

# **Development of intelligent systems (RInS)**

## **Introduction**

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# Intelligent systems

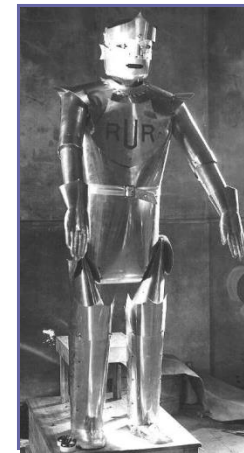
- Software intelligent systems
- Passive situated robot systems
- Active embodied robot systems



ro·bot **noun** \ˈrō-,bät, -bət\ : a real or imaginary machine that is controlled by a computer and is often made to look like a human or animal  
: a machine that can do the work of a person and that works automatically or is controlled by a computer

Merriam – Webster dictionary

- Robot
  - Karel Čapek: R.U.R. (Rossum's Universal Robots), 1921
  - „robota” – work; forced, hard labour



# Intelligent autonomous robot systems

Drive



Walk



# Intelligent autonomous robot systems

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Float



Dive



# Intelligent autonomous robot systems

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Fly



Surround us





# Types of robots

- Industrial robots
- Robot manipulators
- Mobile robots
- Humanoid robots
- Cognitive systems
- Unmanned aerial vehicles, ...



# Industrial robots





# Domestic robots



# Autonomous car navigation

- Autonomous navigation
  - Self-driving cars
- Navigation assistants
  - Pedestrian detection
  - Several cameras + other sensors



<http://www.mobileye.com>



Bloomberg, Uber self-driving car

# Autonomous boat navigation (USV)



UNI-LJ, FE, LSI  
FRI, LUVSS  
Harhpa Sea



# Autonomous drones (UAV)



UNI-LJ, FRI, LUVSS



# Cognitive robotics

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- Wikipedia:

**Cognitive robotics** is concerned with endowing **robots** with mammalian and **human-like cognitive capabilities** to enable the achievement of complex goals in complex environments. Robotic cognitive capabilities include **perception processing, attention allocation, anticipation, planning, reasoning about other agents**, and perhaps reasoning about their **own mental states**. Robotic cognition embodies the **behaviour of intelligent agents** in the **physical world**.

- A cognitive robot should exhibit:
  - knowledge
  - beliefs
  - preferences
  - goals
  - informational attitudes
  - motivational attitudes (observing, communicating, revising beliefs, planning)

# Cognitive systems

- Cognitive assistant
  - Explores the environment and builds a map of it
  - Learns to recognize and identify objects
  - Understand object affordances
  - Can verbally and non-verbally communicate with people in its vicinity
  - Detects new situations and reacts accordingly
- Built-in basic functionalities, which are then further developed, adapted and extended by learning

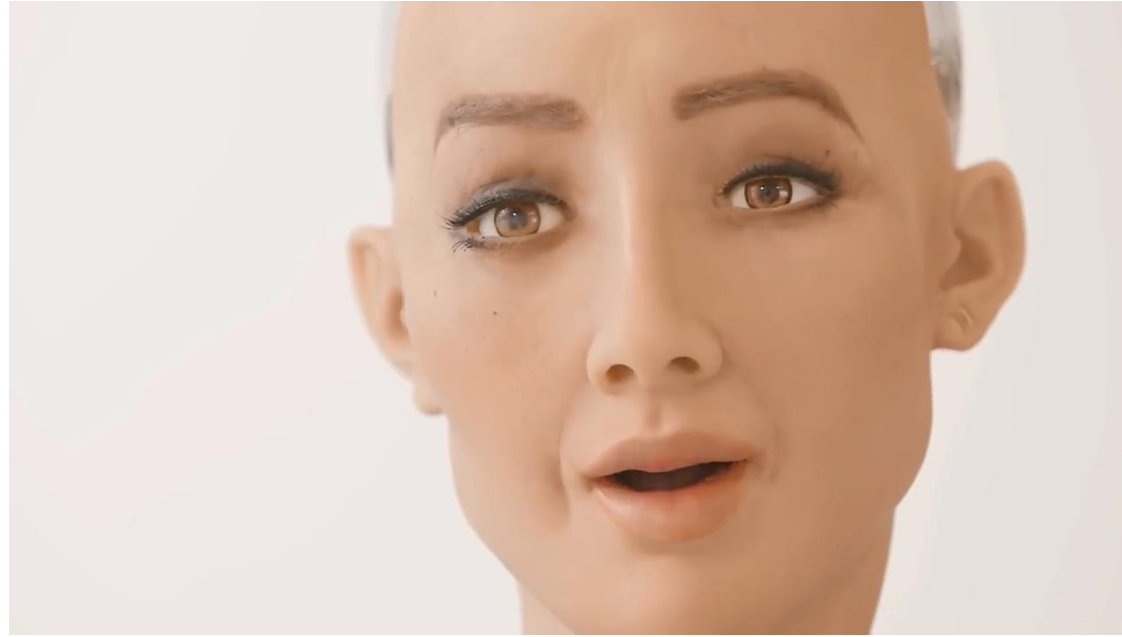


Morpha



Univ. Karlsruhe

# Cognitive systems



# Intelligent robot systems



Univerza v Ljubljani  
Fakulteta za računalništvo  
in informatiko

UL FRI



# Mobile robots

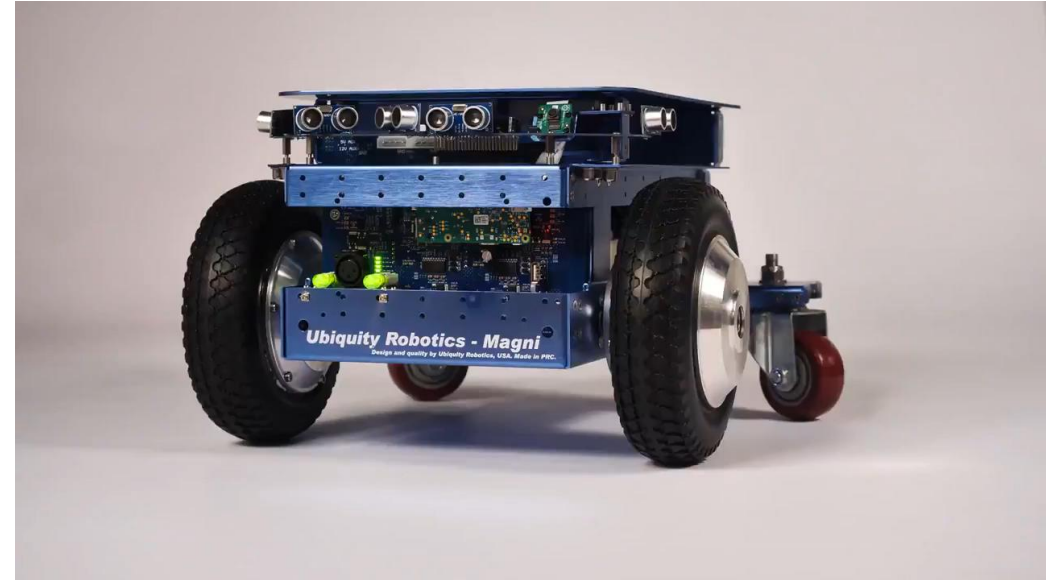


EURON  
video

# Mobile robots

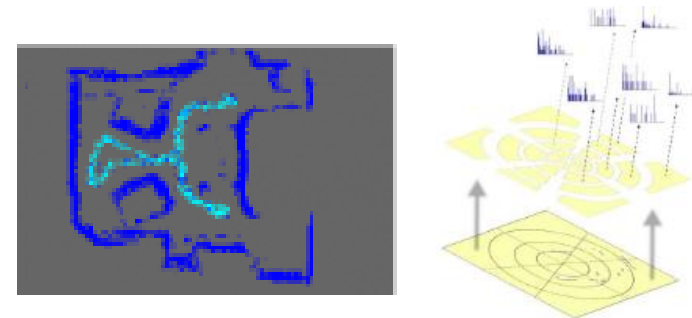


iRobot Roomba TurtleBot



Ubiquity robotics Magni

# Mobile robots

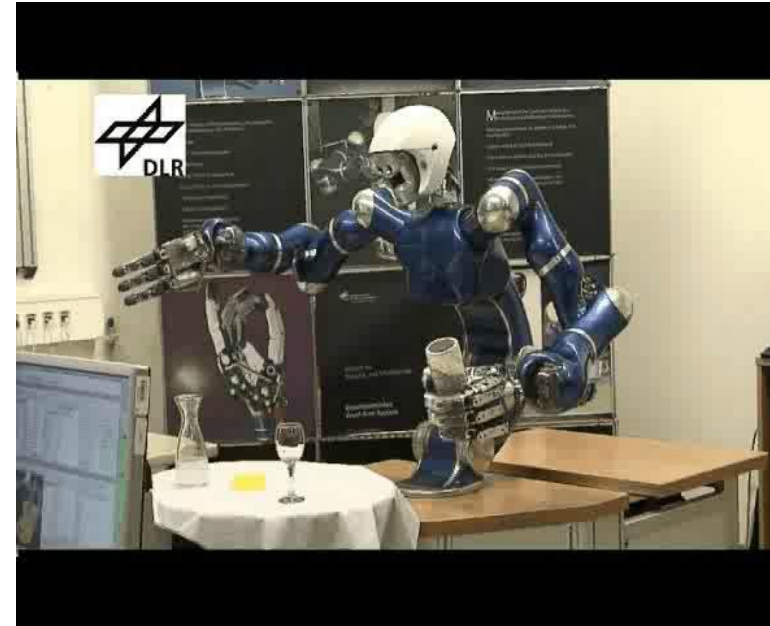


UL FRI LUVSS

- Routine industrial robotic sensor system



EURON video



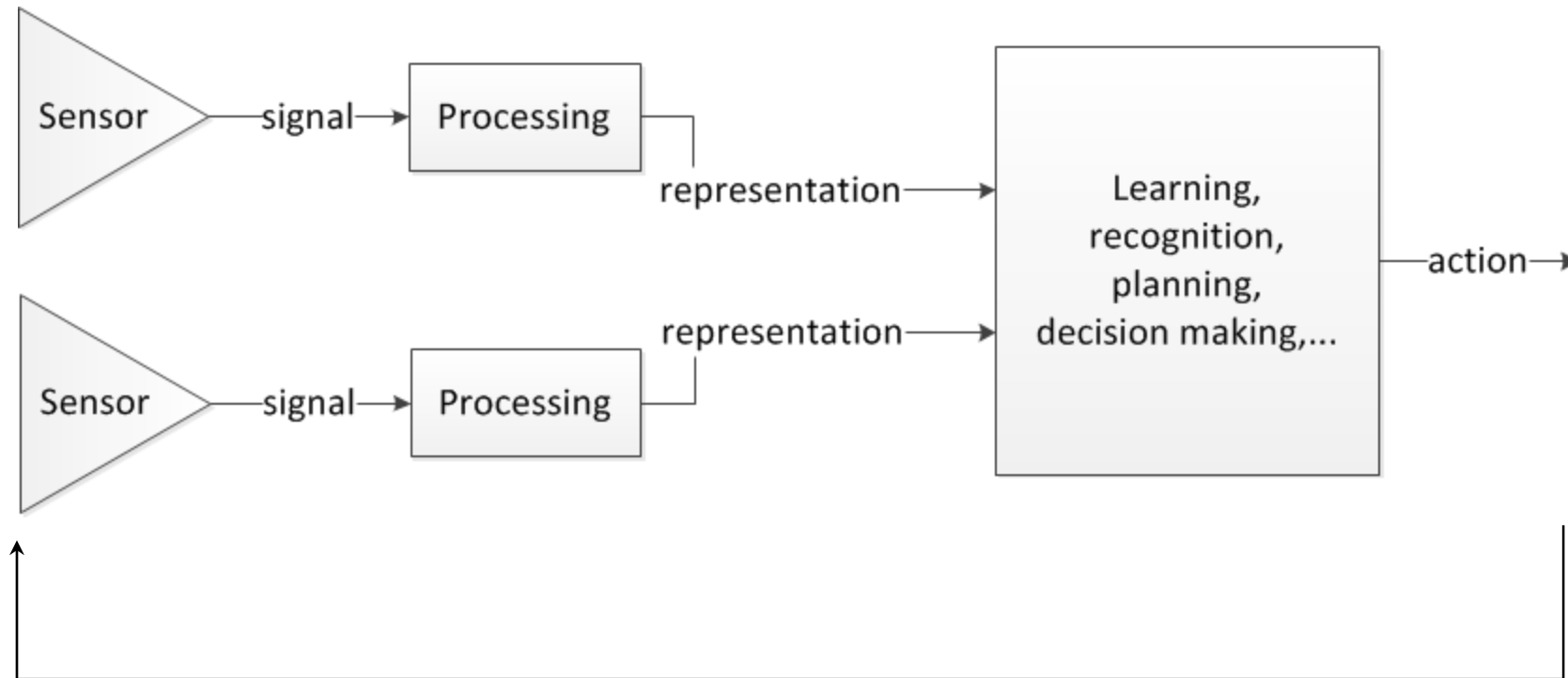
EURON video

- Intelligent artificial visual cognitive systems



# Sensor-robot system

- Perception – action cycle



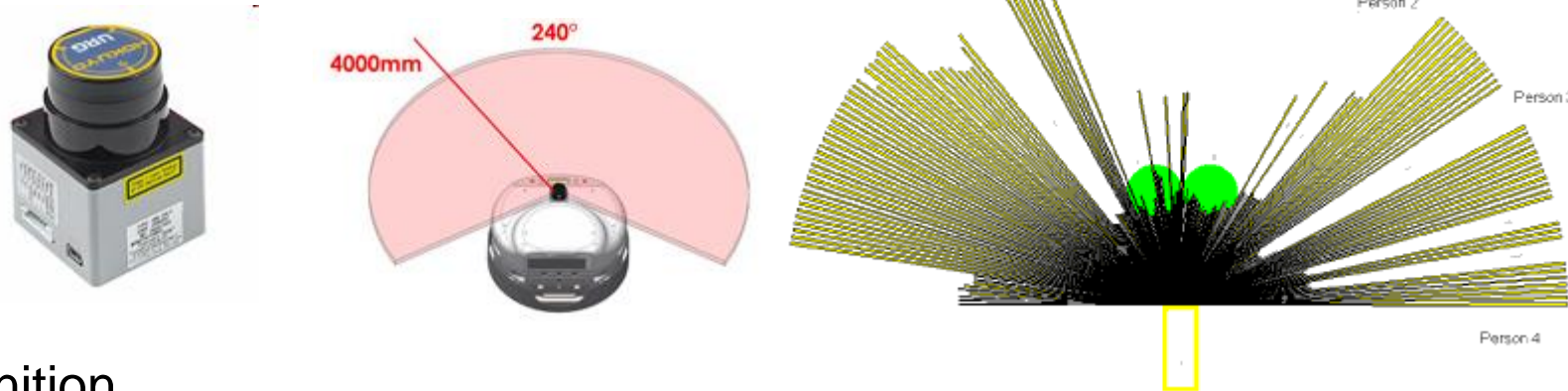
# Simulation of robot perception and control

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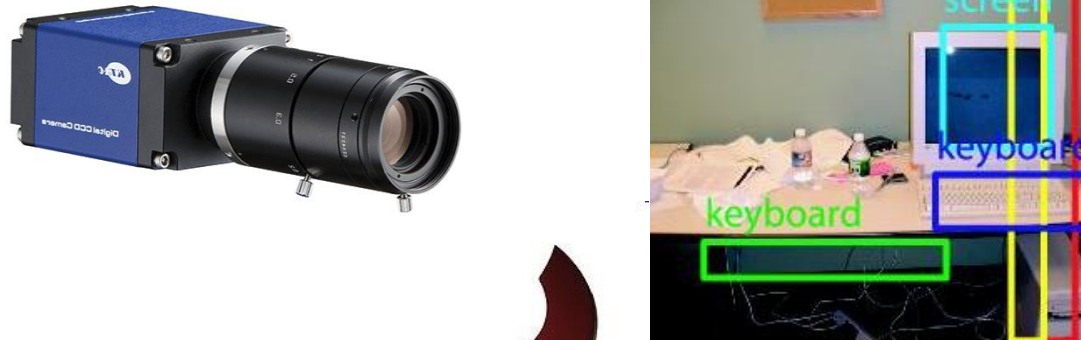


# Sensors

- Range sensors



- Object recognition



- Bumper – collision detector

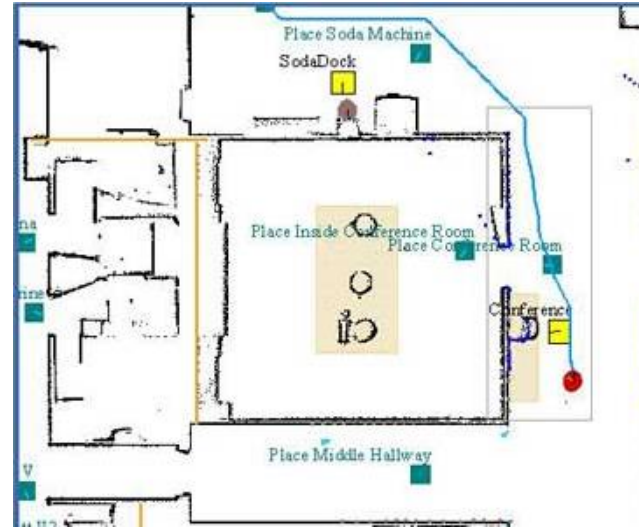


- Odometer



# Planning and control

- Planning



- Control

