Localization and Rover Home Approach

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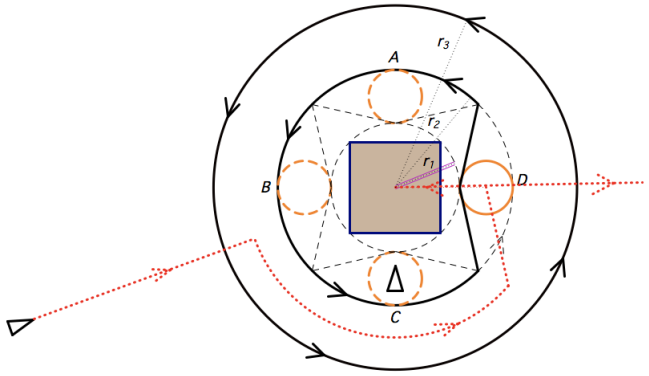
***Abstract*— Temporary Abstract**

I. Introduction

II. Problem Statement

III. Algorithm



Agent localization can be broken down into two parts: 1) static initialization, and 2) dynamic refactoring.

Algorithm 1 *Static Initialization*: create reference anchor node based on collective agent position.

Input: X_p : the perceived agent position.
Output: X_A: the position of the reference anchor node.
1: **return** S, V

After initialization, localization aims to improve the percieved location of the agent by correcting the recorded pose by a dynamic x and y offset. These offsets can be model by the equations,

$$(x,y) = w{\cdot}((x,y)_c - (x,y)_p) + u{\cdot}(x,y)_g - (x,y)_c) + v{\cdot}(cos/sin)(\theta) \tag{1}$$

where $(x,y)_c$ and $(x,y)_p$ are the current and previously recorded GPS locations, $(x,y)_g$ is the goal agent location and θ is the current heading. The weights applied to the relative change in position w, u, and v can then be model by the piece wise functions,

$$w = \begin{cases} 1 & \mathcal{D}_\mathcal{A} < 0.1 \\ e^{-(x,y)} & \text{otherwise} \end{cases} \tag{2}$$

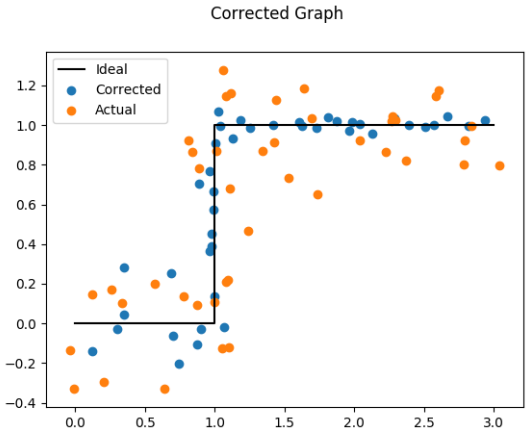
$$u = \begin{cases} 1 & \mathcal{D}_\mathcal{G} < 0.05 \\ \frac{1}{1+(x,y)} & \text{otherwise} \end{cases} \tag{3}$$

$$v = \begin{cases} 0 & \frac{d(x,y)}{dt} < 0.01 \\ (\frac{d(x,y)}{dt})^2 & \text{otherwise} \end{cases} \tag{4}$$

such that $\mathcal{D}_\mathcal{A}$ is the distance from the anchor node, $\mathcal{D}_\mathcal{G}$ is the distance to the goal location, and $\frac{d(x,y)}{dt}$ is the linear velocity of the agent.

IV. Results

Modeled below is graph of the localization of a single rover. The ideal path can be seen in black, originating at



- Mean Square Error = 0.964
- R^2 Regression Score = 0.0067

V. Conclusion