Assignment 3

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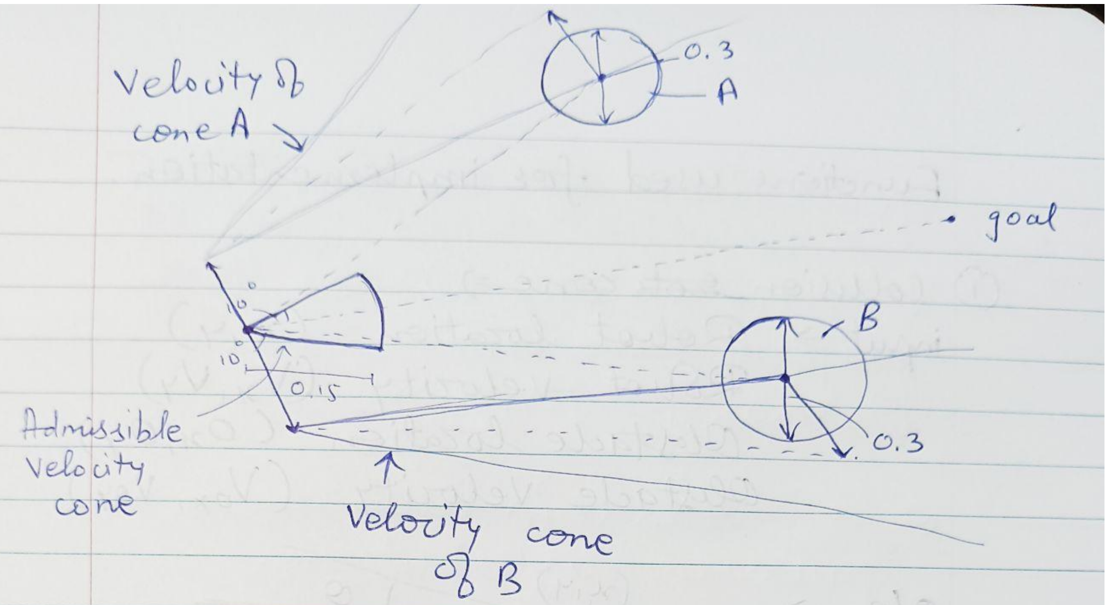
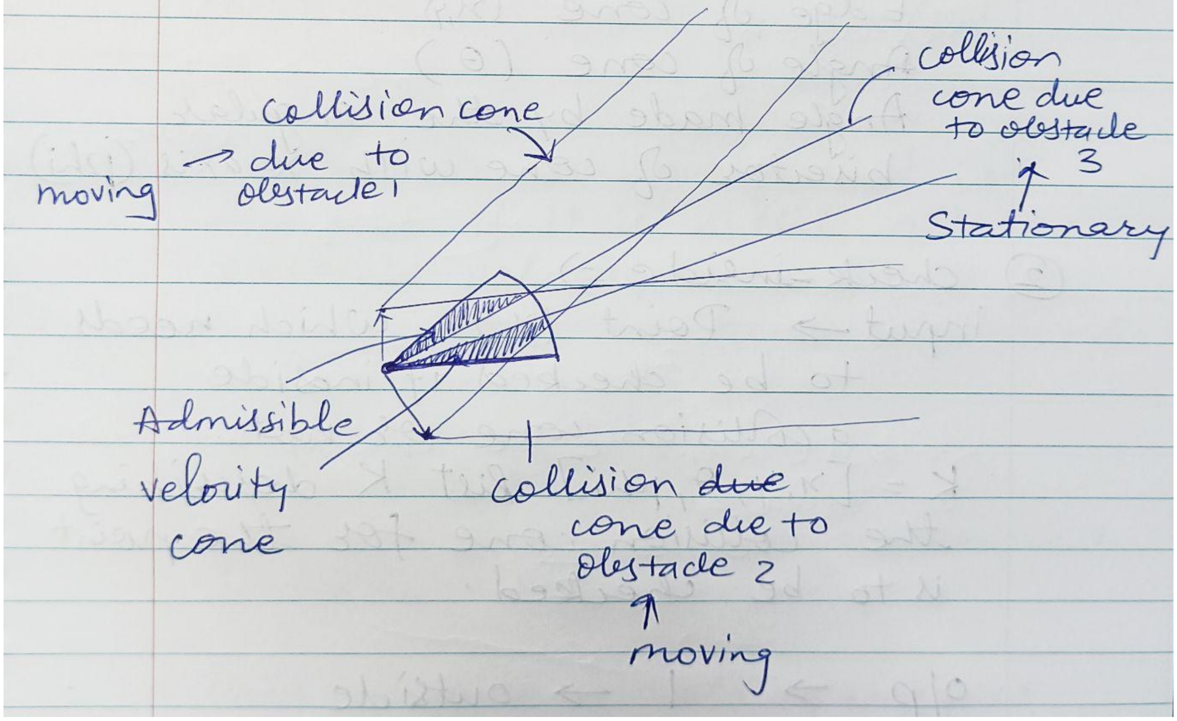


Collision cone diagram

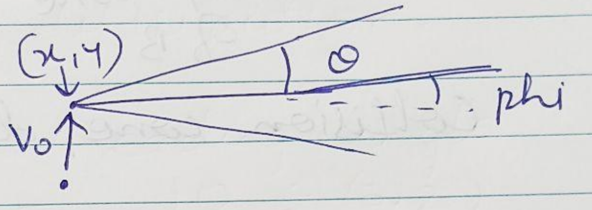


Functions used for implementation.

① Collision [illegible] cone =)

input → Robot location (x, y)
Robot velocity (V_x, V_y)
Obstacle location (O_x, O_y)
Obstacle Velocity (V_{ox}, V_{oy})

o/p →



Edge of cone (x,y)
Angle of cone (θ)
Angle made by the angular bisector of cone with x-axis (phi)

② check-inside =)

input → Point (x,y) which needs to be checked if inside a collision cone or not.

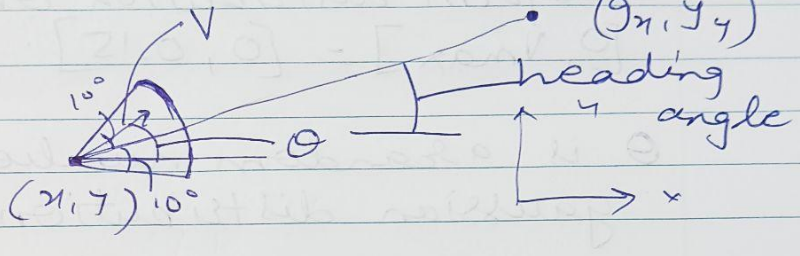
K = [x, y, θ, phi] list K describing the collision cone for the point is to be checked.

o/p → 1 → outside

0 → inside.

Details of implementation ⇒

At any robot location (x, y) and goal location (g_x, g_y).



A admissible cone with angle 10° with angular bisector as line joining (x, y) to (g_x, g_y) is generated.

A random point inside with cone is generate iteratively and is checked if it is outside all the obstacle velocity cone. If it lies outside then the (V, θ) are used to calculate,

$$V_x = V\cos\theta$$
$$V_y = V\sin\theta$$

and are given to velocity convert function.

And the o/ps of velocity convert function are given to robot as i/ps.

If it lies inside, a new random (V, θ) are generated and checked.

The random number generation method implemented should always generate a admissible (V,θ) or if it doesn't then no (V,θ) would be possible.

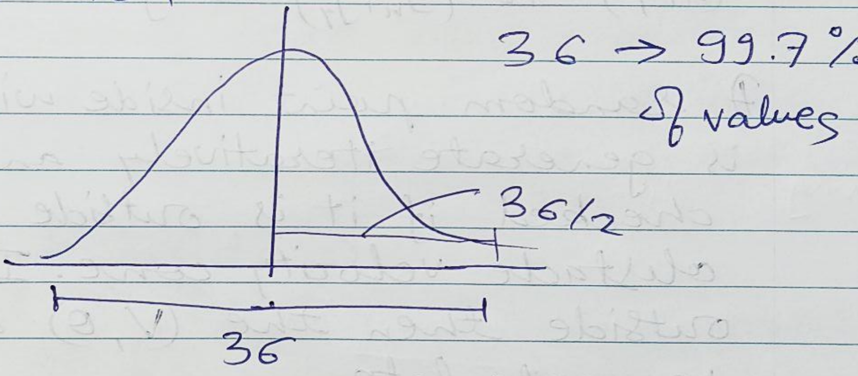
Generation of random (V, θ).

V is a random number with uniform distribution over interval $[0, V_{max}] = [0, 0.15]$.

θ is a random number with gaussian distribution.

mean = heading angle

Standard deviation = $10 \div (3/2)$



Since we want to be inside (-10,10) we equate

$$10 = \frac{36}{2}$$

$$10 \div (3/2) = 6.$$

(Random value generation was seeded for Repeatability).

Results: The robot was not able to reach the goal location. It followed roughly a circular trajectory near the origin. It could have happened due to the mismatch with velocities of obstacles and robot, since the random number generation strategy may require high time, the calculated velocities wouldn’t be relevant since the obstacles would have moved and the collision cones would have changed as well. So, a more efficient strategy could have solved the problem.