Robotica Mobile

Lezione 19:
Strutture di controllo di robot avanzati

Il progetto *BARCS*

(*B*ehavioural *A*rchictecture
*R*obot *C*ontrol *S*ystem)

3-06-2004

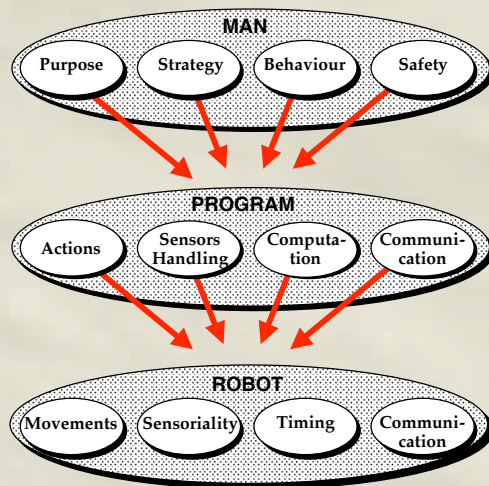# Làapproccio di Brooks…

➥ È un approccio reattivo
➥ Non ha memoria a lungo termine
➥ La struttura è fortemente condizionata dal compito del robot

The traditional robot programming approach

MAN

Purpose | Strategy | Behaviour | Safety

PROGRAM

Actions | Sensors Handling | Computa-tion | Communi-cation

ROBOT

Movements | Sensoriality | Timing | Communi-cation

Mobile robots: their operating conditions

⇨ The environment:
  - The environment is often unknown or partially known. Moving obstacles may be present. Some objects can only be roughly described (e.g., trees or roads);
⇨ The task:
  - Usually, the task is poorly specified. Details can only be defined at execution time;
⇨ Repetitivity:
  - Repetitivity is always very low. Iterations of the same program can be so different from each other that they can be considered as new programs.

Detailed a-priori planning is impossible!

Autonomous robots: the problems

⇝ Task description:
- Tasks to be accomplished cannot be described using traditional techniques (explicit programming);

⇝ Emergency situations:
- The robot operates in a continuous emergency situation;

⇝ Sensoriality:
- Sensory information is completely different from the information required in traditional robots.

Two main points of autonomous robots:

⇝ Planning:
- "Opportunistic"
- Iterative
- Approximate

⇝ Sensoriality:
- Active
- Multimedia
- Goal-oriented

From the basic concept of industrial robots...

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                    ┌──────────┐
                    │   Goal   │
                    └──────────┘
                         │  Symbolic description
                         ▼
                    ┌──────────┐
                    │ Program- │
                    │   mer    │
                    └──────────┘
                         │  Executive description
                         ▼
                    ┌──────────┐◄──────────────────┐
                    │ Executor │                   │
                    └──────────┘                   │
                         │  Executive commands    Parameters
                         ▼                          │
                    ┌──────────┐              ┌──────────┐
                    │ Actuators│              │ Sensors  │
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                         │  Physical actions    Physical parameters ▲
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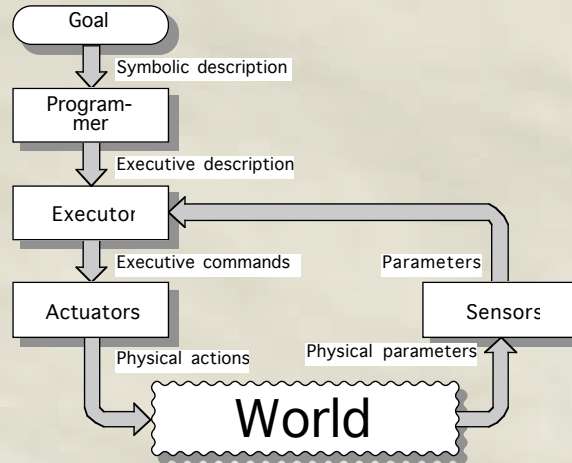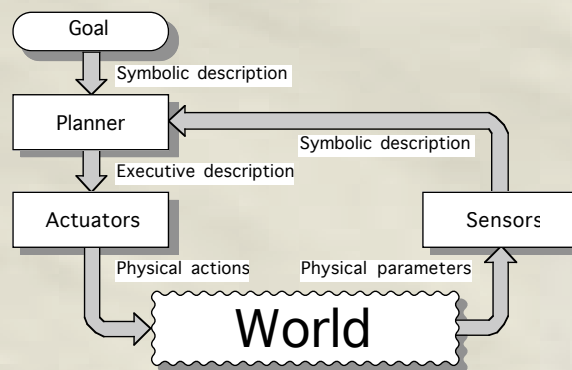
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...to the basic concept of advanced robots

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                         │  Symbolic description
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                    │ Planner  │  Symbolic description
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                    ┌──────────┐              ┌──────────┐
                    │ Actuators│              │ Sensors  │
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                         │  Physical actions    Physical parameters ▲
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                    │           World               │
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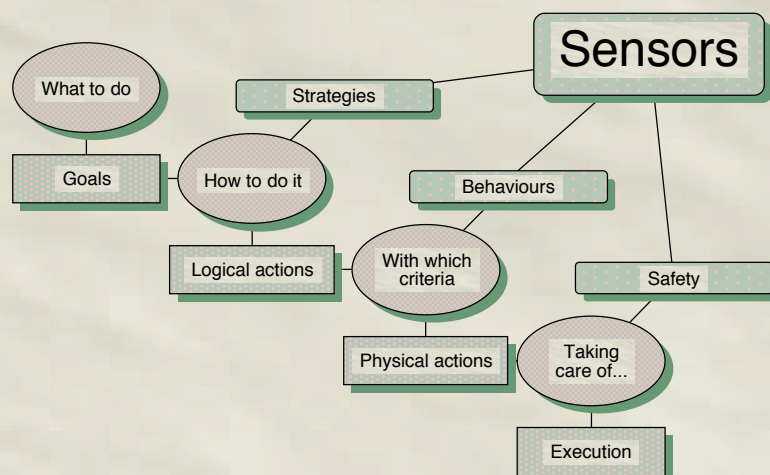Lezione 19: Strutture di controllo di robot avanzati   3-06-2004

BARCS Project

⇒ BARCS: Behavioural Architecture Robot Control System

⇒ Build a robot capable of performing a limited number of different tasks, with no user intervention, and with small environment conditioning;

⇒ Build a robot that knows how to behave in any situation;

⇒ Build a robot that can immediately work in previously unknown environments;

⇒ Have intelligent and flexible behaviours using appropriate, deterministic strategies;

⇒ Allow building simple and low-cost machines.

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Chosen criteria

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