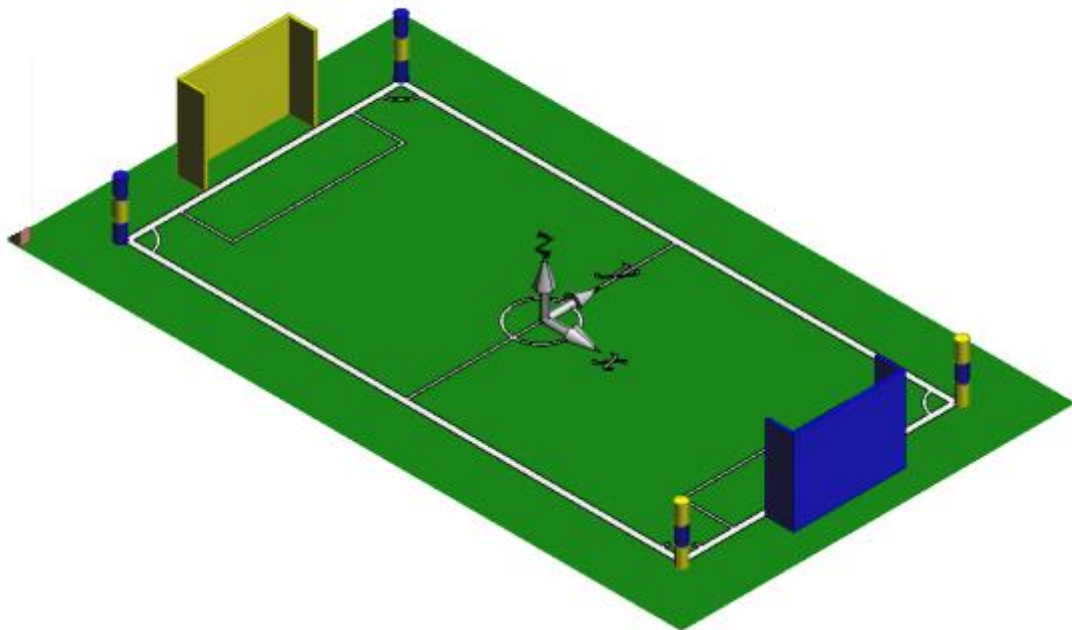
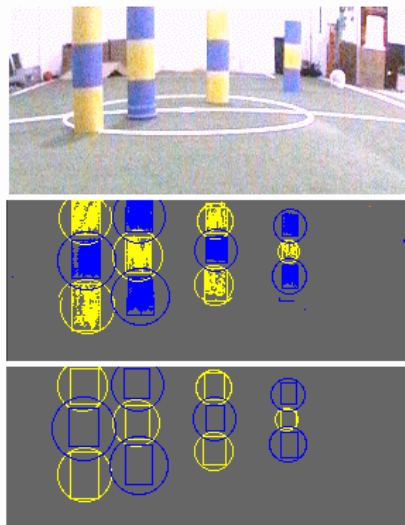




Laboratory Work #2 – Robot localization based on beacons

Consider a soccer robot with differential traction, and a rotating camera on top of it. Through colour segmentation it is possible to detect beacons placed on the playing field corners and obtain a measure of its distance and angle to the robot referential frame (real situation in 2002).





When the robot is near these beacons the rotative motion of a camera allows alternatively the detection of the adjacent beacons to that zone (coordinates: (5, -2.5) and (5, 2.5)). The remaining poles/beacons are too far away to be detected.

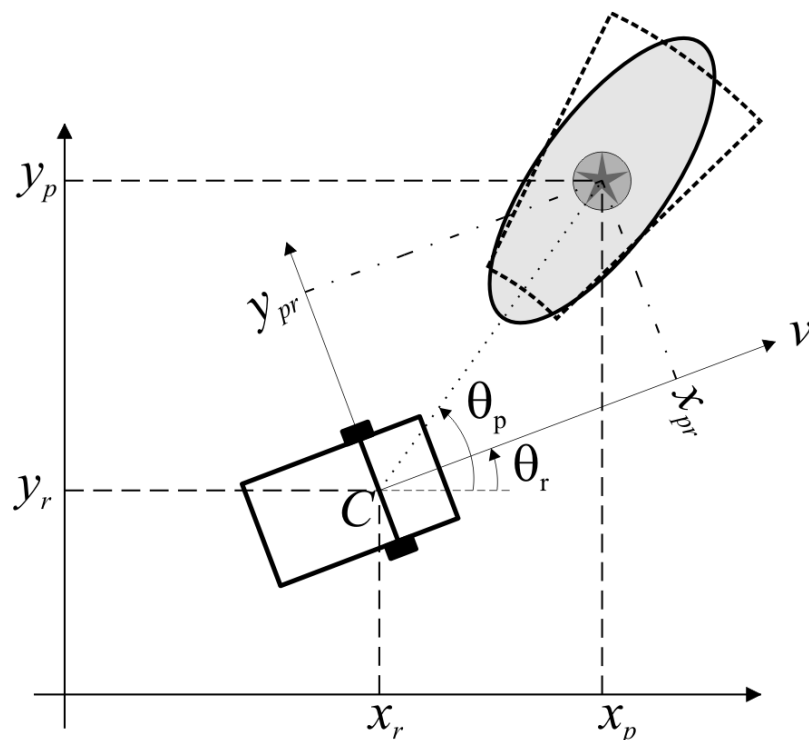
Whenever we observe a beacon there is an error in the estimated angle and an error in the estimated distance. Assume that the standard deviation of the distance error increases proportionally with the distance.

1 - Implement in Matlab a robot simulator that follow a circular path, with some random component and an Extended Kalman Filter to estimate the pose of the robot.

Consider that the measurement error has the following standard deviations:

Standard deviation of the measured distance to the beacon = 0.05 m/m

Standard deviation of the measured angle to the pole = 0.01 rad



2 – Repeat the previous point considering that he can only measure:

- a) The angle.
- b) The distance.



3 – Consider now that the robot has an omnidirectional camera and can measure the distance and angle to the 4 beacons simultaneously.

4 – Repeat the previous point considering that he can only measure:

- a) The angle.
- b) The distance