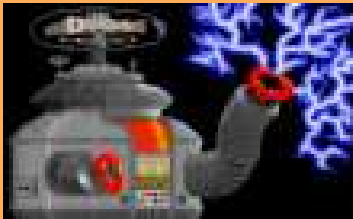# Introduction to Robotics

http://ionaphysics.org/

Some of these are real robots and some are fictional. Can you tell which is which?

Real Vacuum cleaner robot

Real Lawn mower robot

Real NASA rolling robot

Asimo

A real robot - a project of Honda

http://asimo.honda.com/inside_asimo_movies.asp

Simple Machines
Lever
Pulley
Gears

Increase force (but decrease distance)
OR
Increase distance (but decrease force)
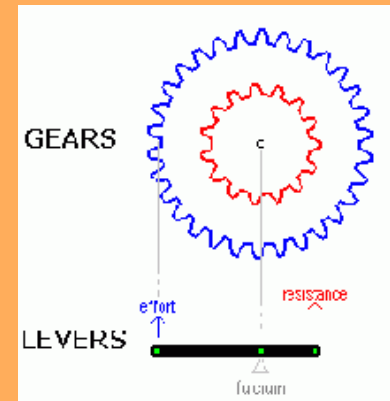**AND/OR**
Change the direction of the force

Electrical Motor:

Problem:
It turns too fast

Solution:
Gears

Gears slow the motion while increasing the strength

Electrical Motor:

With a DC motor, reversing the power connection reverses the direction of rotation of the motor.

Our basic robot design:
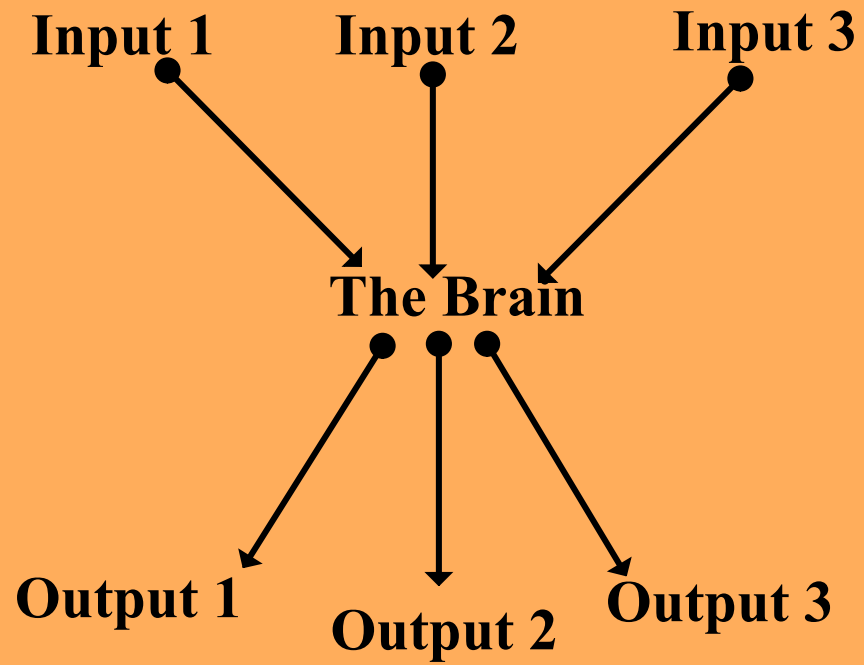
Electric Motor -

1. Gears reduce speed and increase strength

**   2. A reversing switch is engaged when the robot strikes an obstruction.**

Comparison of Human and Robotic Systems

Systems:	Human	Robot
Support	Skeleton	Metal, Plastic frame
Energy	Food	Electricity (or pneumatic/hy
Control	Brain +nerves	Computer + wires
Inputs	Eyes/ears/skin	Assorted sensors
Outputs	Hands,feet mouth, etc	Sounds, movement of parts electrical signals

Robot Systems:

Input 1 **Input 2** **Input 3**

The Brain

Output 1 **Output 2** **Output 3**

Robot Systems

Output
Movement
Electrical Motors
DC Motors
Stepper motor
Servo
Pneumatic or Hydraulic systems
Indicator Lights
Indicator Sounds

Input:
Touch
Switches (on/off)
Analog sensors
Sight
Light Intensity
IR Pulse reflection
Obstruction (Reflected light)
Distance (Sonar)
Sound
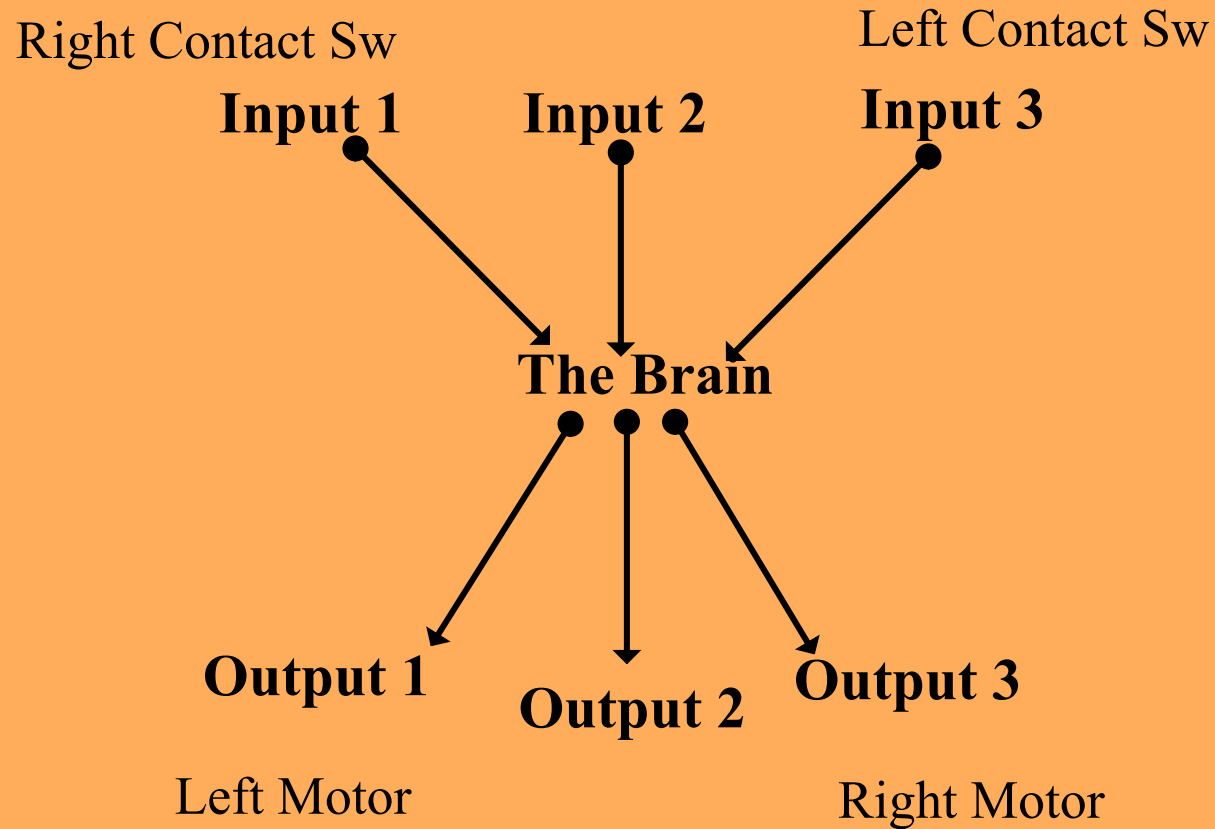**Sound level (microphone)**
Speech recognition (extreme!)

Brain

Computer and Program

Program: A series of instructions. The instructions include provisions for making decisions based upon input variables.

Touch Sensor -

Use and Programming

Robot Systems:

Right Contact Sw

Input 1

Input 2

Left Contact Sw

Input 3

The Brain

Output 1

Output 2

Output 3

Left Motor

Right Motor

Program Pseudo Code:

Start:
Advance Both Motors
Right Switch Contact? IF Yes then Turn Left
Left Switch Contact? If YES then turn Right
Go to Start

Turn Left:
Back Up
Advance right motor
GoTo Start

Turn Right:
Back Up
Advance left motor
GoToStart

Demonstration:
Boe-Bot with whiskers

Line Sensor

How it works and Demonstrations

Scribbler Robot

Infrared emitters and detectors

Demonstration: **Line Detection**

1. Turn on

2. Cover LEFT sensor

3. Press and release the reset button.

4. When you hear the beep, IMMEDIATELY uncover the sensor.

5. Place Scribbler on paper. Move it back and forth.

If the right sensor sees the line, the right LED will light up.
If the left sensor sees the line, the left LED will light up.
If both sensors see the line, both LEDs will light up.

Line Following Behavior:

1. While holding your fingers over the LEFT AND RIGHT sensors, press and release the RESET button.

2. Listen for the beep and then immediately uncover the light sensor.

3. The Scribbler will turn from side to side to find the line, and then will follow it.

Challenge:

Set up your own path for the robot to follow

Object Detection with the Scribbler

Infrared light shines from the emitters and is detected by the detector when it reflects off an object.

(Light objects reflect more light and are easier to see.)

Instructions:

1. Turn Scribbler on
2. Cover the CENTER sensor.
3. Push and release the reset button.
4. When you hear the tone, IMMEDIATELY uncover the sensor.

If the scribbler sees an object on the right, the right LED turns on.

If the scribbler sees an object on the left, the left LED turns on.

If the scribbler sees an object on both sides (probably in the center) both LEDs turn on.

Avoiding Objects While Moving

Directions:

1. Turn ON the Scribbler.
2. Cover the CENTER and the RIGHT sensors.
3. Press and release the Reset button.
4. When you hear the tone, IMMEDIATELY uncover the light sensors.

The scribbler will drive around, turning to avoid objects.

Follow the Light

Directions:
1. Turn the Scribbler ON
2. Cover the right sensor
3. Press and release the RESET button.
4. When you hear the tone, IMMEDIATELY uncover the sensor.

The scribbler will drive around the room seeking the brightest light.

Try this in a dark room using a flashlight to guide the scribbler.

Challenge:
Make the Scribbler draw a box, or a circle, or a flower.

1. Use the Light Seeking behavior
2. Place the scribbler on a large piece of paper.
3. Place a felt marker in the Scribbler's center hole.
4. Guide the scribbler using a flashlight.

Extreme challenge:
Make the Scribbler write your name!

Sumo Wrestling:

Sumo Wrestling:

      1. Do not leave the ring

      2. Try to push the other guy out of the ring

Sumo Wrestling:

      1. Do not leave the ring

      2. Try to push the other guy out of the ring

Need to detect the edge of the ring.

Need to detect the other guy.

Pseudo Code for motion:

Start:
At edge of ring? If YES then go to change path
Move straight ahead

Change Direction:
Is the edge on both sides? If YES turn around. Then
Go to Start
Is the edge on your right? If YES turn left. Then
go to Start
Turn right. Then Go To Start

Get Aligned:
Do you see opponent dead ahead? If YES then attack.
Do you see opponent on right? If YES turn right and then GO TO GetAligned
Do you see opponent on the left? If YES turn left and then GO TO Get Aligned

Attack:
Go straight ahead and push as hard as you can.
Do you see end of ring? If YES then celebrate.
Go to attack

Title: Jul 21 - 12:08 PM (37 of 37)