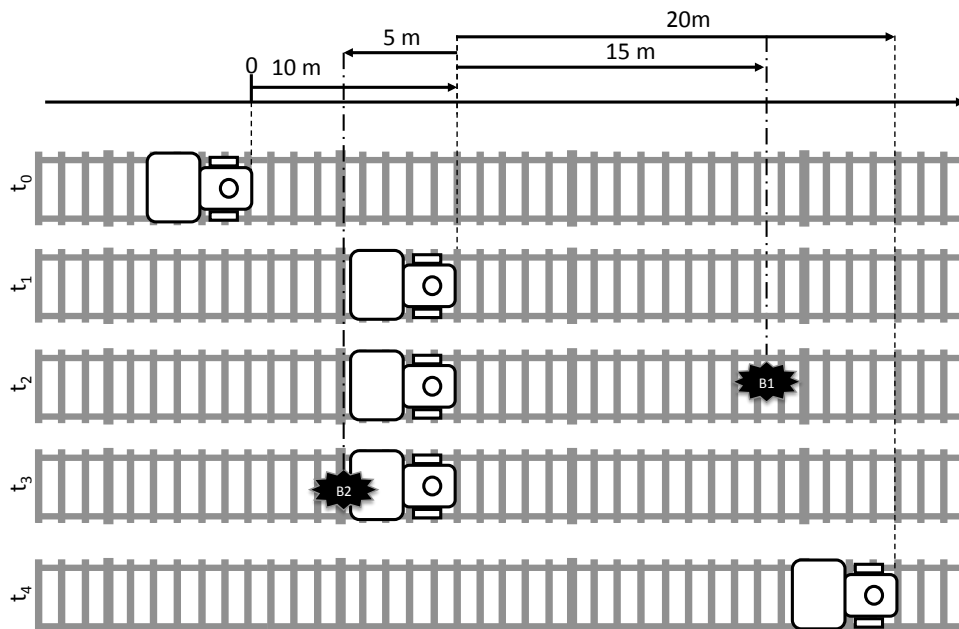


Exercise 2

A train is moving on a rail using odometry to measure its position along the rail. There are two fixed beacons at unknown positions. The train has a sensor that is able to measure the distance to these beacons. We assume that the initial position of the train is zero (in the selected reference frame). We are interested in jointly estimate the robot and beacons position. To this aim, a particle filter with state vector contains the robot and both beacon positions (each one 1 DOF) is used. You are requested to draw the particles distribution after the following situations.

- 1) t_0 : Initial distribution assuming the train is at zero position with zero uncertainty. Both beacons positions are unknown.
- 2) t_1 : The train moves 10 meters to the right.
- 3) t_2 : Beacon 1 is detected at 15 meters at the right of the train.
- 4) t_3 : Beacon 2 is detected at 5 meters at the left of the train.
- 5) t_4 : The train moves 20 meters to the right.



Because the state vector contains 3 variables (i.e., train_position, beacon_1_position, and beacon_2_position) draw the particles in 3D using this axis:

