A Light, Accurate, Inexpensive, and Easy to Implement Indoor Localization System.

Mark Woodward
Goal:

Localization System

Requirements:
- Light
- Accurate
- Inexpensive
- Easy to Implement

Assumptions
- Flat uniform ground plane
Approach:

Overview

- Video camera
- Canny edge detector
- Extract nearest edge as a wall
- Project onto flat ground plane
- Use Projections as range estimates
- Run Monte Carlo Localization (MCL)
Approach (cntd):
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**Approach (cntd):**

- Run MCL
  - \( x^{[m]} \sim \text{bel}(x_{0:t}) \)
  - \( \text{bel}(x_{0:t}) = n \ p(z_t|x_t) \ p(x_t|x_{t-1}, u_{t-1}) \ \text{bel}(x_{0:t-1}) \)
Platform:

➡️ Hardware
Platform (cntd):

Motion Model
Platform (cntd):

Motion Model

\[
\alpha = (\text{servo} - a1)^2 a2
\]
Results:

- Video
Results (cntd):
Problems:

- Pitch
  - Pitch from the image
  - Put pitch in the state
  - Add an accurate IMU
  - Alter the sensor model
  - Change sensor (laser triangulation)

- Corrupted Images
  - Corrupted image classifier

- Motion Model Inaccuracies
  - Add velocity to the turning radius equation (side slip)
Thank-you