Collision Avoidance

AE353 Spring 2025 Bretl

COLLISION AVOIDANCE BY GRADIENT DESCENT

Define a function h(p) that is

small near the goal
large near obstacles

and choose the desired position by gradient descent:

Pdes = p̂ - kdes Th(p̂)

$$h(p) = h_{att}(p) + h_{rep}(p)$$

 \downarrow

 $\nabla h(p) = \nabla h_{att}(p) + \nabla h_{rep}(p)$





REPULSIVE PART ("large near obstacles")



$$\nabla d_i(p) = \left(\frac{1}{\|p - p_{obst}\}} \right)$$

SPHERICAL OBSTACLE (avoid other droves)





PLANAR OBSTACLE WITH CIRCULAR HOLE (avoid ring)



PLANAR OBSTACLE WITH CIRCULAR HOLE (avoid ring)



HOW TO CHOOSE PARAMETERS ?

kdes, katt, krep ...

WHAT CAN GO WRONG ?

Local minima...

COME TO CLASS ON FRIDAY (4/25) TO FIND OUT