

***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

They are able to:

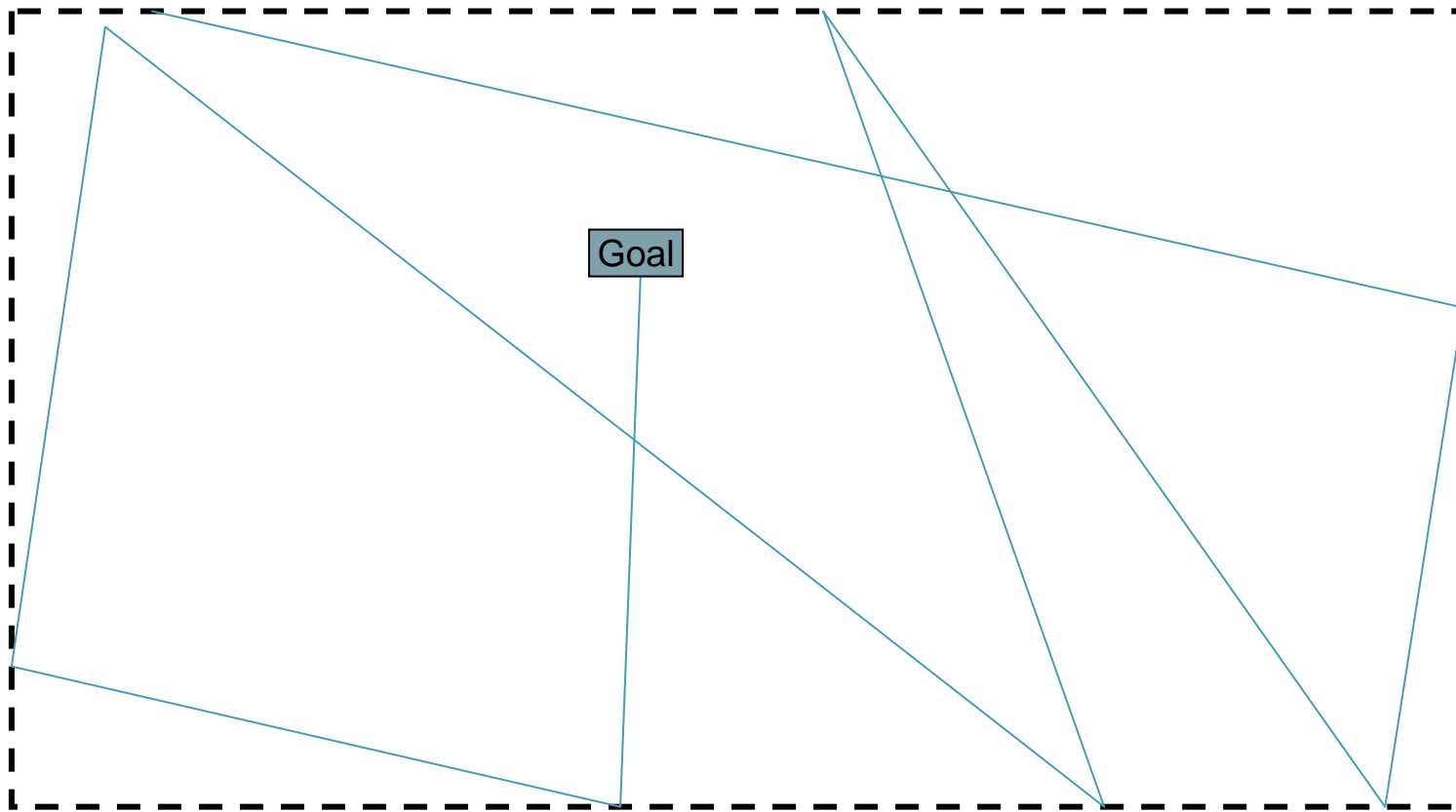
- Protect themselves (e.g:avoid hazards)
- Make decisions (e.g:how to avoid obstacles!?)
- Accomplish task objectives (e.g:detect victims based on their heat signature)

All without human assistance

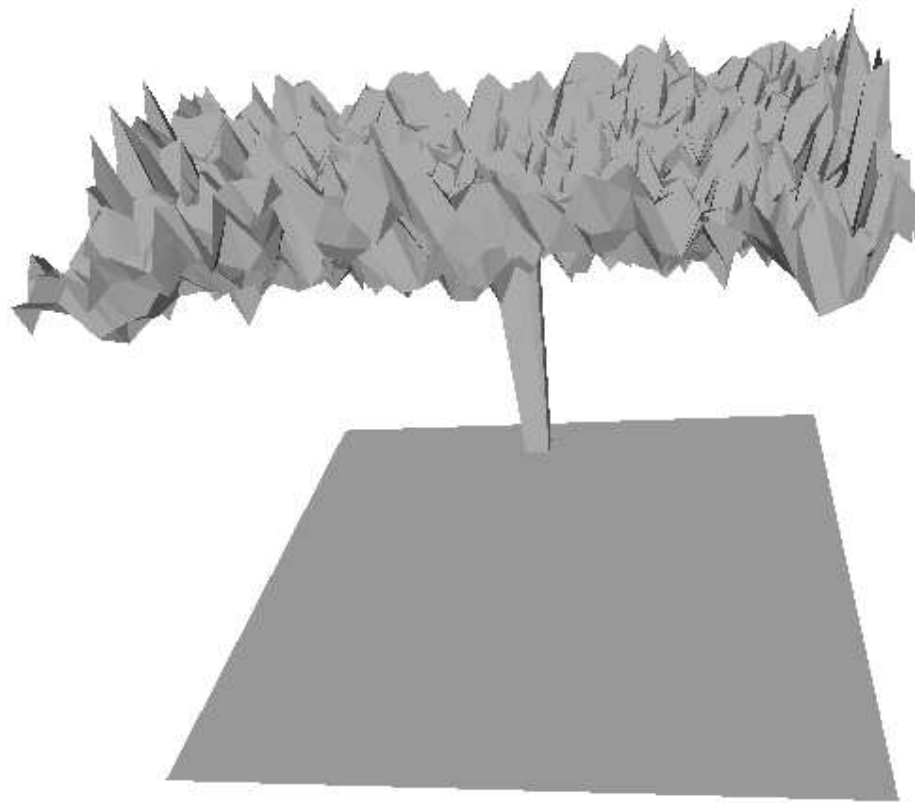
Methodologies:

- *Random Slope Search*
- *Spiral surge Search*
- *Sweep Curve Search*

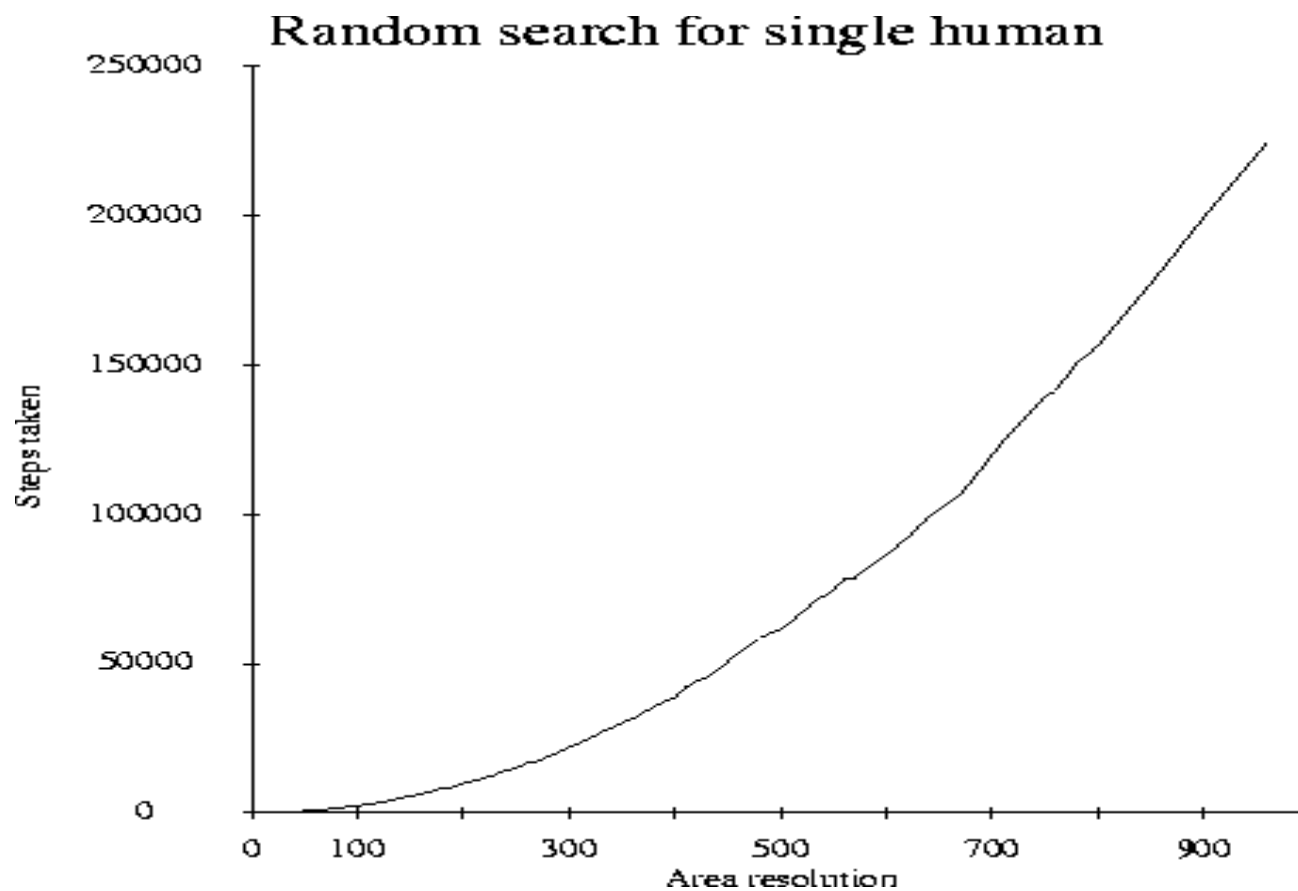
Random Slope Search



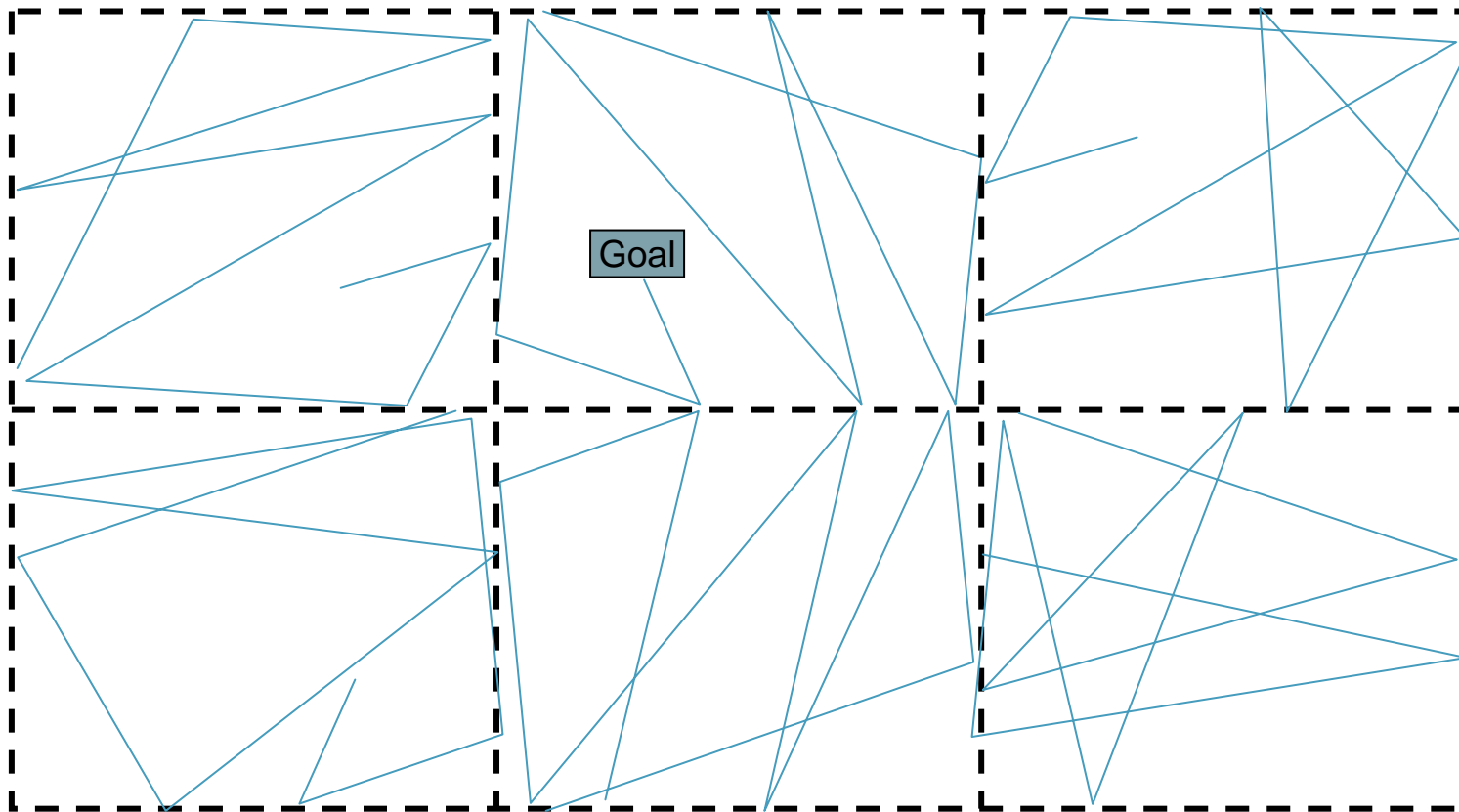
Area Coverage for RSS



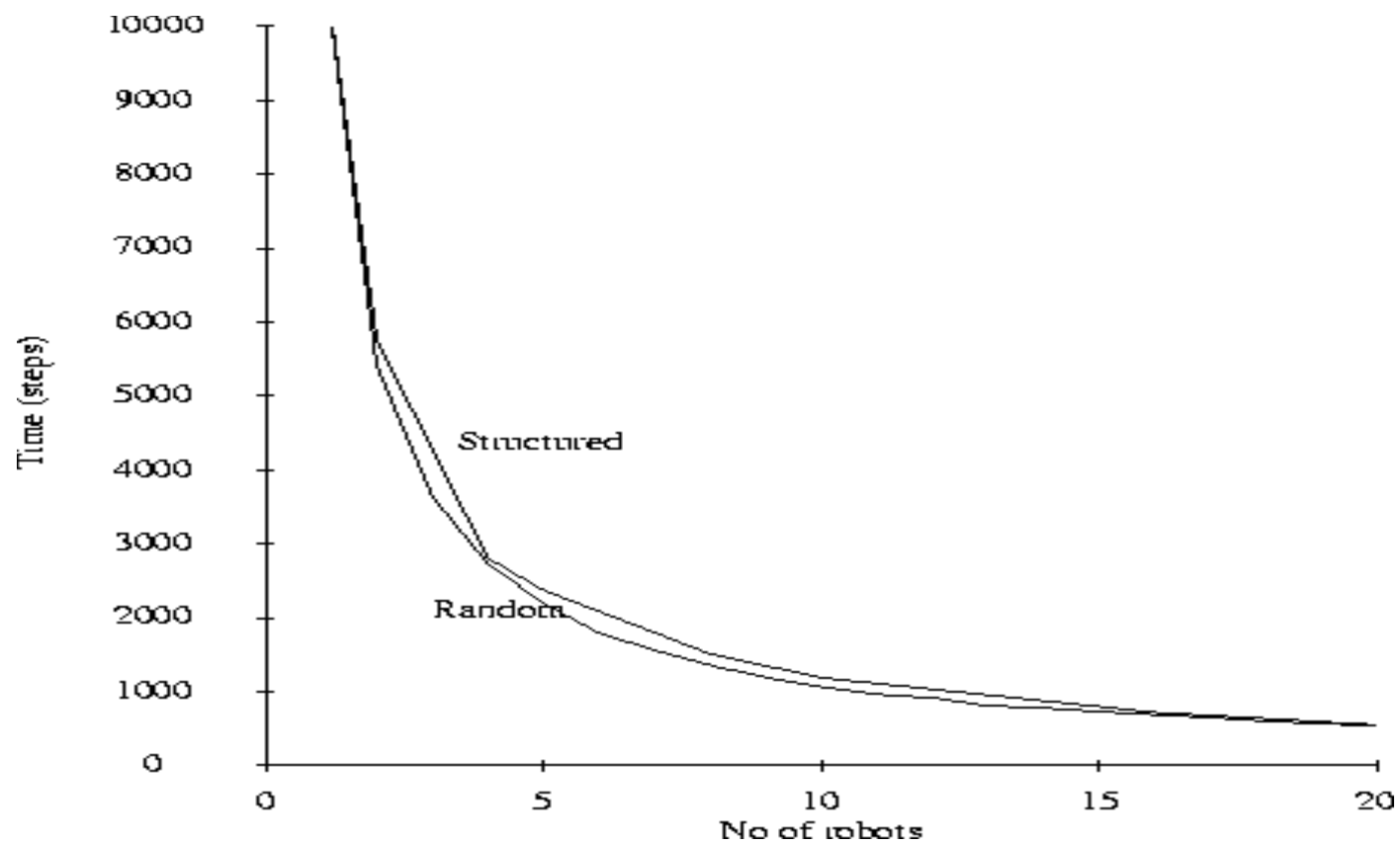
Relationship between Steps and Area Coverage



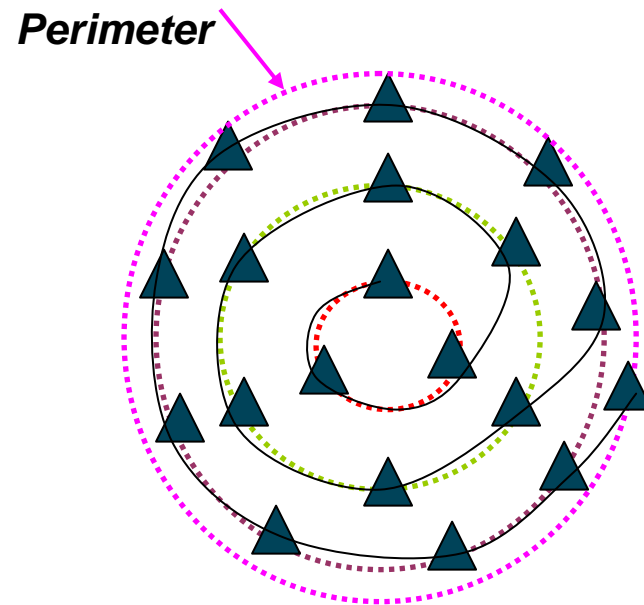
Structured Random Slope Search



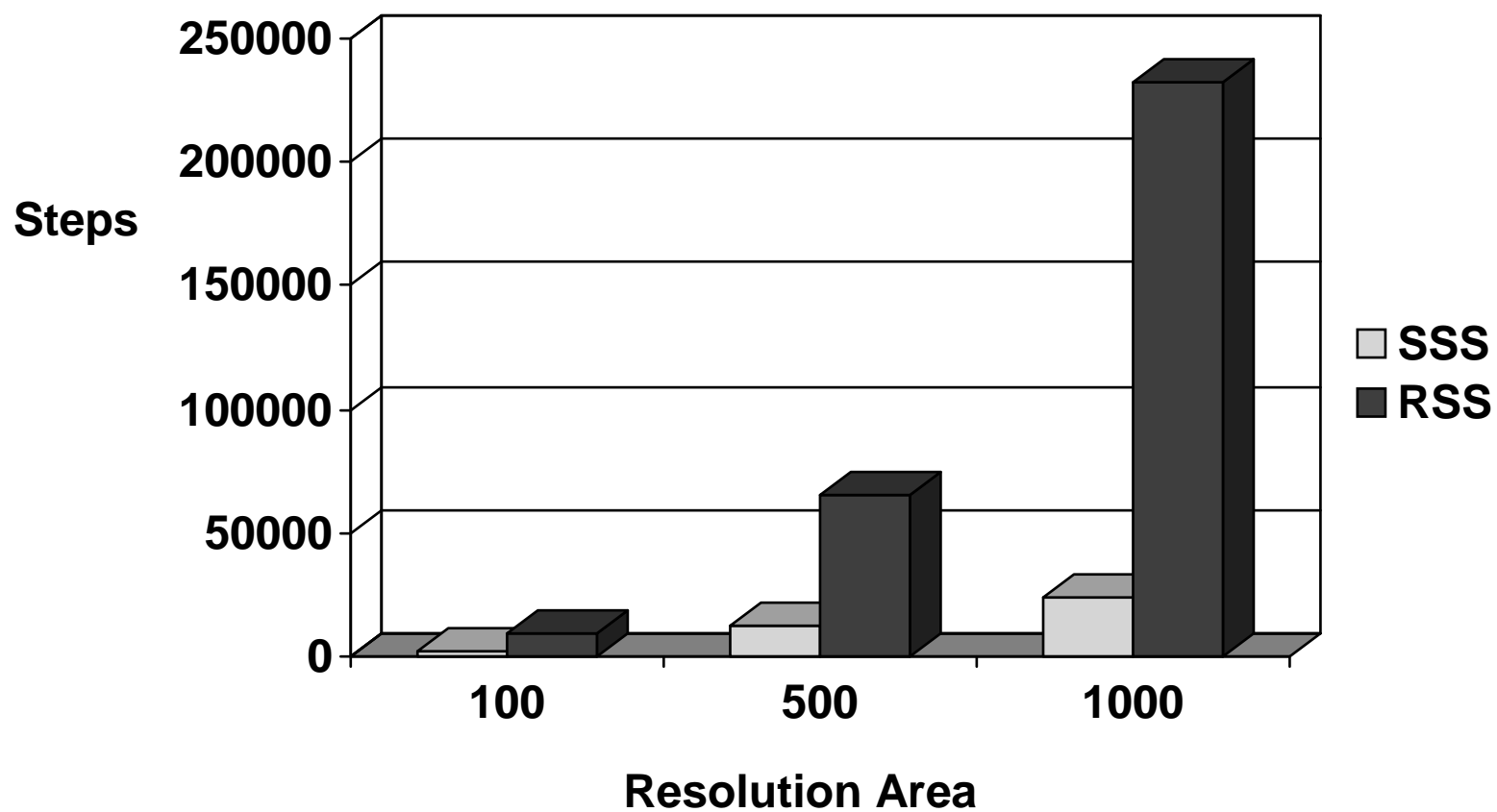
Random vs. Structure



Spiral Surge Searching Algorithm



SSS vs. RSS

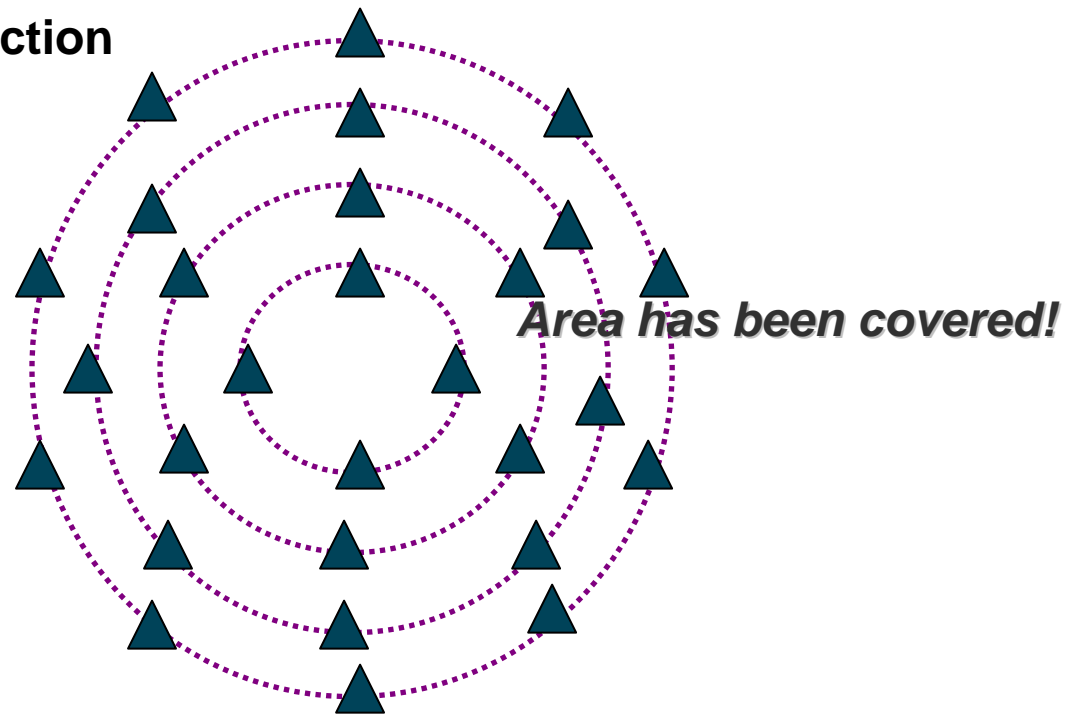


Sweep Curve Searching Algorithm

Forming a perimeter

Ad-hoc network

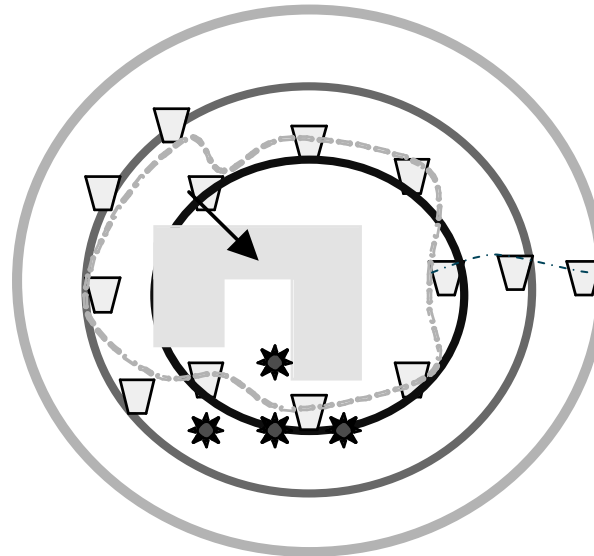
Vector- Valued function



Conclusion:

	Area Resolution	Obstacles	Required Time
RSS	✓	✓	✗
SSR	✓	✗	✓
SCS	✗	✓	✓

Masters & Slaves



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