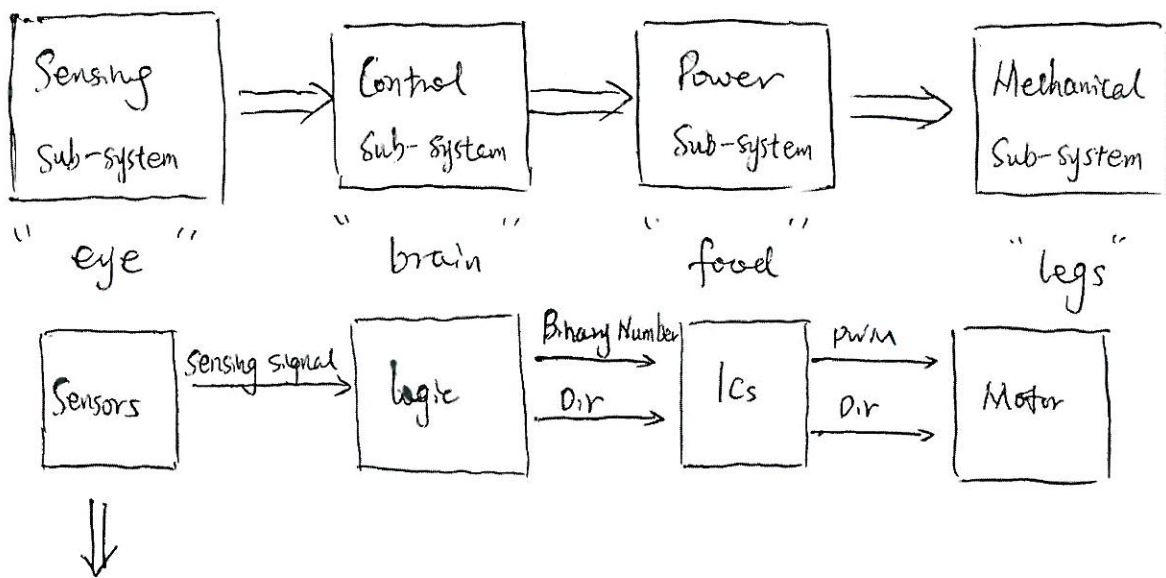


L10 Sensors.

1. By now, we have completed the power & mechanical sub-system. We know how to provide power to the motor and how to control the direction of the motor



2. Today, we talk about sensors.

Sensor: a device that measures/detects a real-world condition such as motion/heat/light... and converts it into a signal that can be read by an instrument

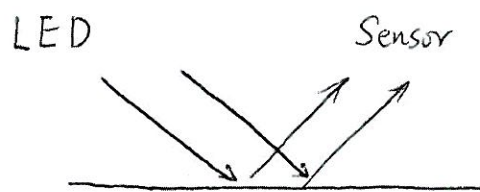
We have lots of sensors in human body. \Rightarrow our Robot also needs sensors to learn the environment.

3. Types of sensors: Depending on the types of "conditions" to be measured,

we have vibration/temperature/light/Force - - - Proximity/Ambient Light
Thermistor

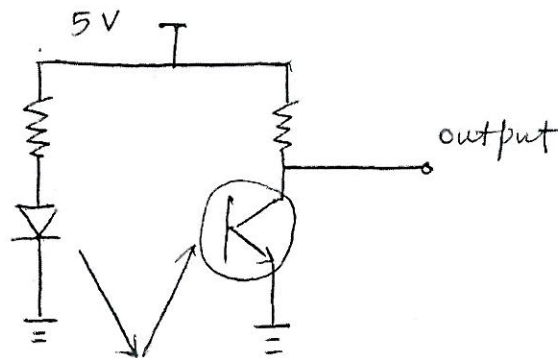
4. Sensors in this course.

- 1) Optical Sensor: Light sensitive resistor (CdS) and photodiode.
- 2) Line Sensor: Optical sensor + Light source.
- 3) Line sensor in this course: Infrared light sensor + LED.

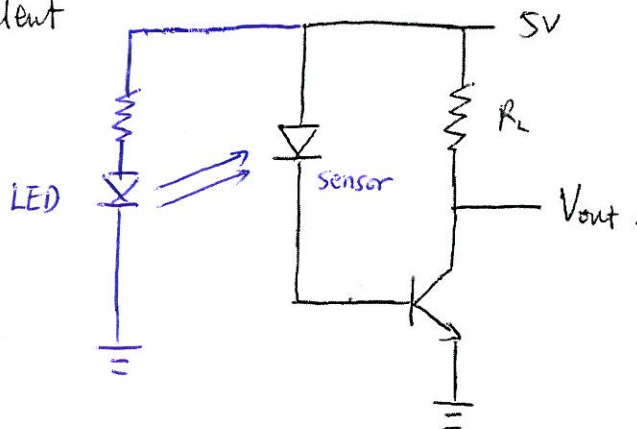


Light-colored surface reflects more light than dark surface

4) Circuit



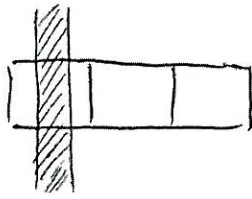
equivalent



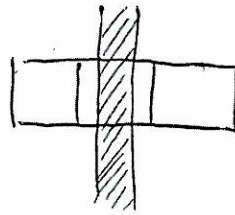
Light Color \rightarrow more reflective \rightarrow higher illumination \Rightarrow Transistor on \Rightarrow output = 0V

Dark \rightarrow Less \rightarrow lower \Rightarrow Transistor OFF \Rightarrow output = 5V

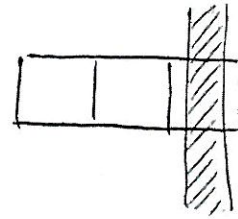
5) You will use $\frac{2}{3}$ line sensors for tracking the road.



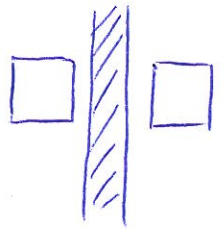
Turn left



Move forward



Turn right.



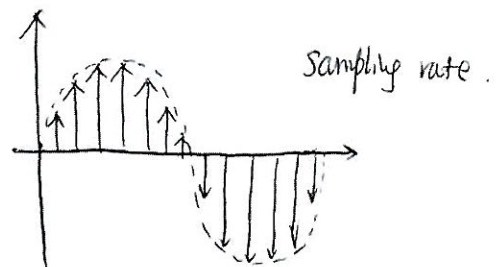
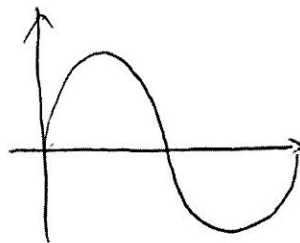
2 sensors

3 sensors

5. Analog Vs Digital representation (Digital signal is easy to store and duplicate)

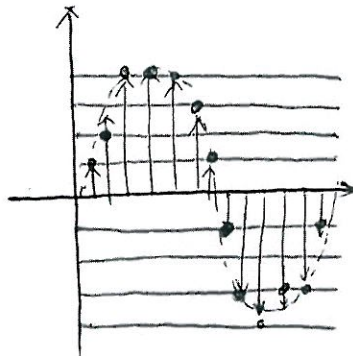
Analog \Rightarrow Digital conversion

Step 1: Sampling



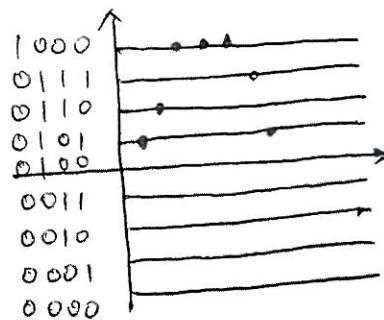
Sampling rate.

Step 2: Quantization



Take the nearest level

Step 3: Coding

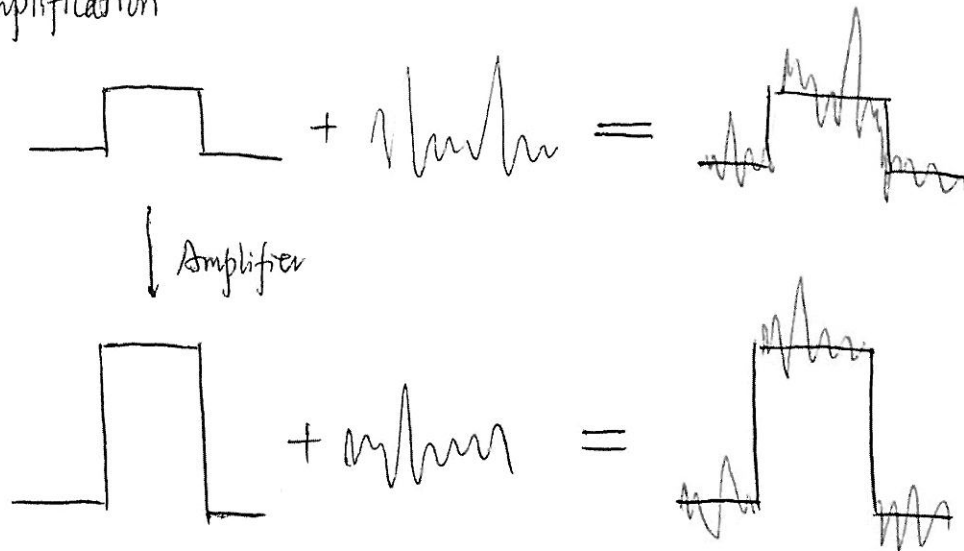


step level \Leftrightarrow LSB

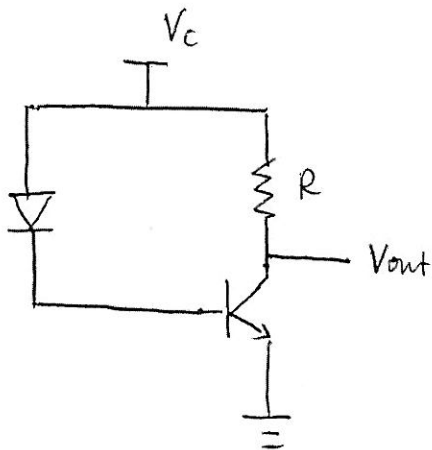
Least Significant Bit.

\Rightarrow "0101" "0110"

6. Amplification



Where is our amplifier



$$V_{out} = V_c - R I_c$$

$$= V_c - R \cdot \beta \cdot I_B$$