Autonomous Mobile Robot Navigation Methods

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- What is an autonomous robot?

- Why have one?

Picture by: http://techdigest.tv/Roomba560_onFloor.jpg

Picture by: www.wetasschronicles.com/.../MarsRover4.jpg

Applied Robotics

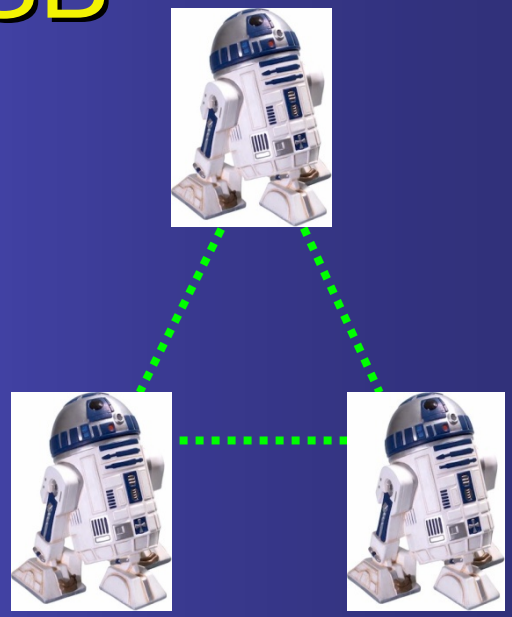
- Hazardous areas
- Space exploration
- Handicapped service
- Repetitive tasks
- Security / Surveillance

Image from http://www.gizmag.com/go/6626/

Research at UCSB

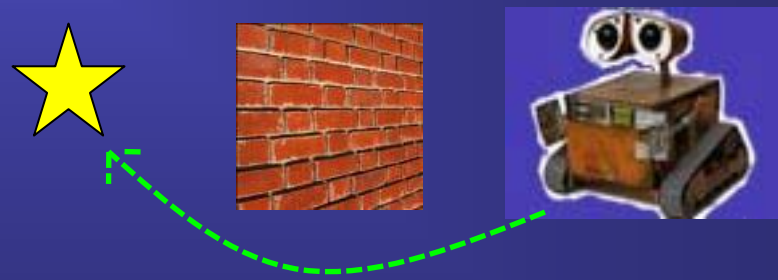
Broad goals

- Multiple robot coordination
- Time minimization



Specific goals

- Autonomous navigation
- Obstacle avoidance



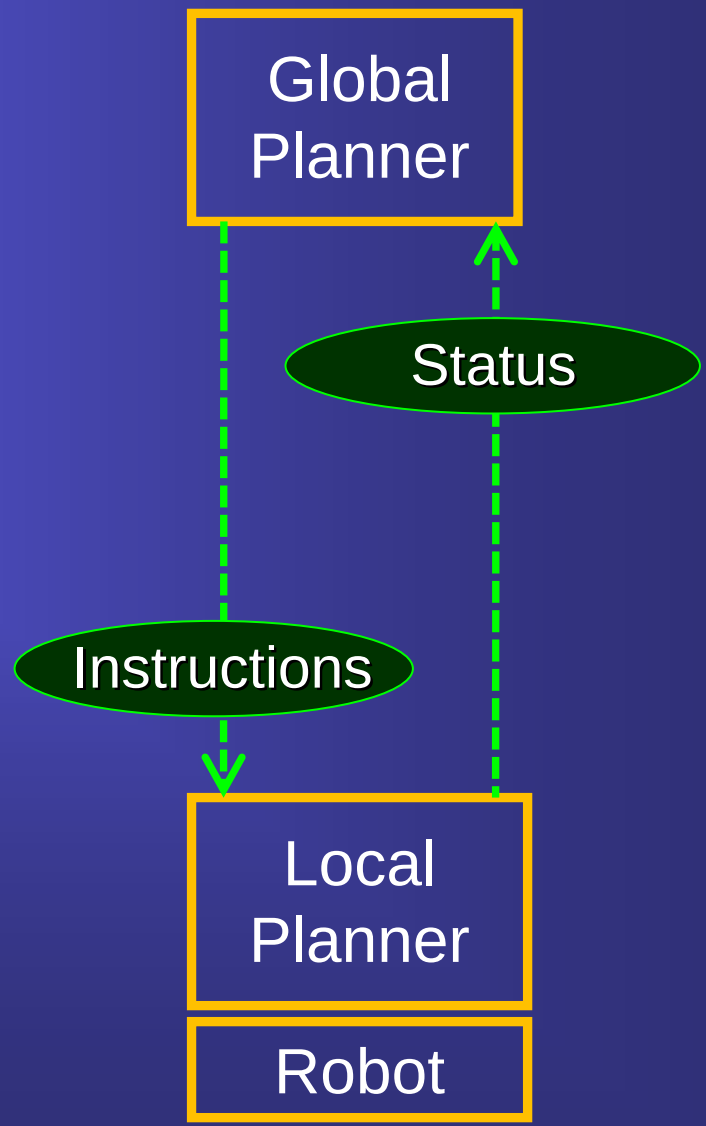
Physical Parts of the Robot

Courtesyfrom Prof. Bullo's lab

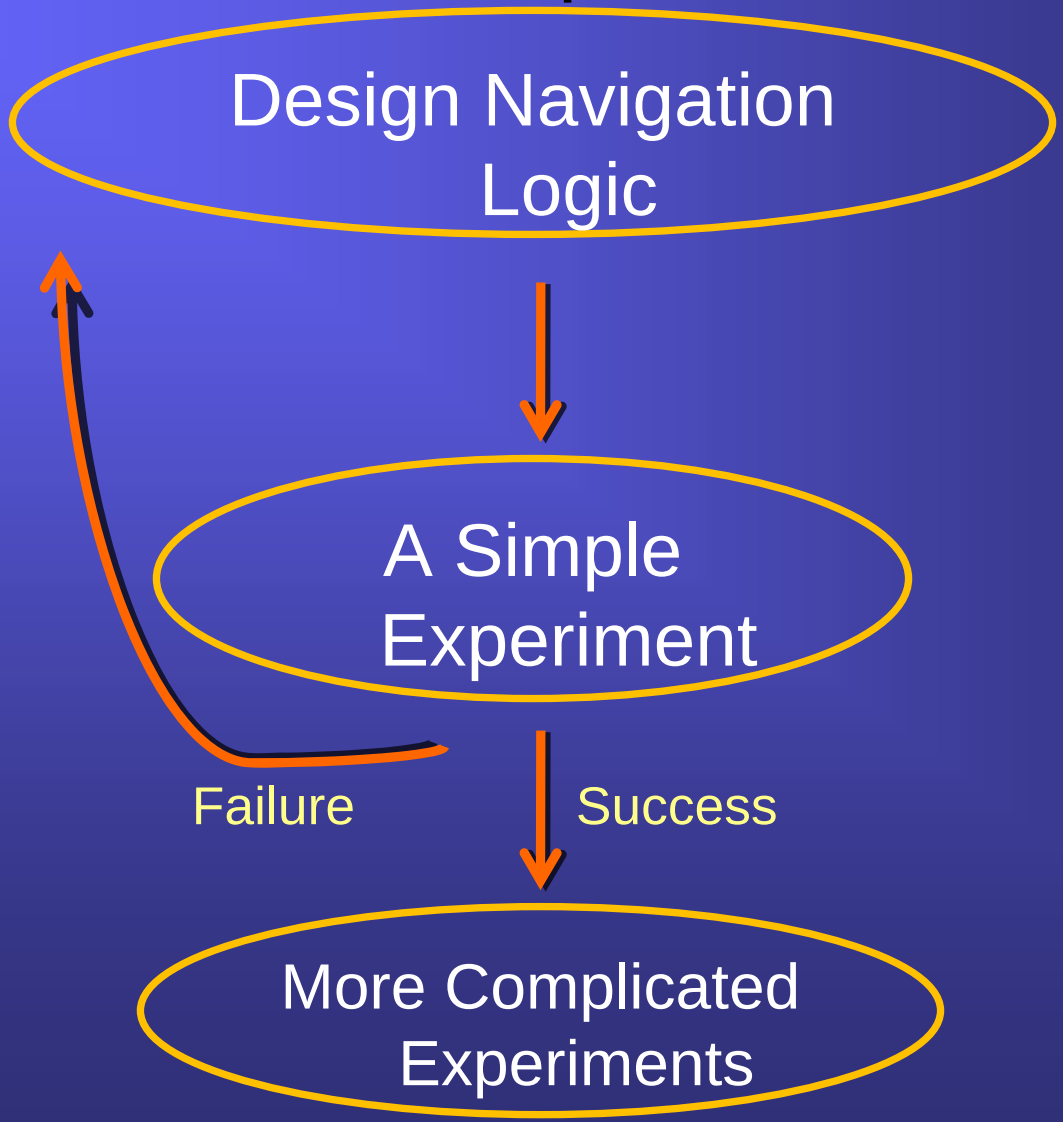
- Platform
- Computer
- Laser Sensor

Software of the Robot

- Global Planner decides where to go
- Local Planner manages how to get there

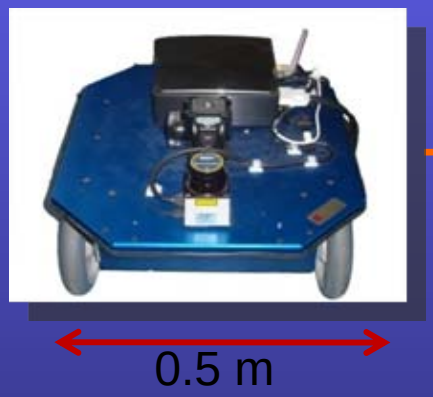


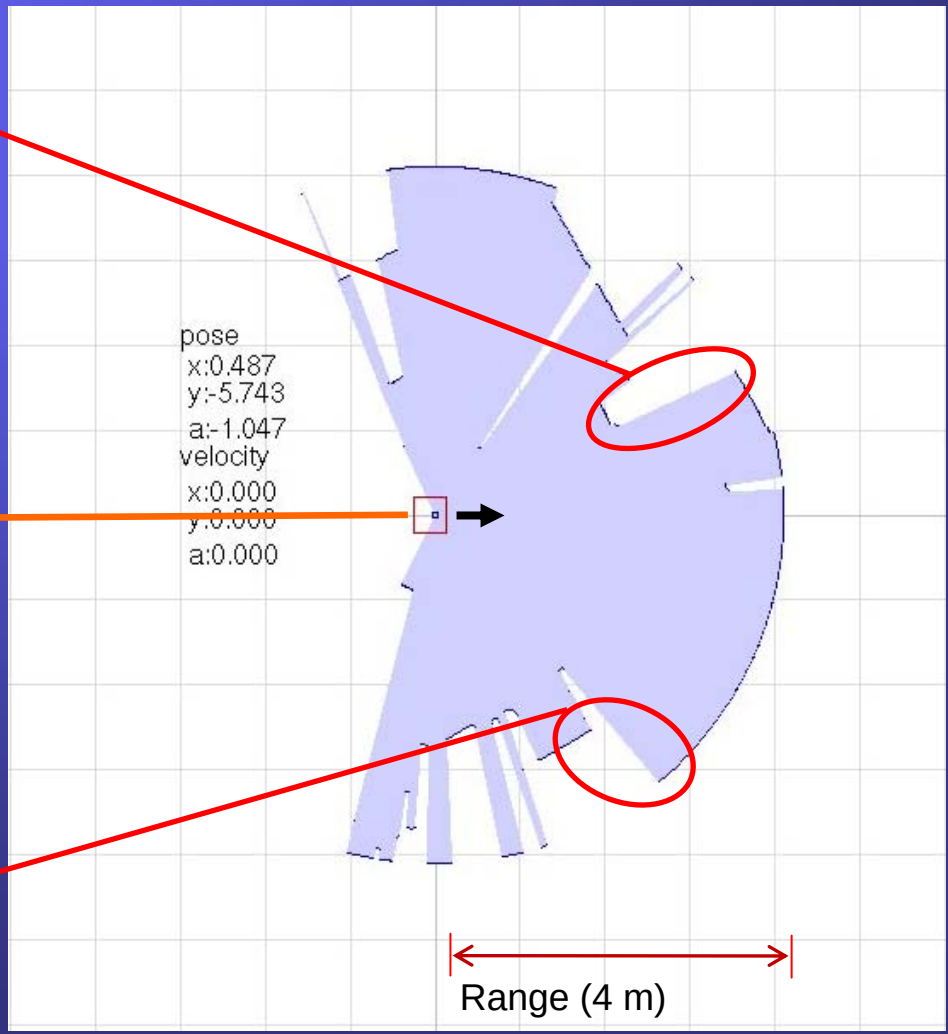
Reactive Navigation Planner (Local Planner) Development



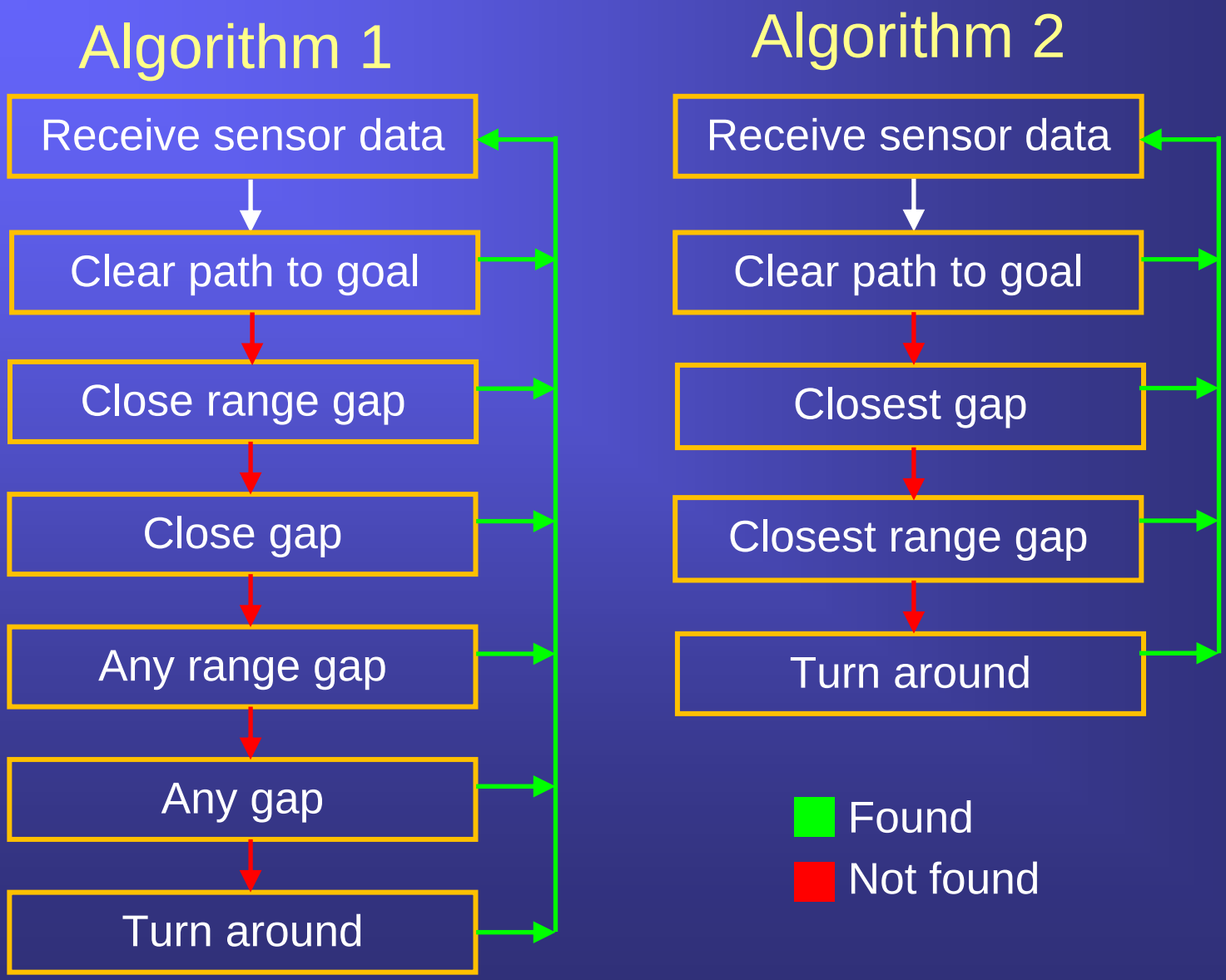
What the Robot Sees

- Gap
- Range gap

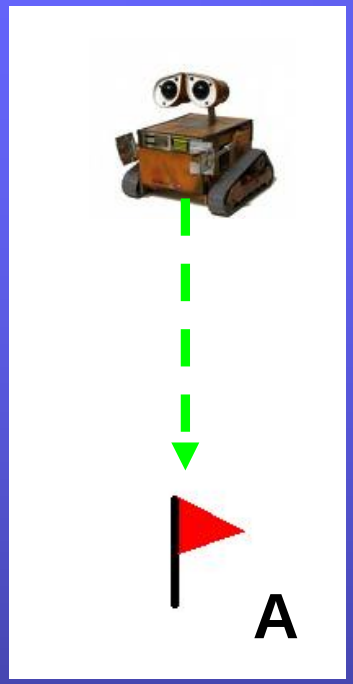


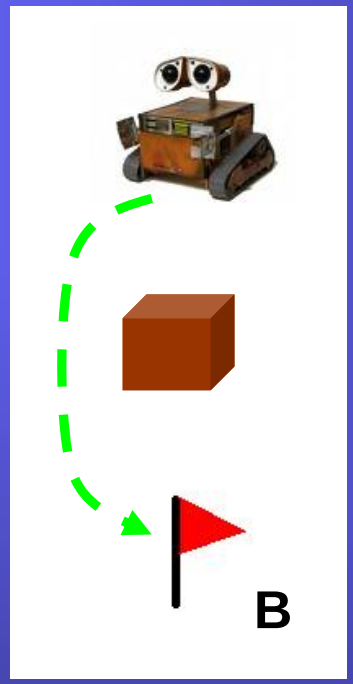


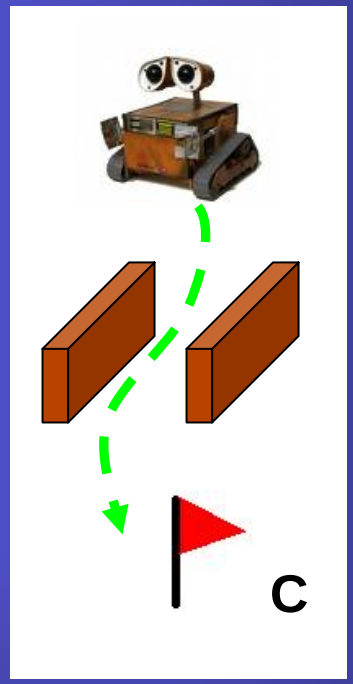
Designed Algorithms

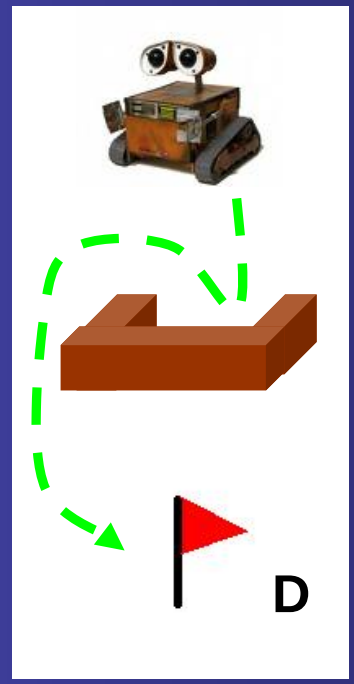


Experimental Data









	Test A	Test B	Test C	Test D
Algorithm 1	0:13	0:13	0:12	0:13
Algorithm 2	0:12	☹	0:35	☹
Control	0:14	0:29	0:33	0:33

Time is in minutes:seconds

Conclusion

- Algorithm 1 would be well-suited for environments where speed is a priority and obstacles are less numerous
- Algorithm 2 requires additional design and testing to be a feasible option
- The control algorithm remains the best option for careful navigation around objects

Acknowledgments

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- Our lovely families, faculties, and EPSEM fellows who supported us during our phenomenal experiment.

Laser Rangefinder

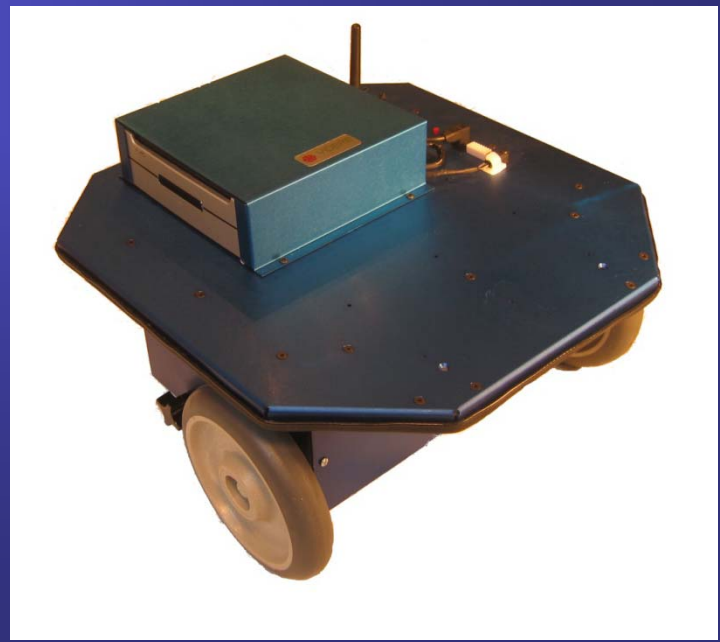
- Model: Hokuyo URG
- Wavelength: 785nm
- Range: 4 m
- Scan rate: 10 Hz
- Resolution: 0.36 degrees
- Price: $2500

- Source -

http://www.hokuyo-aut.jp/02sensor/07scanner/urg.html

Robot Chassis

- Model: Videre ERA-MOBI
- Size: 40cm (L) x 37cm (W) x 18 cm (H)
- Batteries: 3x 12V 7 Amp-Hour (4-5 Hours)
- Encoder accuracy: 500 counts/rev
- Speed: Up to 2.0 m/s
- Capacity: 20 kg (44 lbs)
- Price: $2350



- Source -

http://www.videredesign.com/robots/era_mobi.htm

Onboard Computer

- OS: Ubuntu Linux
- Network: 802.11b/g
- Software: Player/Stage, SSH server
- Processor: 1.6 Ghz
- Memory: 1 GB RAM
- Hard drive: 40 GB
- Price: ~$1000

- Source -

http://www.videredesign.com/robots/era_mobi.htm