Self Adaptive Systems

EECE 310
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What is a self adaptive system?

Definition

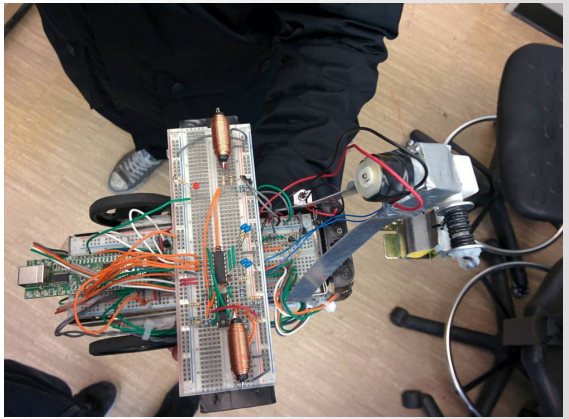
An automatic control system that preserves its operational capability under conditions of unforeseen change in the properties of the controlled system, in the control goal, or in the environment by changing its operation algorithm or searching for optimal states.

it is a closed-loop system with a feedback loop aiming to adjust itself
to changes during its operation.

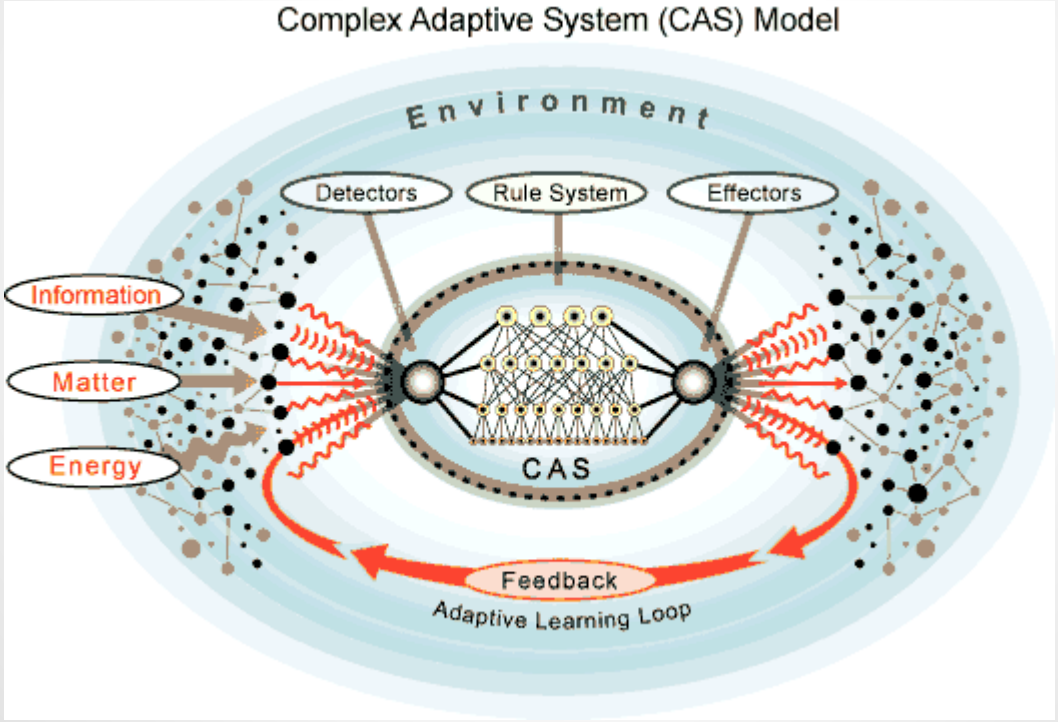
TLDR: A system that makes decisions on the go.

Tetherbot

- It can follow a beacon signal
- Completely autonomous

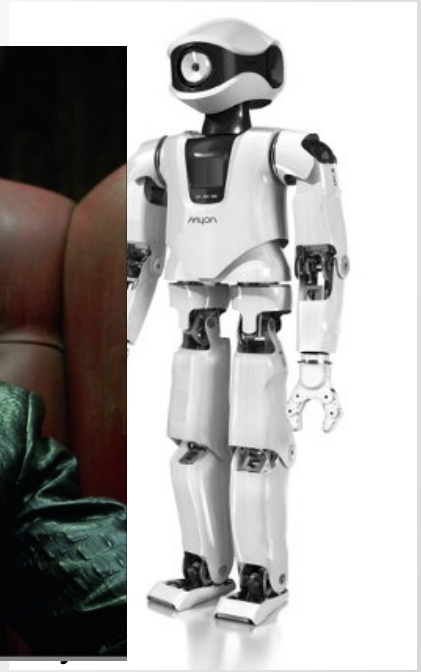


Complex Adaptive System

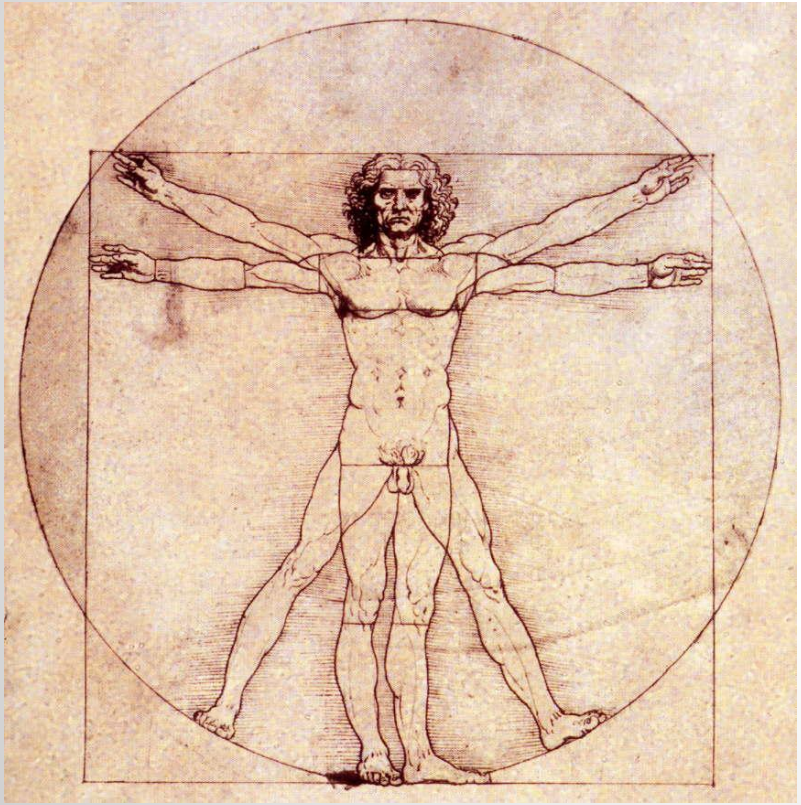


Real World Examples

What are some examples of self-adaptive systems?



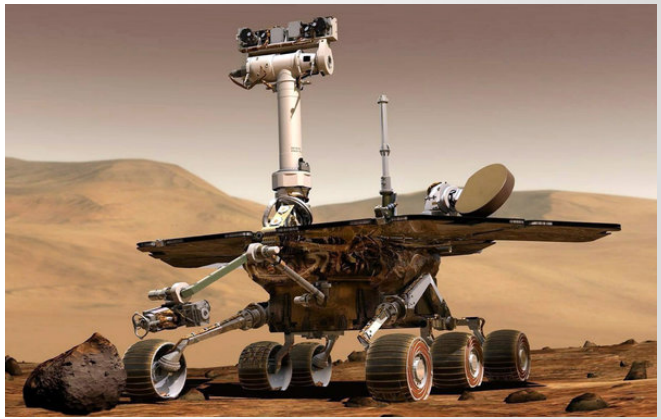
The Human Body



- Body converts fat to simple sugars when energy is needed.
- Many mechanisms used to fight viruses

Mars Rover Curiosity

- Autonomous navigation
  - Move to (x,y)
- Has to plan its own route
  - Analyzes images from drive camera



Myon

- Learns about its body
- Synthesizes language
- Teaches language to another robot

Evolutionary Algorithm

- Inspired by Charles Darwin’s theory of evolution
- Cross-over different solution to come up with the best solution

Example:hello world

candidate strings:

1. ksdfo wolfc (4)
2. ecpggtfaios (0)
3. held urykgj (3)
4. ftysgm eorx(1)
5. pg ksmtodqz(1)

Cross-over and Mutation

ksd**fo wolfc** + **hel**d uryklj = helfo wolfc(7)

Since none of the candidate solutions ends with letter “d”, the system needs to occasionally mutate the solutions to fill the missing keys.

references

definition:http://encyclopedia2.thefreedictionary.com/Self-Adaptive+System

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