

Embedded Agents

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Traditional AI: Functional Modules



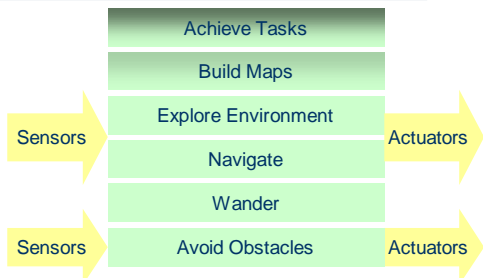
Problems

Limited success in each functional module
Increasingly specialized subproblems
Lack of interface

Instead, we must

Incrementally build up the capabilities of intelligent systems
Having complete systems at each step of the way and thus automatically ensure that the pieces and their interfaces are valid.

Behavior-Based Architecture [Brooks, 1986]



Subsumption Architecture

Collection of concurrent FSA behaviors

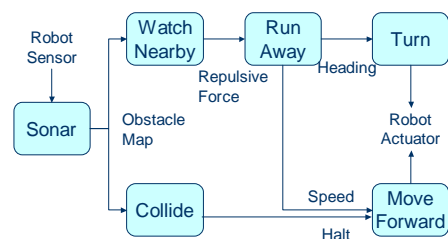
Behaviors are arranged in layers:

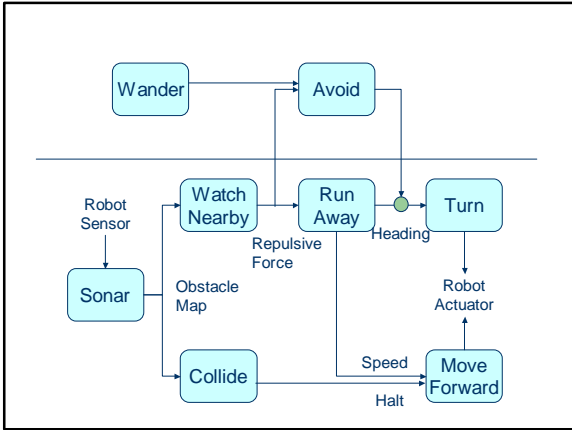
- Lower layers implement general system goals
- Higher layers subsume lower layers to implement more specific goals

Very little internal state: the world is used as its own best model

Fixed connection between sensors and behaviors

A Behavior Network [Brooks, 1986]





What this is NOT

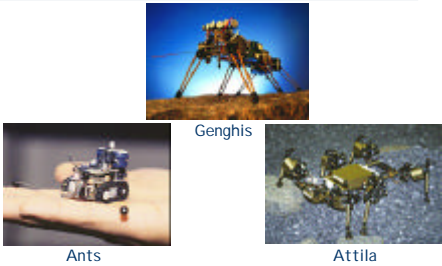
- It isn't connectionism.
- It isn't neural networks.
- It isn't production rules.
- It isn't blackboard.
- It isn't German philosophy.

The approach is based purely on engineering considerations and performance.

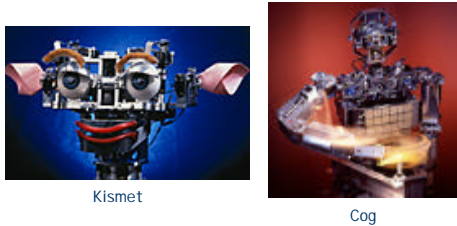
Summary

- Pre-defined network of concurrent behaviors mapping sensor readings into actions
- All system goals must be built into network
- Emphasis on:
 - ; Unpredictable environments
 - ; Relatively simple tasks
 - ; Coping with noisy sensors

Robot Insects



Humanoid Robots



Reactive Architecture

- RAP [Firby]
- Goals explicitly represented as tasks
- Tasks choose actions at execution time based on current world state
- Actions are reconsidered when they don't have their intended effects
- Many tasks may be eligible for execution at any given time