Braitenberg Vehicle

Home Assignment 1

Background

- In *Vehicles*, Valentino Braitenberg describes a set of thought experiments in which increasingly complex vehicles are built from simple mechanical and electronical components.

- Braitenberg uses these thought experiments to explore psycological ideas and the nature of intelligence.

- Throughout the book, we see more intricate behaviors emerge from the interaction of simple component parts.

Background

- Each of these imaginary vehicles in some way mimics intelligent behavior , and each one is given a name that corresponds to the behavior it imitates;

  – ”Fear”, ”Love”, ”Logic”, etc.

Simple Creatures

- Timid
  - the shadow seeker
    - one motor
    - one threshold light sensor, pointing up, *on* when in light and *off* in shadow.
- Timid will run when it can "see" the room lights, and stop when it cannot. When the lights are turned on, Timid drives until it gets into shadow, at which point it stops.

Simple Creatures

- Indecisive
  - the shadow edge finder
    - one motor
    - one threshold light sensor, pointing up, *on* when in light and *off* in shadow.

- Indecisive drives forward until it gets to a shadow. At this point, the threshold light sensor no longer sees the overhed lights and its output switches of. The motor reverses and the creature runs back into the light. Indecisive oscillates back and forth at shadow edges.

Simple Creatures

- Paranoid
  - the shadow-fearing robot
    - two motors
    - one threshold light sensor, pointing up, mounted on an arm sticking out forward, *on* when in light and *off* in shadow.

- Paranoid drives straight forward until its threshold light sensor enters a shadow. Then, triggered by the sensor, its left wheel reverses. It swings around to the left until the protruding sensor has swung back out of the shadow. At this point the left wheel returns to forward motion.

Simple Creatures

- Dogged
  - the obstacle avoider
    - one motor
    - two touch sensors, one facing front and one back, each connected to a bumper.
    - or
    - flip-flop
- When Dogged is started it runs either forward or backward. When either the front or back bumper is pressed, the creature reverses direction. Dogged changes direction every time either bumper gets pressed. It will fall into a pattern of running quickly back and forth between two objects.

Simple Creatures

- Insecure
  - the wall follower
    - two motors
    - whisker sensor, *on* when sufficiently bent and *off* otherwise (implement using a touch sensor and a strip).
    - inverter

- Insecure slowly edges its way along walls and around the base of pillars.

Simple Creatures

- Driven

  - the light seeker

    - two motors
    - differential light sensor, facing forward (implent it with two light sensors)

- Driven moves towards a bright light by successive right and left turns. It slowly wiggles its way towards light sources.

More Complex Creatures

- Persistent
  - the light seeker with a collision algorithm
- Attractive and Repulsive
  - the leading and following pair
- Consistent
  - the four state turtle
- Inhumane
  - the mouse trap

Philosophical Creatures

- Frantic

  – the negative feedback loop

- Observant

  – the creature sensitive to the direction of a sound

Tasks

- In the spirit of Braitenberg, you should implement one of those *Vehicles* (which one is of your own choice).

- You should implement using the Lego Mindstorms set.

- Work in groups, 2-3 students per group

Tasks

- Each group should do:
  - Oral presentation in class
    - One OH-slide
    - Robot demonstration
    - 5-10 minutes per group
  - Hand in a short, written report (3-4 pages).
    - Background, describtion of your robot + image, program code with explanation.
- Due by Monday, February 9, 2004!

Readings

- *Vehicles: Experiments in Synthetic Psychology*
  - Valentino Braitenberg,

    MIT Press; Reprint edition (1986)

    ISBN: 0262521121

- *Braitenberg Creatures*
  - D. W. Hogg, F. Martin, M. Resnick. E&L Memo No 13, MIT Media Lab. Cambridge, MA, 1991.

    http://citeseer.nj.nec.com/hogg91braitenberg.html