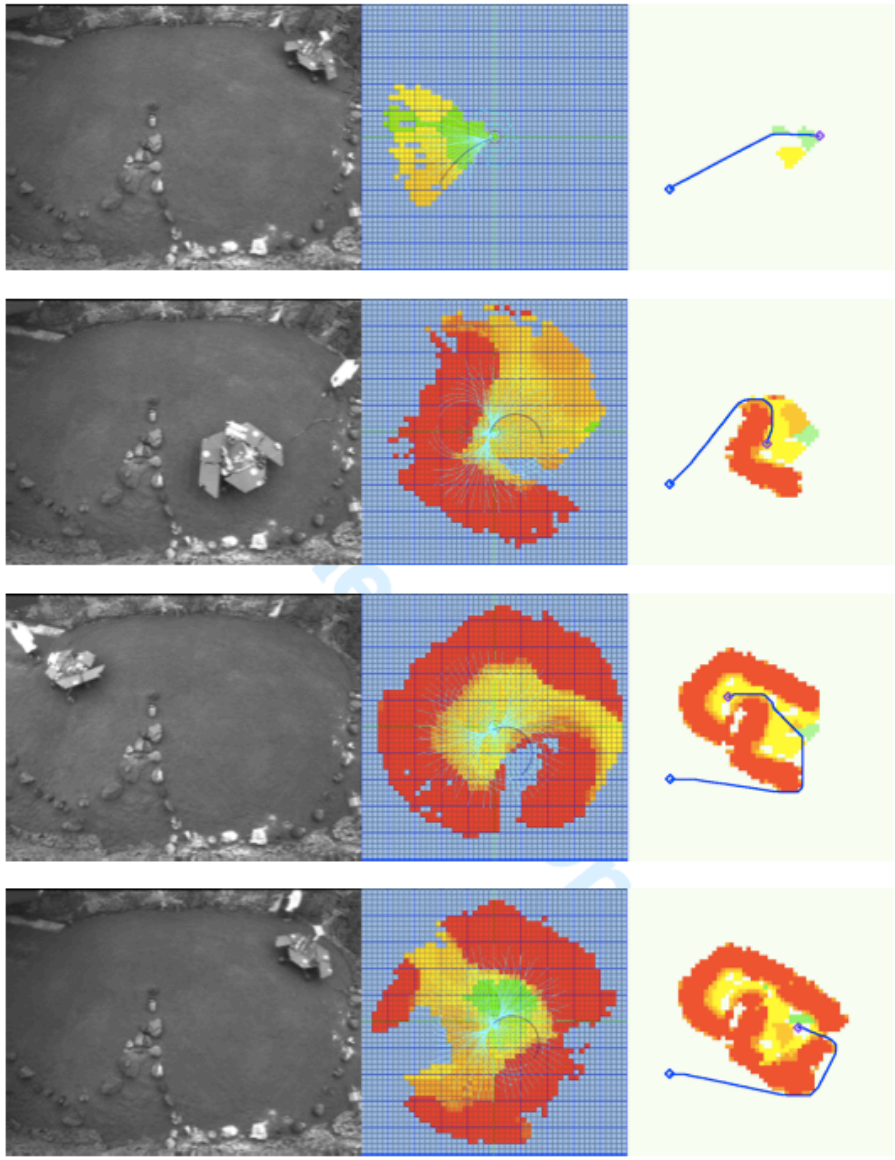
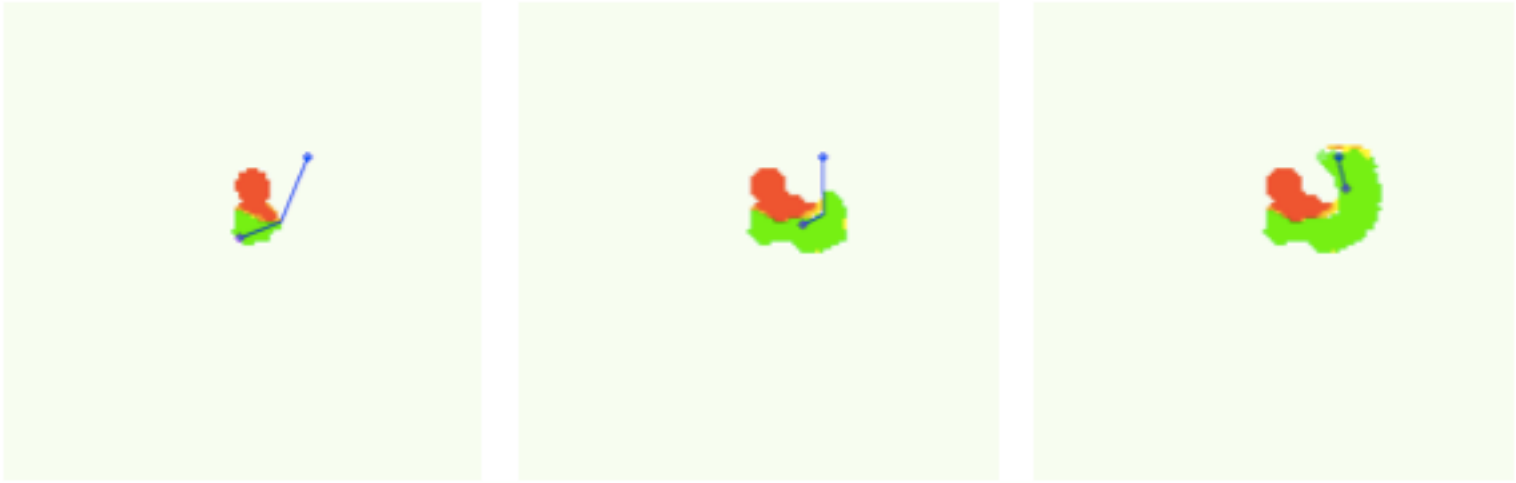
Navigation strategies

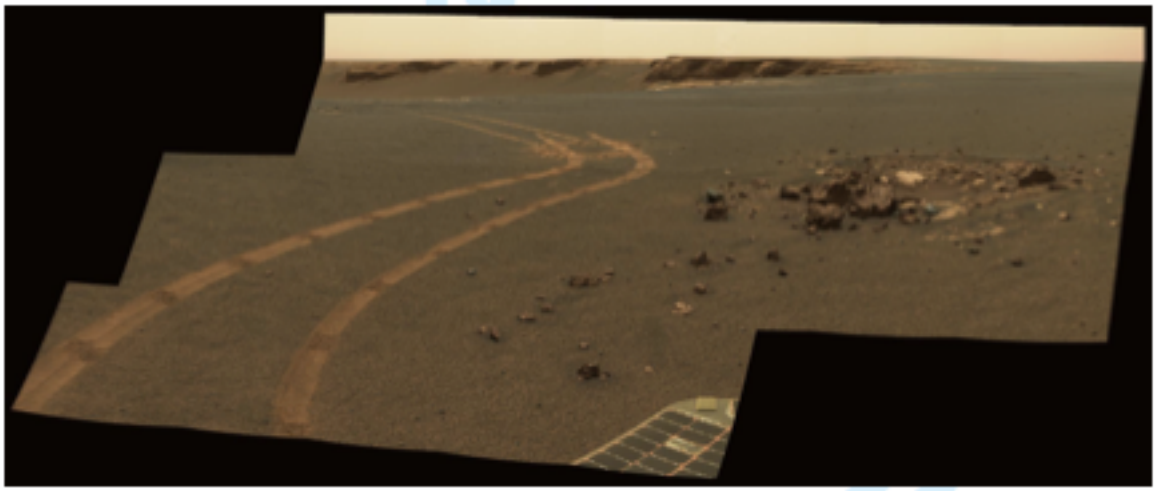
- Illustration with the Mars Exploration Rovers (2009)



Navigation strategies

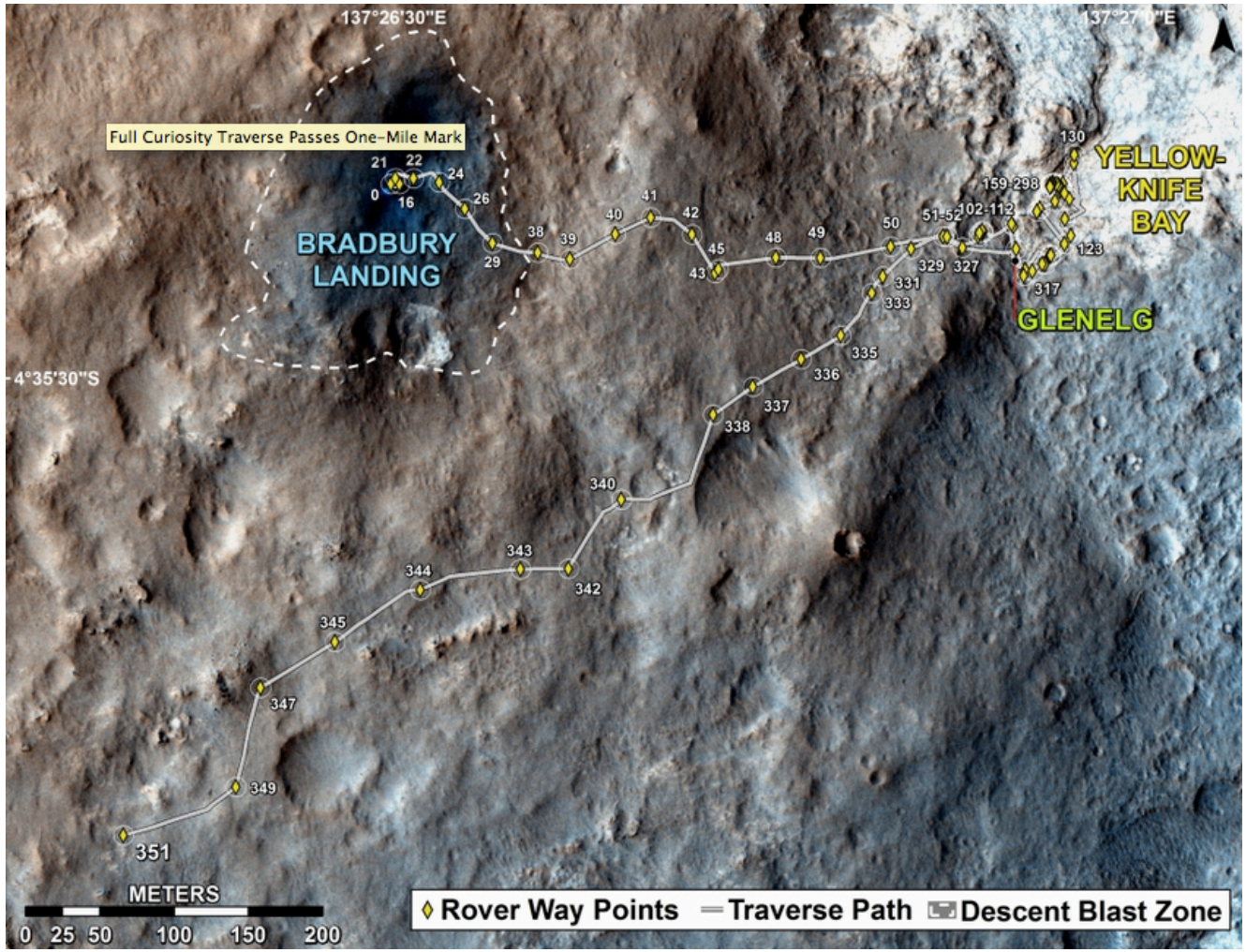
- Actual results on Mars (2009)





Navigation strategies

- Does Curiosity use D*? (so far, it seems no)



Outline

- Basic notions
  - Configuration space, kinematic constraints, search algorithms
- Practical field solutions
  - Potential field approaches
  - Short-term (“reactive”) planning
  - Long-term itineraries
- Other problems

Crossing obstacles

- The heavy way

“Crusher” (Darpa / CMU)

Crossing obstacles

- A little bit less heavy way

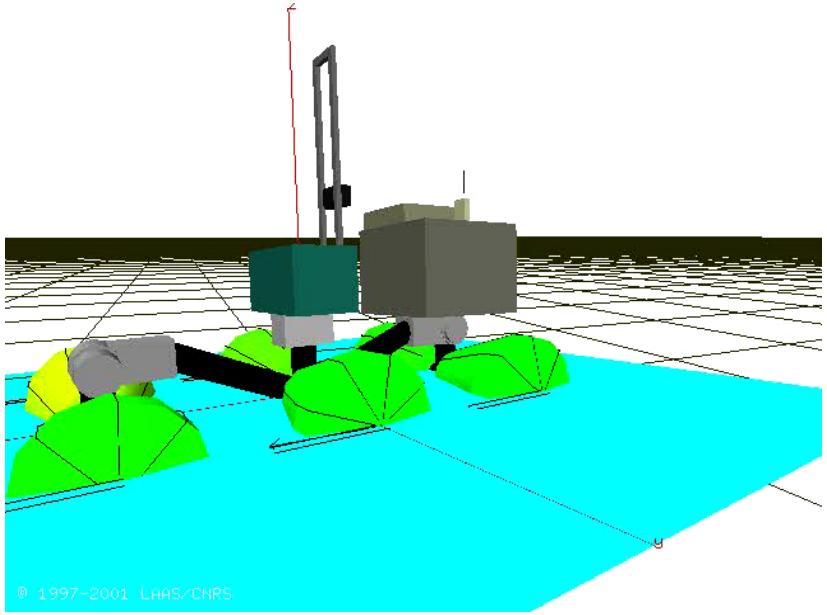
“Rhex” (Boston Dynamics)

Crossing obstacles

- Agile robots can be powerful

Crossing obstacles

- Smarter ways to cross obstacles ?
  - Advanced locomotion control
    - On line evaluation of the masses repartition
    - On line evaluation of the wheel torques



Crossing obstacles

- Smarter ways to cross obstacles ?
  - Advanced locomotion control
    - On line evaluation of the masses repartition
    - On line evaluation of the wheel torques
    - On line evaluation of the chassis configuration evolution

Going fast

- Stepping into dynamics of motion

But wait one more time…

- Given
  - A current position ?
  - A goal position
  - Information on the environment
  - Constraints to satisfy / criteria to optimize
- Find
  - A trajectory that satisfies the constraints / optimizes the criteria

Summary

- Basic notions
  - Configuration space, kinematic constraints, search algorithms
- Practical field solutions
  - Potential field approaches
  - Short-term (“reactive”) planning
  - Long-term itineraries
- Other problems

Some readings

http://homepages.laas.fr/jpl/book-toc.html

Robot Motion Planning and Control