

# Intelligent Systems

## Lab

2016 spring

- Mobile robots I-IV. (D. Stojcsics)
- Genetic algorithms I-II. (Zs. Sziklai)
- Neural networks I-II. (G. Nagy)
- GPS I-II. (D. Stojcsics)

# Requirements

Student participation in practical lectures is required.

## Final grade calculation method:

The average result of the practical test and the theoretical test must be at least 50-50%!

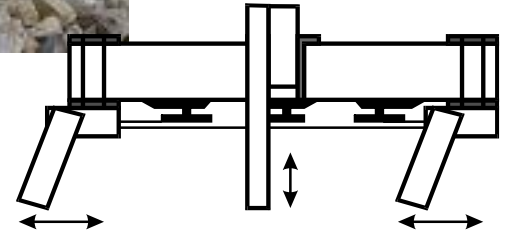
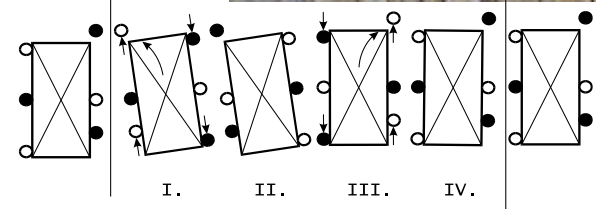
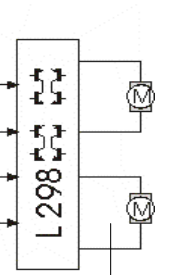
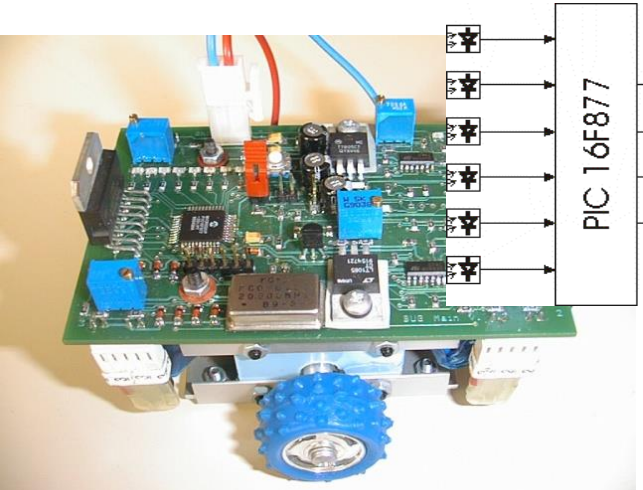
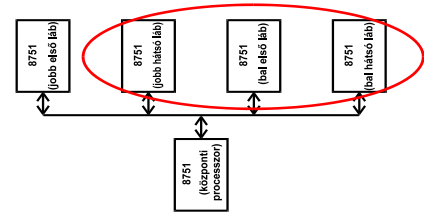
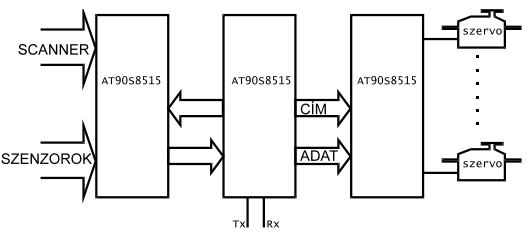
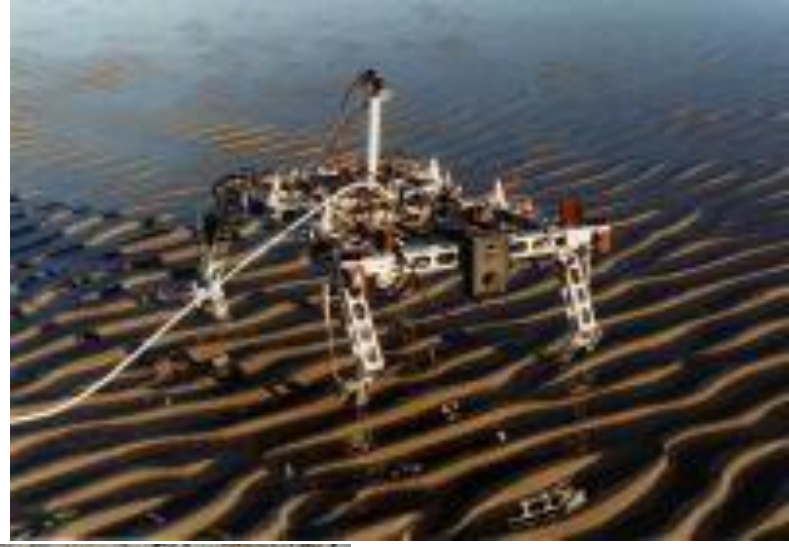
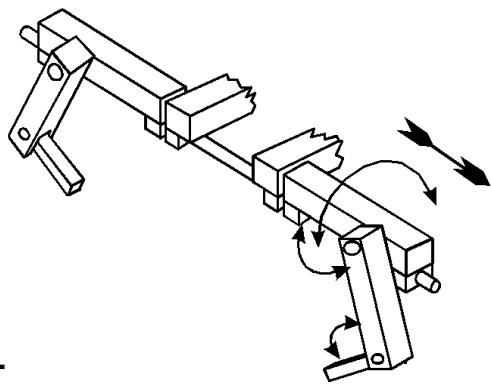
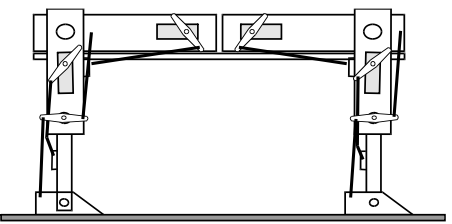
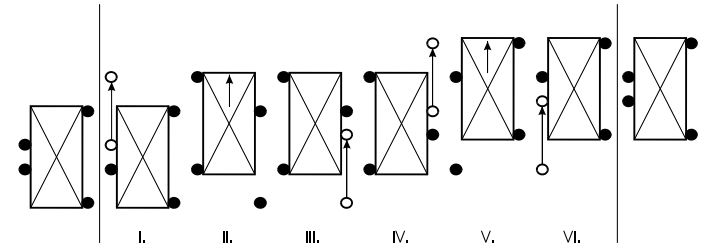
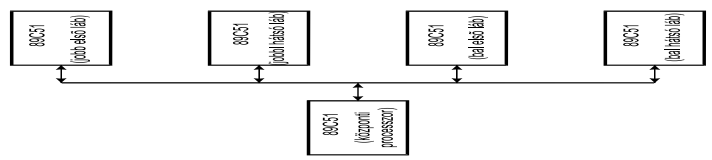
Result	Grade
89%-100%	excellent (5)
76%-88<%	good (4)
63%-75<%	average (3)
51%-62<%	satisfactory (2)
0%-50<%	failed (1)

During the semester students are going to write two practical and two theoretical tests.

Lectures:

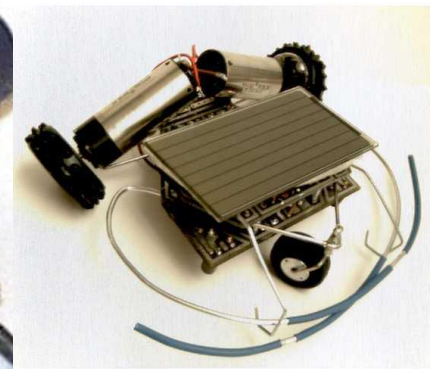
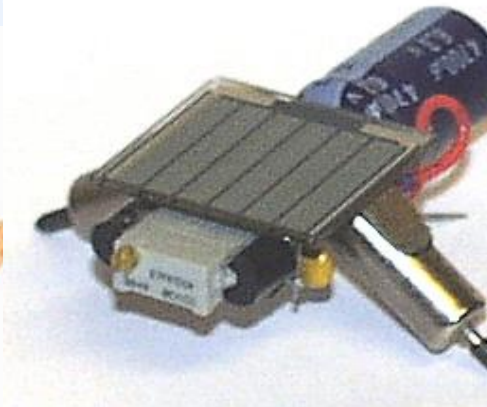
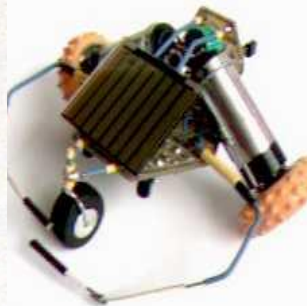
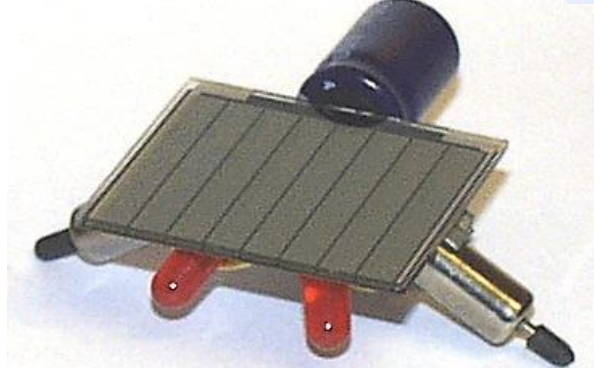
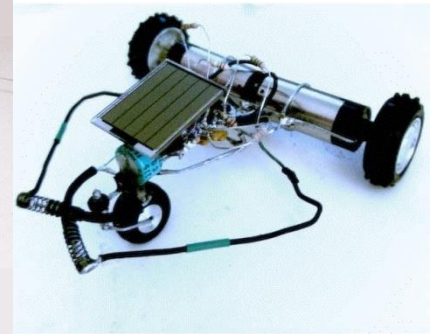
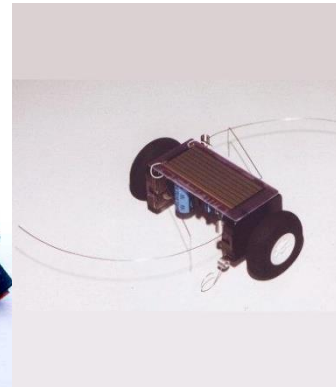
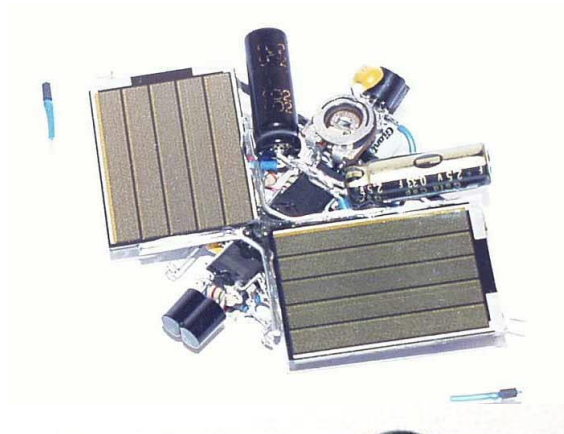
[http://users.nik.uni-obuda.hu/mobil/en/intsys\\_lab/](http://users.nik.uni-obuda.hu/mobil/en/intsys_lab/)

# Sensor systems



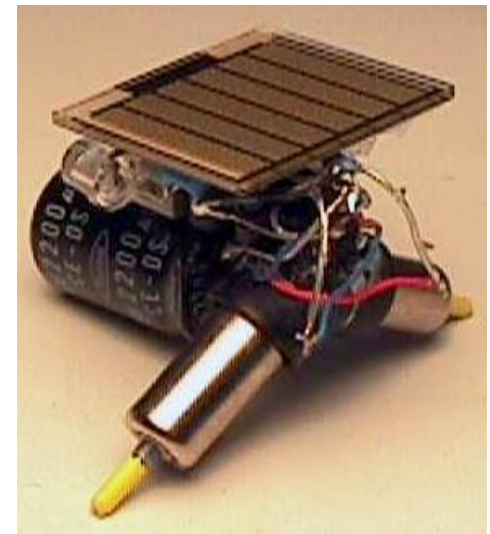
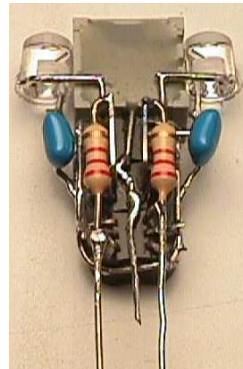
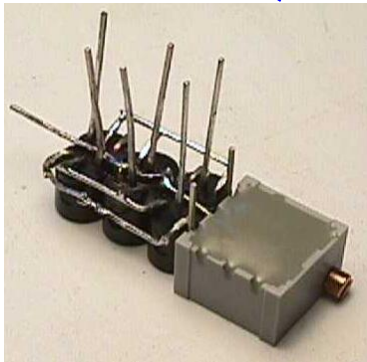
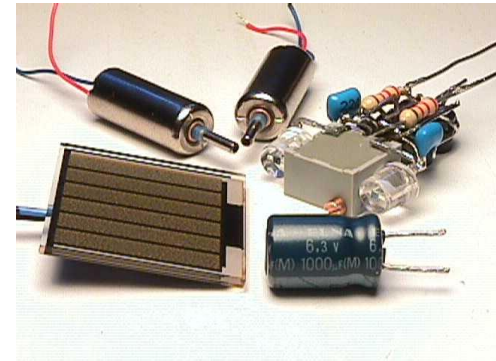
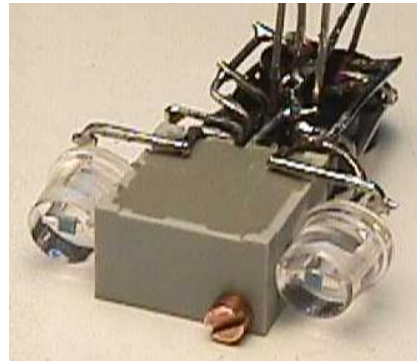
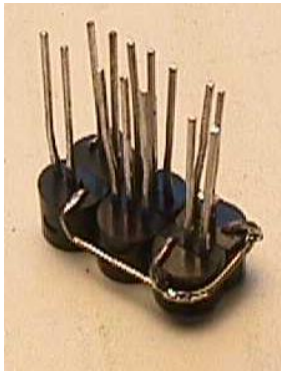
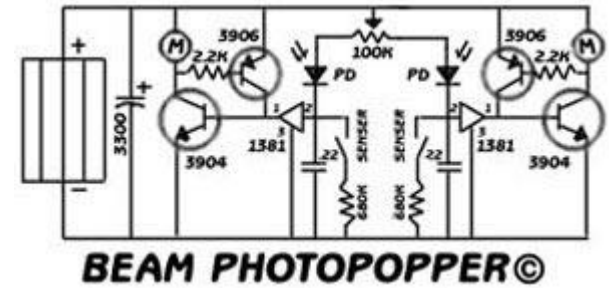
# BEAM

- B – Biology
- E – Electronics
- A – Aesthetics
- M – Mechanics
  - mechanikák.

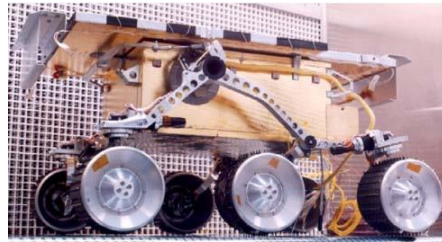


# BEAM

- B – Biology
- E – Electronics
- A – Aesthetics
- M – Mechanics

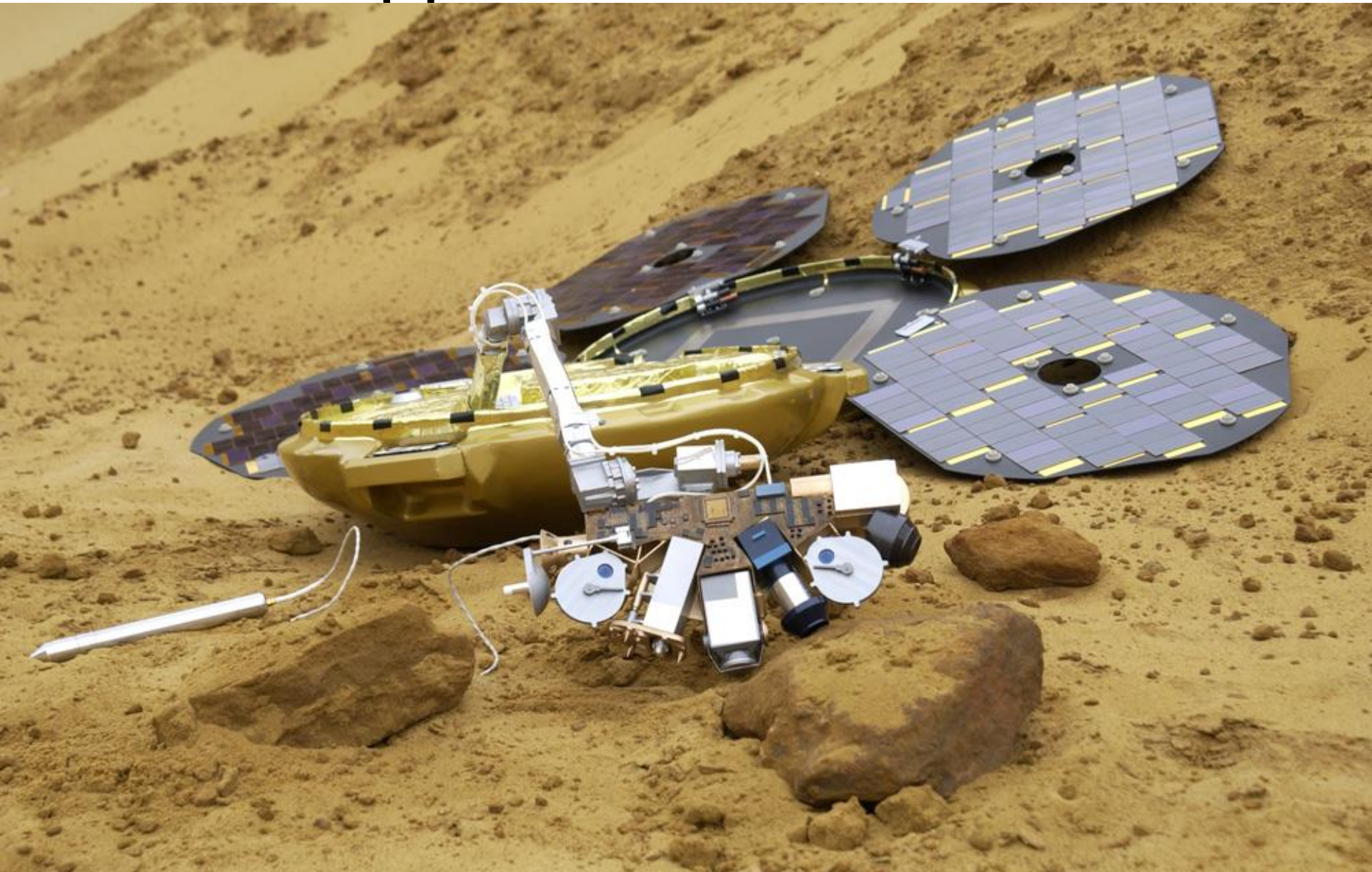


# Application of robots





# Application of robots



# Sensors

Infrared reflection sensor

fast and easy to use  
(0/1 – no obstacle/obstacle)

Ultrasonic / Laser rangefinder

similar to IR Reflection sensor, but gives  
the distance from obstacle (A or D)

Camera

FOV: usually 50-120°

Huge amount of RAW data

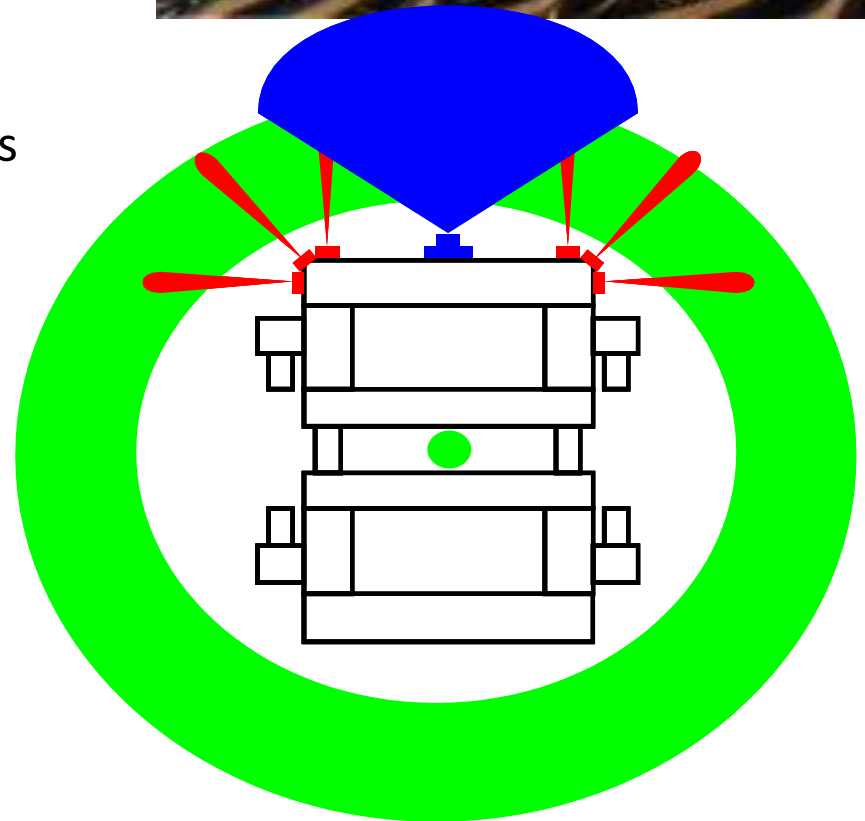
(min. 640x480x8 bit)

Image procession required -> slow,  
much computation power needed

Detailed information!

360° Camera

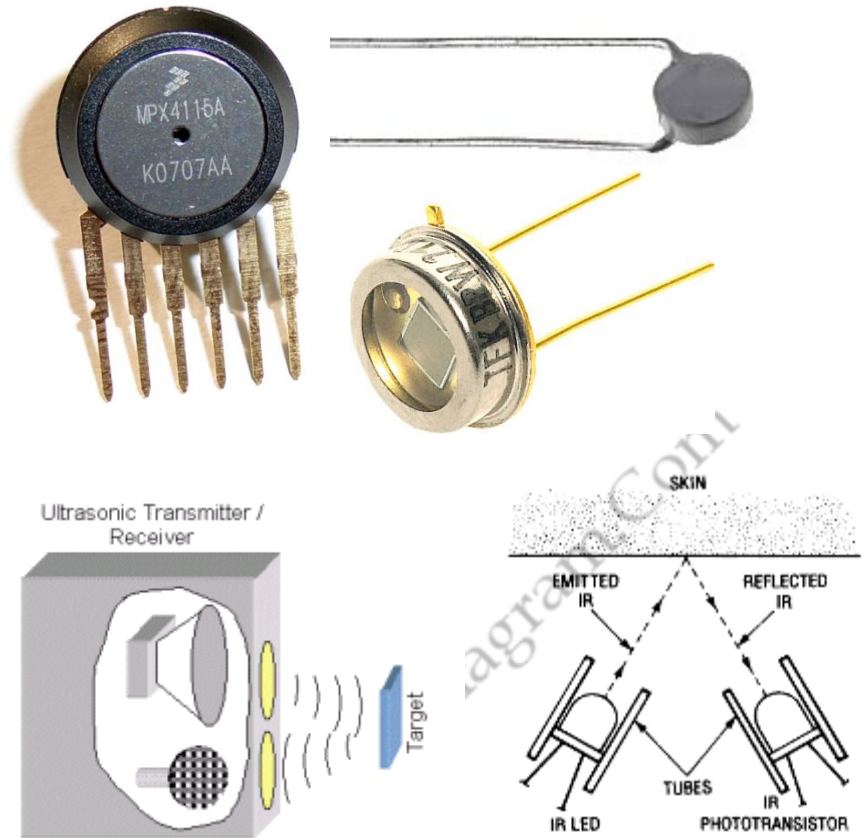
Distortion, but wide area coverage



# Sensors

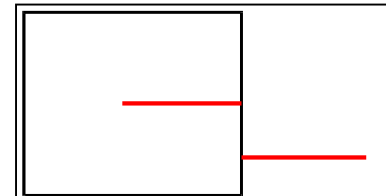
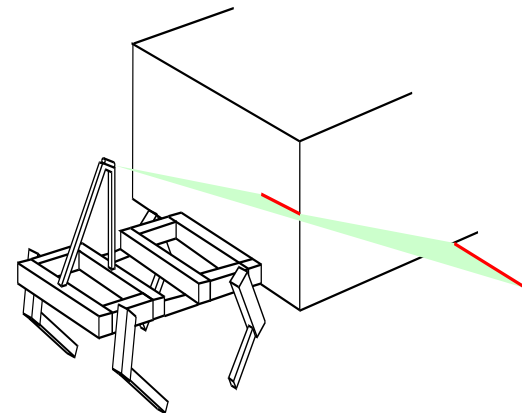
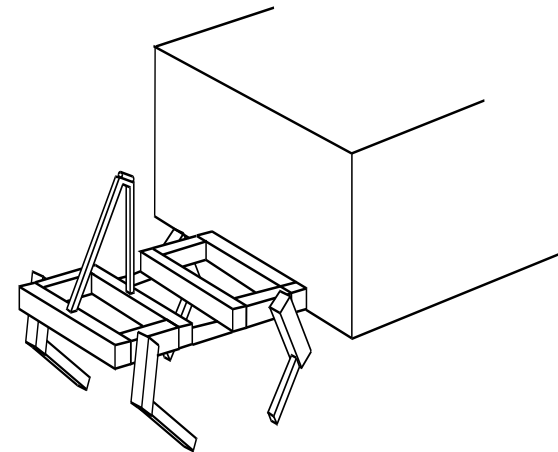
## Types

- Passive
  - Measure a physical entity
    - temperature
    - pressure
    - Light intensity
    - Sound intensity
- Active
  - Measuring signal emission
    - Radar
    - Rangefinders

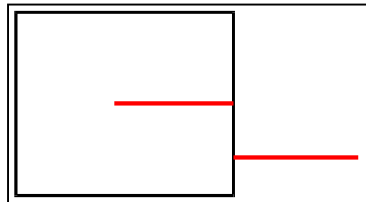
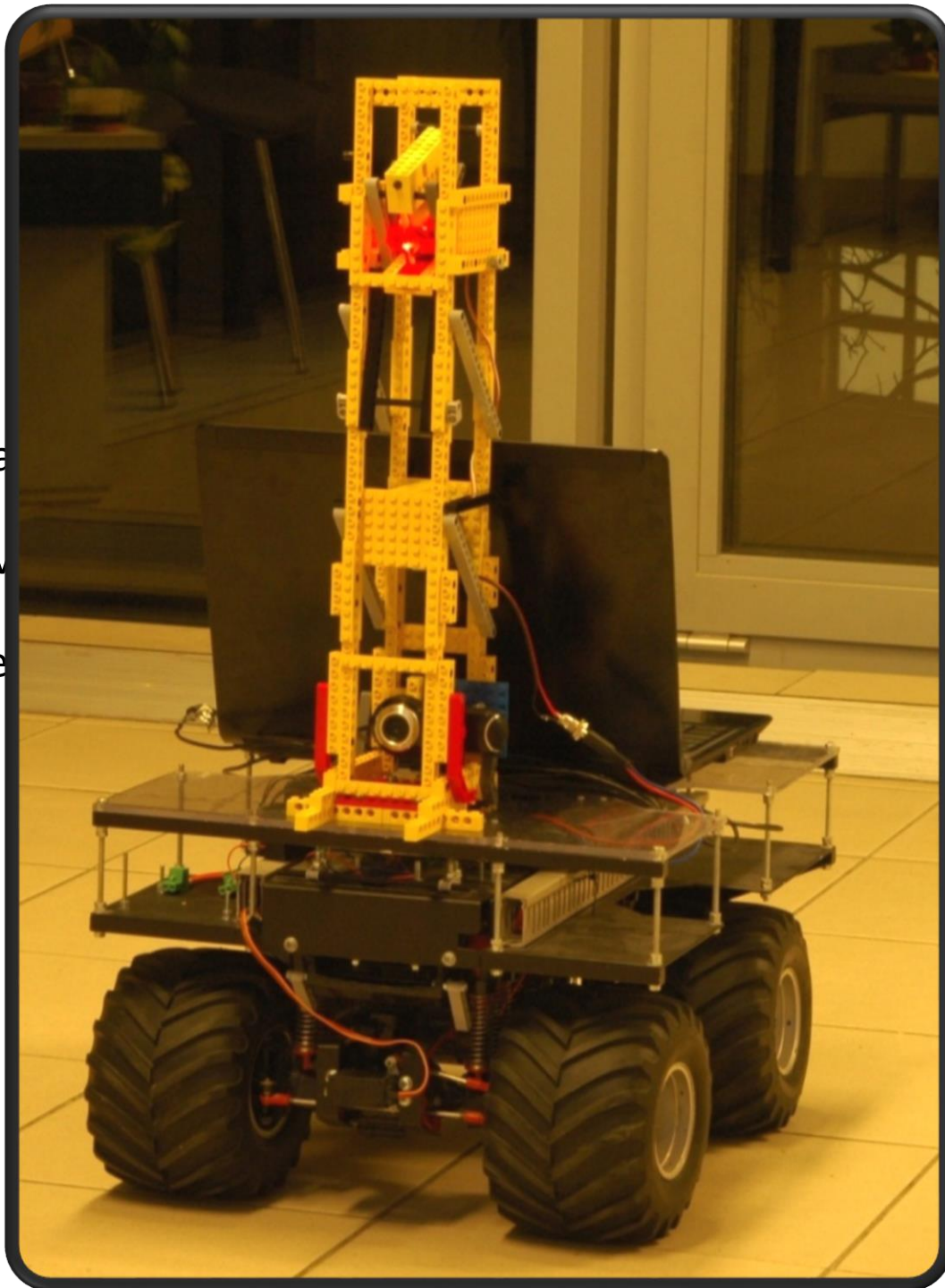


# Structured light

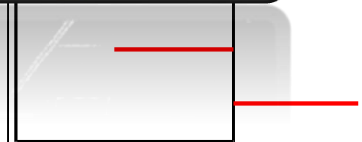
- Projected pattern (e.g. laser line or net)
- Distortion gives the distance from object
- Image processing!
- Like Kinect



- Projected pattern (net)
- Distortion given by object
- Image processing
- Like Kinect



- Projected (net)
- Disoriented object
- Image
- Like K



# Mobile robots

*Navigation*

# Navigation

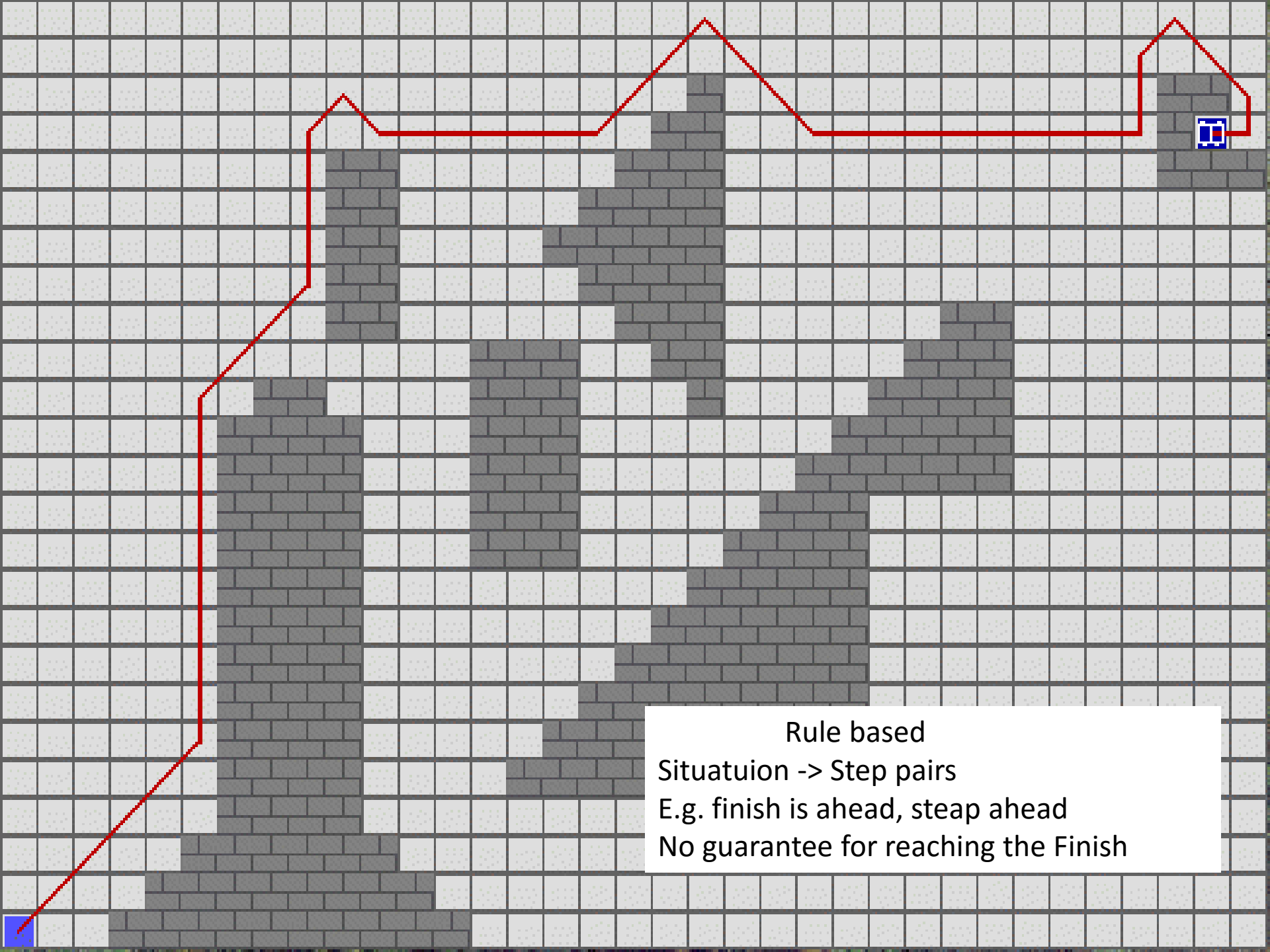
- The mission is to get the robot to the Finish from the Initial (Start) position
  - Robot movement possibilities
  - Energy consumption
  - Time
  - Mechanic restrictions
  - Terrain
- Known / unknown terrain



# Navigation

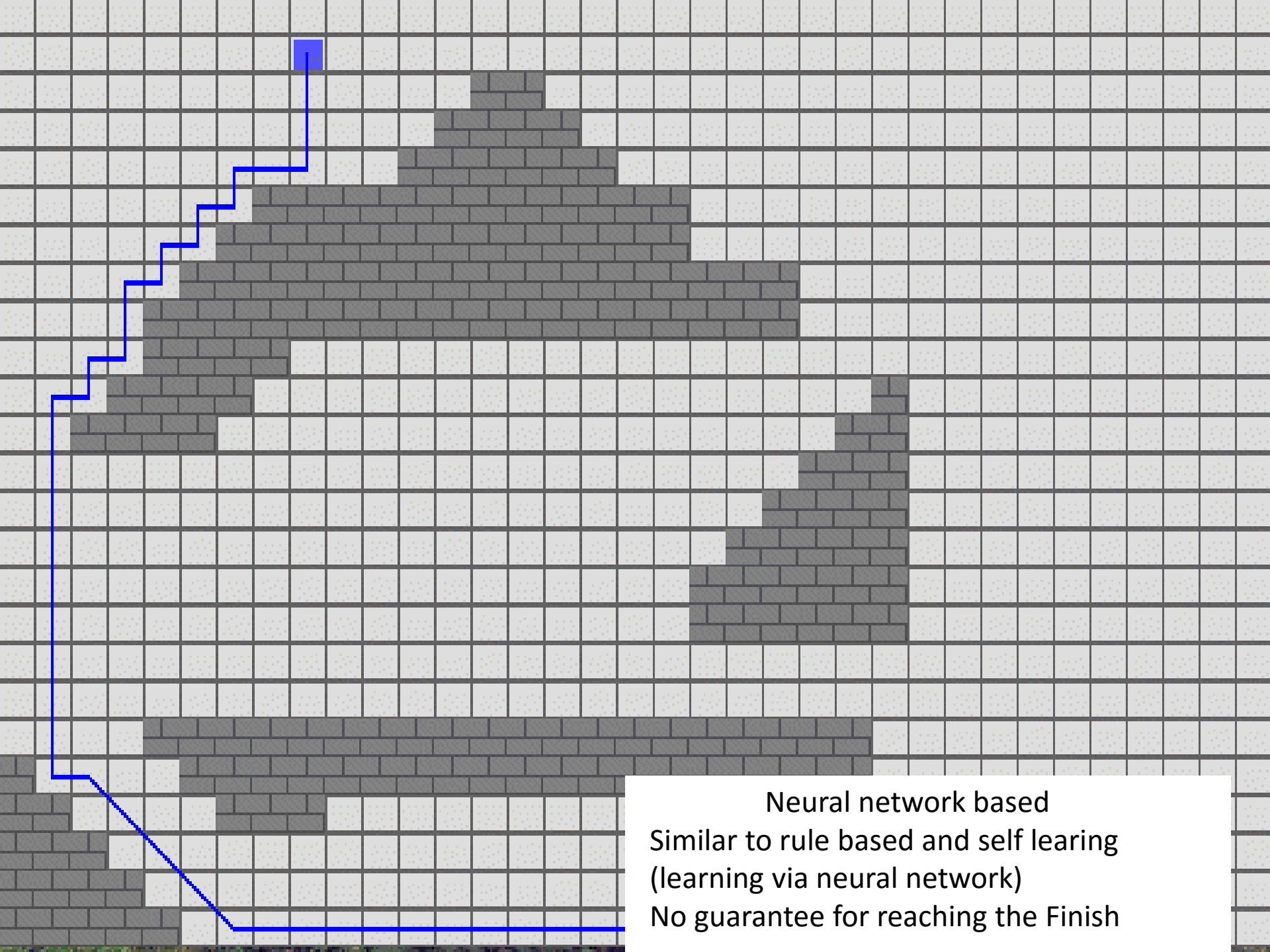
## Navigation and obstacle avoidance

- Rule based
  - Modified rule based (additional memory)
  - Neural based
  - Self learning
- Wavefront propagation
- Modified wavefront propagation (unknown terrain)
- GVD (safest)



Rule based  
Situatuion -> Step pairs  
E.g. finish is ahead, steap ahead  
No guarantee for reaching the Finish





Neural network based  
Similar to rule based and self learning  
(learning via neural network)  
No guarantee for reaching the Finish













