Motion Planning in Unknown Environments

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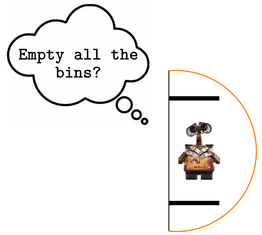
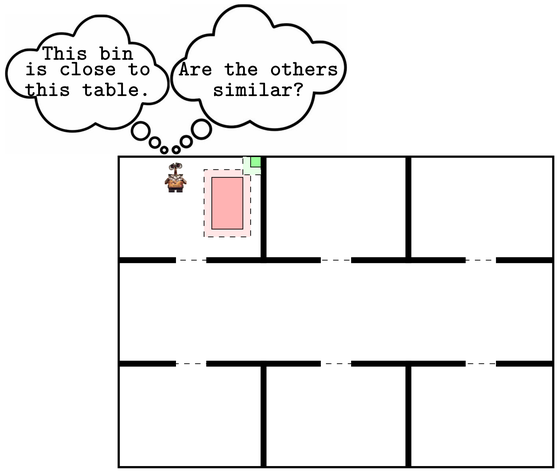
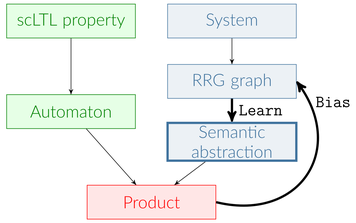
Problem Description



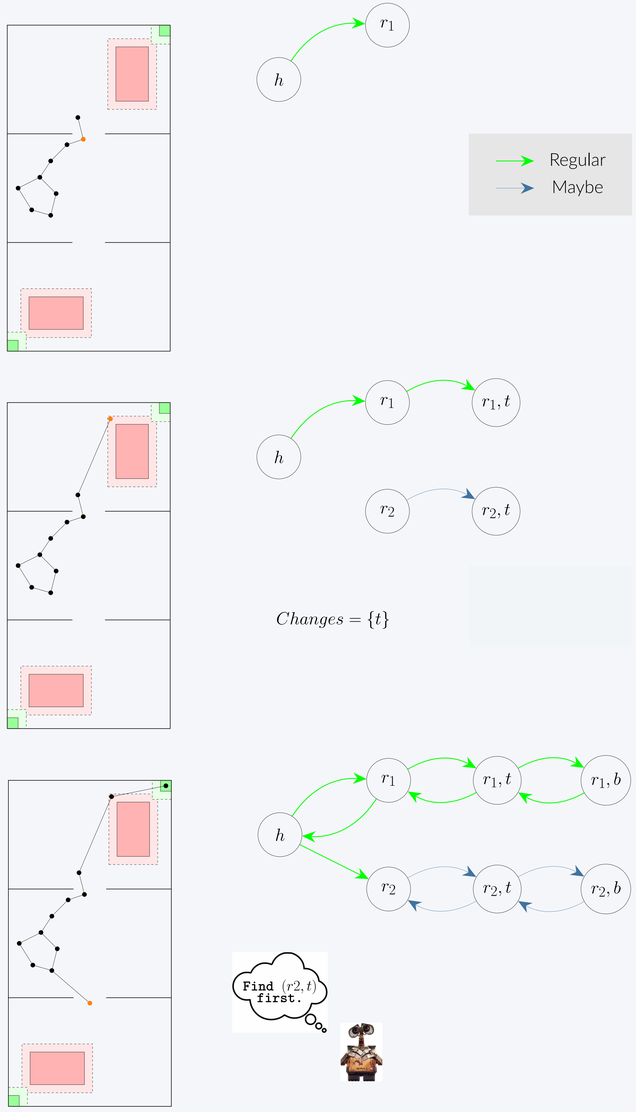
Key Observation



Overview of our solution



Our Solution



Algorithm

- Sample a batch in the known area (initially, sensing radius) using biasing (initially, no biasing).
- Learn from the newly added edges and improve the bias.
- Find the best move and go there.

Finding the best move

Define information gain for each possible move according to a frontier as:

$$IG_{map} = size \times f(d)$$

Define information gain for each possible move according to biasing as:

$$IG_{bias} = g(r, d)$$

Experiments

Used 100 randomly generated office like environments to compare three possible approaches. The table entries represent the **mean** and **standard deviation**.

	See-through Desks		
	Explore, then plan	Simultaneous	Simult. biased
Total length	77.3 (7.5)	56.6 (8.0)	29.4 (5.0)
Total Time	7.8 (2.0)	6.4 (2.3)	7.3 (1.9)
RRG size	1931.2 (460.9)	1938.6 (559.5)	1793.6 (312.1)

	Opaque Desks		
	Explore, then plan	Simultaneous	Simult. biased
Total length	79.1 (7.1)	62.9 (16.5)	32.3 (11.8)
Total Time	9.6 (2.5)	8.3 (3.2)	9.1 (2.4)
RRG size	2313.8 (550.9)	1868.7 (498.2)	1901.4 (301.2)