

AI_11_29

Keys for Autonomous Navigation

Environment Representation

角度測量: x, y, θ

離散測量

離散拓樸

How to do? (Model)

Odometry 里程計 ex. find a treasure -> Not applicable

Modified Environment 改變環境，用於適應，讓設計不會複雜 ex. Landing at night -> Expensive、Inflexible

Feature-based Navigation 根據特徵導航 -> Still a challenge for artificial systems

Map Representation

- Recognizable locations
- Topological maps 只在東西之間的關係
- Metric topological maps
- Fully metric maps

Model

- Continuous
- Discrete
- Raw data
- Features

Method

Incrementally (dead reckoning)

- ex. Odometric or inertial sensors (gyro 陀螺儀)
- -> Not applicable
- Modifying the envirmnet (artifical landmarks / beacons)
- 用於環就改變的時候，可以用感測器來動作
- -> Expensive, Inflexible

Method for Localization

- A priori map: graph, metric 已知地圖，但你不知道你在哪裡
- Feature extraction 特徵萃取，一邊動作一邊獲取動作
- Matching: Find correspondence of features 多個狀態的變化，找尋對應的特徵，找到變化量
- Position estimation (e.g., Kalman filter, Markov)
 - 不確定的表示
 - 根據優先統計的加權方式

Gaining Information through Motion

Multi-hypotheses tracking

- A prior map
- Method for determining the *local uniqueness*
- Library of *driving behaviors*

How to Establish

- By hand
- Automatically
 - 機器人自己看、偵測，自己做判斷
- Basic requirements of a map
 - 循序漸進建構地圖
 - 路徑規劃、避開障礙
- Measure of quality of a map
 - + 拓樸正確
 - + 度量、量測正確
 - ! But: Most environments are a mixture of predictable and unpredictable feature → hybrid approach

The Problems

Exploration and Graph Construction

- 探索
 - 提供正確拓樸
 - 必須辨識已訪問過的位置
 - 回溯到未開發的開口
- 圖形結構
 - 特定的地方會給一個 node
 - 像是轉角之類，明確有不一樣的特徵
 - 特徵出現或消失的地方