Interfacing with External Hardware

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COMP2215: Computer Systems II
The following material will not be on the exam.
Example: Simple Robot

- Communication
- Body
- Sensors
- Controller
- Actuators
- Power Supply
Using Hardware

Beginners guide:

▶ Set up your circuits on Prototype board ("bread board") first
▶ Select components that are available in "through-hole" packages (DIP/DIL)

▶ In case you use cheap parts:
  ▶ Buy everything twice
  ▶ Keep the bread board while soldering a permanent version ⇒ easy debugging
Permanent Circuits: Soldering

- Use Boards with single pads
  - just bend the wires in the direction in which you want to connect
  - this will be more compact than strip-board

- 2.54 mm hole spacing is standard
  - keep this in mind when buying connectors

- You will need
  - Soldering Iron
  - Solder
  - Wire cutter
Soldering I

- Heat wire and pad for 2 s
- Add a little solder to wire and pad; aim not at iron tip
- Remove first the solder, then the iron
- Do not move solder joint until cold (5 s)

A good connection:
Too much heat can damage semiconductor components:

- Use a 15–25W Soldering Iron
- If the connection is not right, let the component cool off before working on it again
- You can use pliers on the wires above the board to conduct heat away from the body of the component (e.g. on an LED)
Using Modules and Breakout Boards

- Easy way to use surface-mount (SMD) components
- Some are cheaper than the components in single quantities, some are much more expensive
- Be careful with the power supply: many are not protected against wrong polarity.
- Make sure the signal levels are compatible (1.8 V, 3.3 V, 5 V); or use a level-converter
Digital Output Protection

- Flyback Protection
- “free wheeling” diode
Analogue Input Protection

Schottky diodes and current limiting resistor:
Analogue Output?

Use digital output in PWM mode and low-pass filter:

RC lowpass filter

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f_c = \frac{1}{2\pi RC}
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