Autonomous Multi-Agents: In Search and Rescue operations

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Search & Rescue Robots

Application:
Natural or man-made disasters
  • Earthquake
  • Terrorist attack

Motivation:
These robots will assist rescue team with:
  • Exploration
  • Site evaluation
  • Human(victim) Detection
Methodological Approach

- **Optimization**: Searches for a solution for a given function

Objective functions:
- **Efficiency**
  - Time and effort needed to search the area comprehensively.
- **Robustness**
  - Ability to avoid destruction and communication.
- **Fairness**
  - Ability to find all targets independent of position.

- **Adaptation**: Searches for a function behind given solution
**Autonomous Robots**

There are able to:

- Protect themselves (e.g: avoid hazards)
- Make decisions (e.g: how to avoid obstacles!?)
- Accomplish task objectives (e.g: detect victims based on their heat signature)

All without human assistance

**Methodologies:**

- *Random Slope Search*
- *Spiral surge Search*
- *Sweep Curve Search*
Random Slope Search
Area Coverage for RSS
Relationship between Steps and Area Coverage
Structured Random Slope Search
Random vs. Structure
Spiral Surge Searching Algorithm

Perimeter
SSS vs. RSS

![Graph comparing SSS and RSS with steps and resolution area]
Sweep Curve Searching Algorithm

Forming a perimeter
Ad-hoc network
Vector-Valued function

Area has been covered!
## Conclusion:

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<tr>
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<th>Area Resolution</th>
<th>Obstacles</th>
<th>Required Time</th>
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<tbody>
<tr>
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Masters & Slaves

- Dividing the search area between general independent units. Larger robots span larger gaps while smaller gaps will be searched by slaves.