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Adaptive Systems - Week 4

4.1 Braatenburg's Vehicles

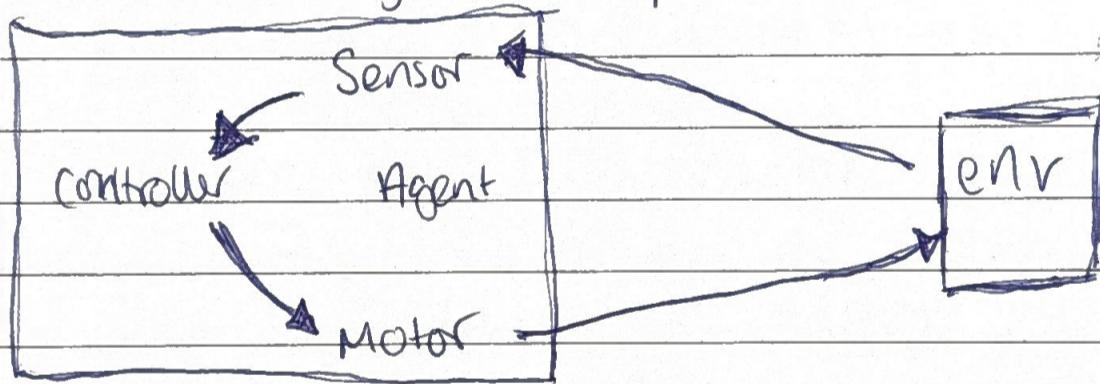
Sensor + motor behaviour = neither pos or negative feedback

Sensigagents: 3 types

- ① Artifical
- ② Organism
- ③ Robot

most systems studied or module are agnts

Agents are systems which act in & on their envs
- They are couple to envs



Cybernetic Agents - Braatenberg

END of Part 1 lecture

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Start of Part 2 lecture

Braiden Vechicks

Motors are connect to sensors & react accord

This is a sensor closed loop

Brait imagined how we might perceive behaviour
of the Black Box

- often assume it is more complex than it is

System can be described by functions & parameters
(lab 1)

More complex = more parameters

BVs are not self adaptive

- they are adapted external by us
by adjusting the pars

Lab 1 = NN w/ parameters to address behav of Vech

the lights in motion or patterns can make a
ven w/ limited pars or functions behave in
complex ways

types of archs in nervous systems

1. hardwired (evolution)

2. learned (cognitively learned)

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Autonomy working definition from Pfeifer & Scheier:

- Auto mean indep from external control
- Not - all - or - not but matter of degree
- Controllable & capability of having own history are correlated — more ag has history, less controllable
- More you know about internals = more controllable

Lecture 4.2 Cybernetics & Sensorimotors

No momentum = no dynamical system

We can parameterise sensorimotor systems

Certain algos can take params & make self-adapting

William Grey Walter = early cyberneticist

ratio club → him, turing, esby, mcculloch
→ smaller than many meeting US

Invented EEG, motor of tortoise robot

With BV, they explore environment

Diff control = Motor + Steer

Single scanning light sensor w/ steering

have lights & sensors for Bumps

Situate = making use of environment

embodied = morphological charac of agent

GAP research after this & picked up in 80's

All robots or animals are sit & emb

Deeper concept of embodiment:

- memory is physically embodied somehow
- To what extent does agent take advantage of situ
- " " " " does embod affect behavior?
better or worse?

Umwelten

- * German word, similar to env
- * env that agents can sense & have effect on
- * species have diff umwelten due to senses
- * A physical space can have many umwelten

Objectiveness: metaphor or analogy?

4. AI Robotics - What not to do in the 1980s

- * Stafford Cart Robot
- * Camera on front to take photos
- * Pics processed & gives robot moving directions
- * Cutting edge @ time, partie the image process

Rodney Brooks -

Read 4.2 sensi lecture Part 1

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Part 2 Sensi 4.2 lecture

Experiencing controlled indoors → outside = failed

Randy Brook - critical powers of standard cont & cost

RB became leader of AI/Robotics

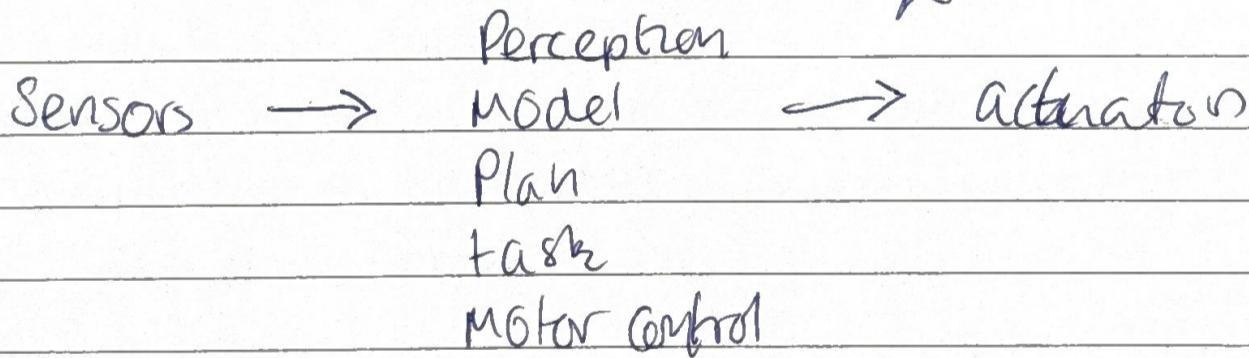
5. Behaviour-Based Robotics

RB → wanted new approach to AI

unplanned vs ^{an} unplanned
- carts - tortoise

Plans are often redundant

Bad Way



- + {
- the world is its own best model
 - it is exact upto date
 - contains all detail
 - trick is to sense approp & often enough

RB tries to parallelise

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RB update

What is bad about plan

- costly
- sensor - slow
- env changes fast

Often central planner =

- smaller, faster, cheaper
- no model reqd

Extended Brainswieg Archit

- Procs in parallel
- Procs don't all have to be same type, e.g. NNs
- every sensor connects to every process & every process to motor
- No strict hierarchy
- Allows for modularity
- many simple to complex prod complex behaviours
- Process can be applied in several ways
- Procs are linked to each other

Summary

- * Situ & embed Robs began in Cybernetics but AI research was focused more on a more comp approach
- * 60's = grey walker tortoises
- * 80's = AI led = fitters = shift to of cybernetics-inspired approach
- * Behaviour based robotics
- * None of studied systems are self-adaptive = limitation
- * torts had lack of purpose - success vs failure