Indoor Coverage Path Planning using the Constriction Decomposition

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Overview

- Review a few existing methods
- Background on Straight Skeletons
- Explain the Algorithm
- Demonstrate the results on a few floor plans from University of Waterloo

Classes of Coverage Methods

- Online
  - Robot creates coverage path as it explores the environment (Think Nasa Sample Return)
- Offline
  - Robot has access to entire map (may not be completely accurate)
- Approximate Decomposition
  - Environment is discretized and approximated using a occupancy grid.
  - Examples include: Wavefront Coverage, Spiral Spanning Tree Coverage, that Korean one, Depth First Search
  - Easier to apply in an online manner than exact decomposition, but cannot guarantee complete coverage. Also representation of non-rectilinear elements is very difficult.

Classes of Coverage Methods cont...

- Exact Decomposition Methods
  - Environment is broken down into a subset of environments. The union of all sets is the same equal to the entire free space of an environment.
  - Examples: Morse Cell based Decompositions, CDM, Trapezoidal, Boustrophedon, etc...
  - Works well in polygonal based environments, can prove complete coverage if applied in an offline manner

Some examples of Online Coverage Methods