Autonomous Coarse Localization

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Problem with current approaches

- Doesn't exploit the variation in appearance across progressive viewpoints which can be used for an initial estimation.
- Expensive in terms of memory and Computation

Objective

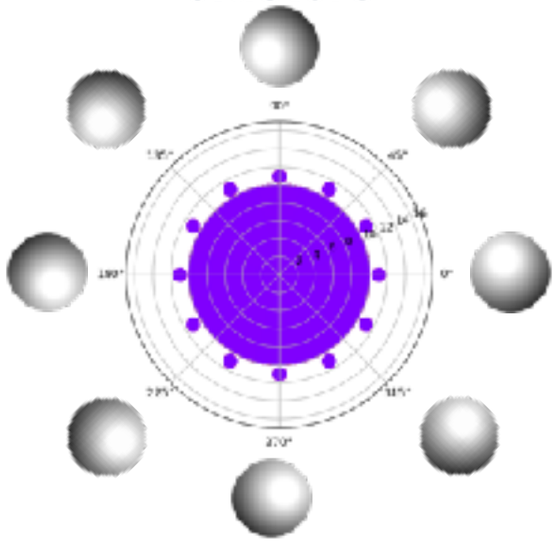
- Coarsely localize a workpiece based on its CAD data.
- Provide initial estimate to Fine Localization module for further pose precision

Probabilistic model of localization

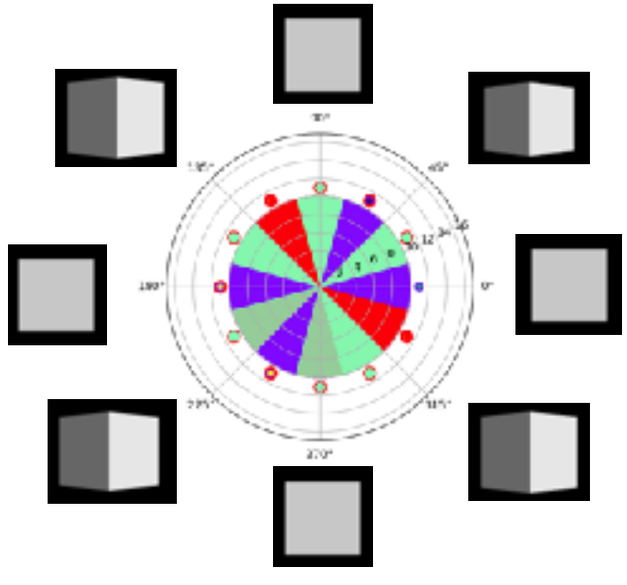
to update the location after every observation

$$P(pos|obs) = \frac{P(obs|pos) * P(pos)}{P(obs)}$$

The system learns *appearance* of the workpiece across coarse poses from the CAD model as clusters



Robot uses pattern of neighbors to localize itself in the map.



Approach

High level Feature Extraction:

faster computation for a **coarse estimate** (wide domains) with **high certainty** in a trade off with a **fine estimate** (narrow domain with **low certainty.**

Clustering:

Gaussian Mixture Model (GMM):
- soft association of views to clusters.
- provides a probabilistic distribution that indicates the certainty of the clustering.

Mean Shift model:
- finds the number of clusters it on its own.

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