P-ClearPath

Milestone 1

Milestone 1 Review

Complete basic implementation

a. Only parallelize per robot FVO computation
b. CPU implementation
c. Some simple debug views

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(Yay for __host__ __device__!!!)

“Caveats”

1. Doesn’t fully work for more than 2 robots yet
    a. Most of the code is written
    b. Just need to combine it all together

Encountered unforseen difficulties

Lotsss of ambiguities in the paper, had to figure out what they were alone

Not pleasant :(, but I think I got most!

Will show just a few (there are quite a few more than the ones I show)

Some ambiguities

$$\Gamma_{AB}(\mathbf{v}) = \lambda\left(M - \widehat{\mathbf{p}_{AB}^{\perp}}\eta,\, \mathbf{p}_{AB}^{\perp}\right), \text{where}$$

$$\eta = \tan\left(\sin^{-1}\frac{r_A + r_B}{|\mathbf{p}_{AB}|}\right)(|\mathbf{p}_{AB}| - (r_A + r_B)), \text{and}$$

$$M = (|\mathbf{p}_{AB}| - (r_A + r_B))\widehat{\mathbf{p}_{AB}} + \frac{\mathbf{v}_A + \mathbf{v}_B}{2}$$

This actually needs to be shifted by pA!!!

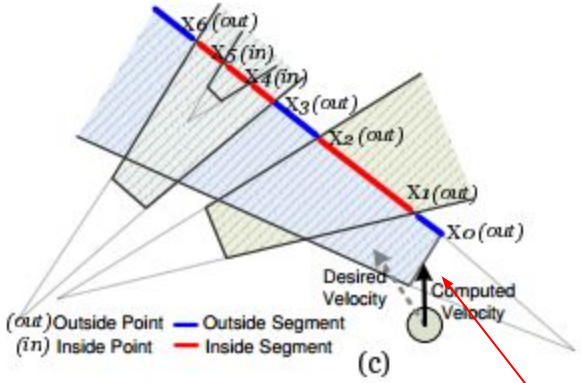
Some ambiguities

Step 5. Classify the subsegments along each segment as *Inside* or *Outside*, and compute/maintain the closest point for the *Outside* subsegments.

Step 6. In case the resulting solution does not satisfy the kineodynamic or velocity constraints, relax the constraints by removing the FVO corresponding to the furthest neighbor by distance, and repeat the algorithm with fewer agents.

What...is the resulting solution???

Some ambiguities



What is this pointing to and why???

Ambiguities

Seem simple now that I figured them out…

Easily took a half/full day for each one :(

But mostly made it!

- Finished most of milestone
- Missing multi-robot part, but have all the pieces

Next time on...

Milestone 2:

Implement uniform grid optimization

a. Used to compute nearest neighbors (that might result in collisions, ignore far away bots)

Slight detour: Need to finish multi-robot portion