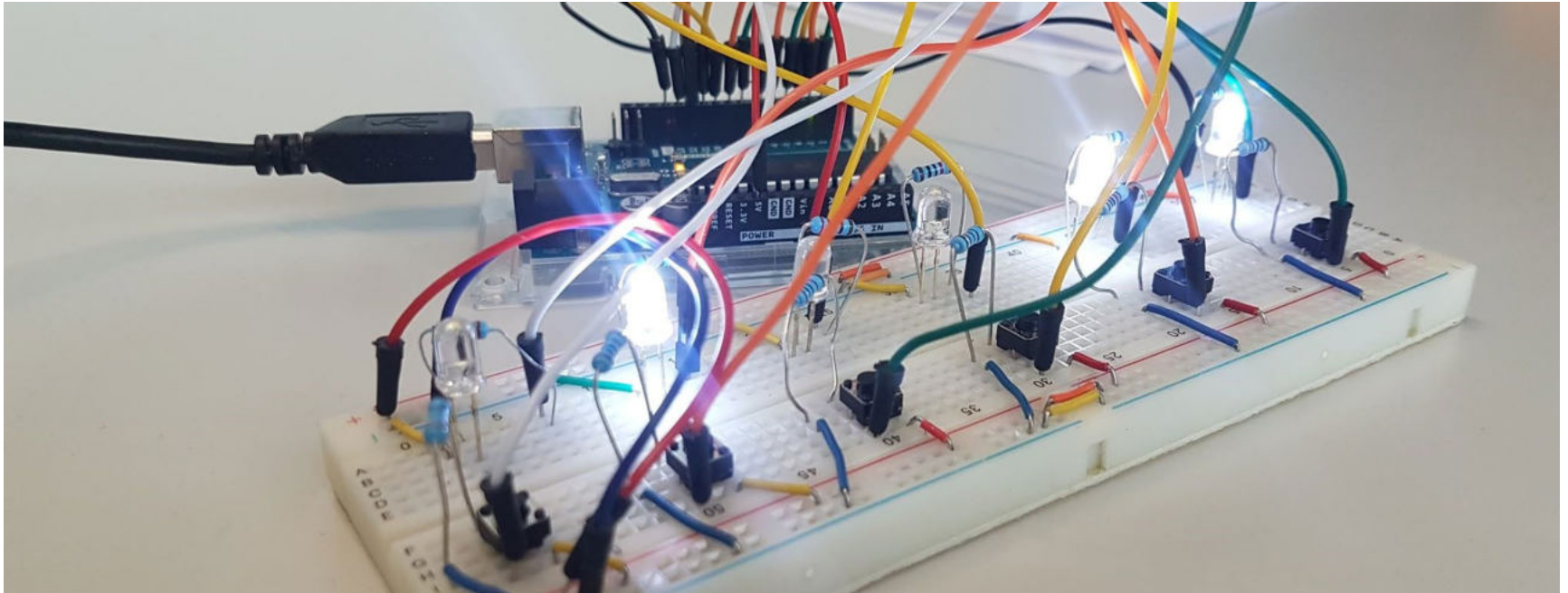


IAT 884 – Week 5 – Workshop 5

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Soldering

Soldering Equipment



Higher temperature, fast heating, big tip: used for connecting metal together

Soldering

Equipment

Soldering Iron/Station:

Lower temperature
Temperature control
Finer tip



Soldering

Equipment Tips

- Buy an iron/station with a 3-pronged plug to protect electrical components.
- Only use lead-free rosin flux core solder (not acid core).
- Use solder with a small diameter (0.75mm to 1.0mm).



Soldering

Solder

Solder is an alloy (mixture) of tin that traditionally contained 60% tin and 40% lead. Fortunately, there are now **lead free** varieties available which are safer to use.

Solder melts at a temperature of about 200°C (392°F). Usually, irons are set between 370°C and 426°C (700°F and 800°F).

Coating a surface with solder is called '**tinning**' because of the tin content of solder.

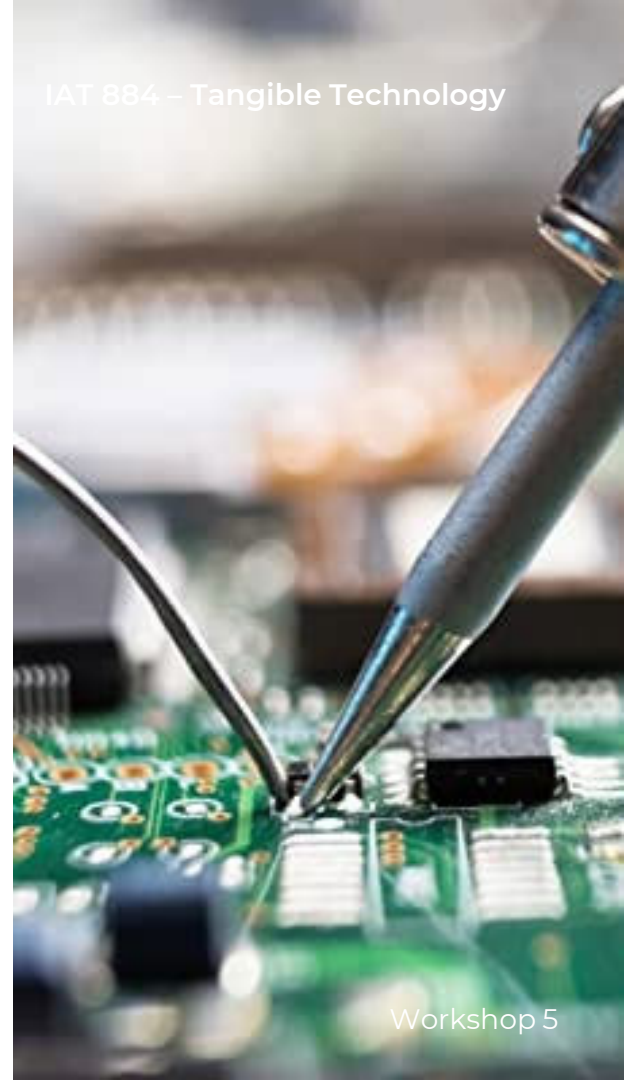
Solder for electronics use contains tiny cores of **flux**. The flux is corrosive, like an acid, and it cleans the metal surfaces as the solder melts. Without flux most joints would fail because metals quickly oxidize and the solder itself will not flow properly onto a dirty, oxidized, metal surface.



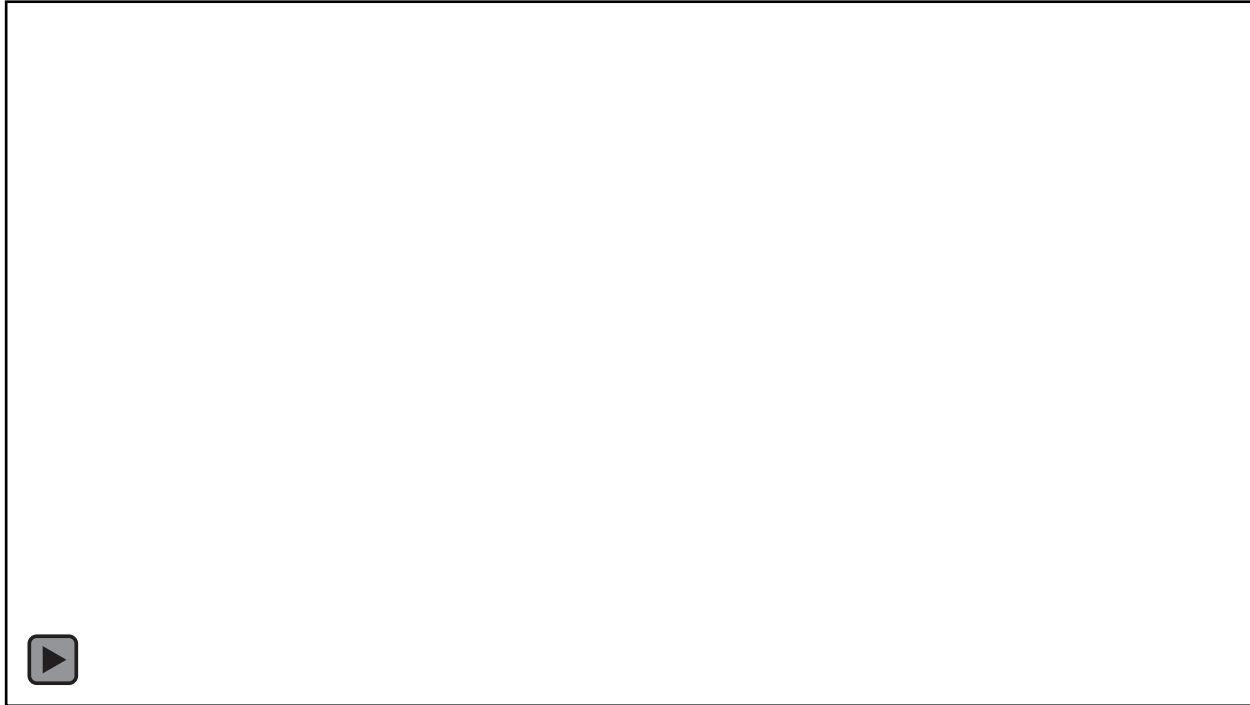
Soldering

Soldering tips

- **Work in a well-ventilated area.** The flux in solder releases fumes that are harmful to your lungs and eyes.
- **Correct Tip.** Match the tip size to the work.
- **Low Temperature.** Keep temperature as low as possible while maintaining enough temperature to quickly solder a joint (2 to 3 seconds maximum for electronic soldering). Soldering temperatures range from 350 °C to 400 °C.
- **Keep the iron tip clean.** A clean iron tip means better heat conduction and a better joint. Use a wet sponge to clean the tip between joints. Keep the tip well tinned.
- **Solder small parts first.** Solder resistors, jumper leads, diodes and any other small parts before you solder larger parts like capacitors and transistors. This makes assembly much easier.
- **Install sensitive components last.** Install CMOS ICs, MOSFETs and other static sensitive components last to avoid damaging them during assembly of other parts.



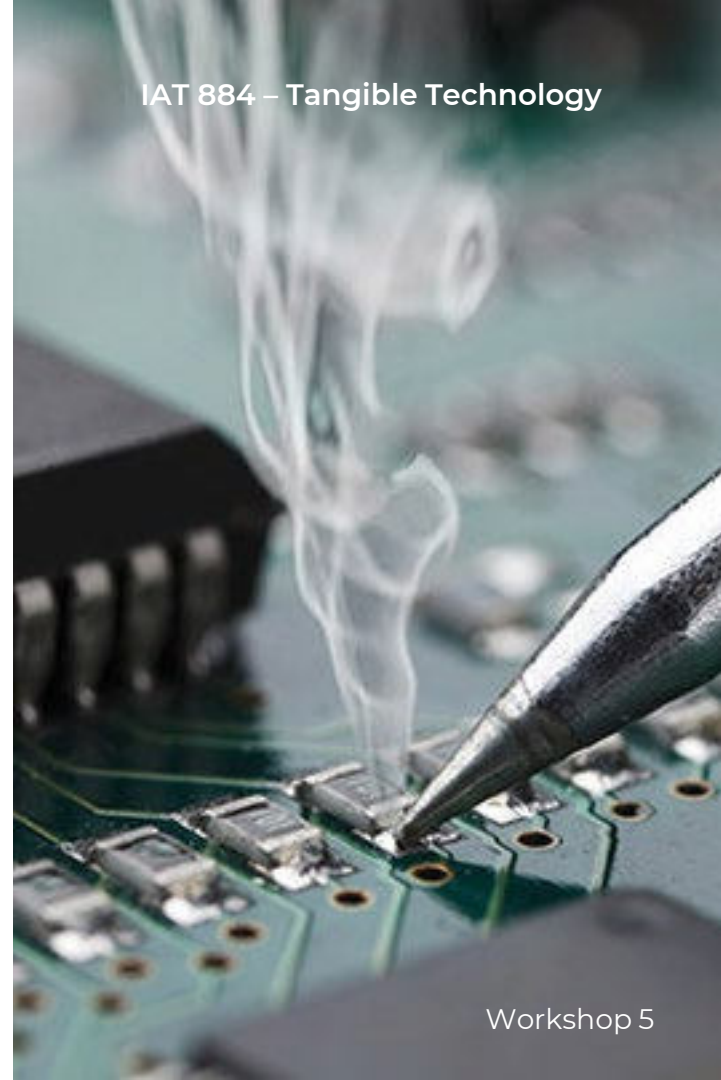
Soldering



Soldering

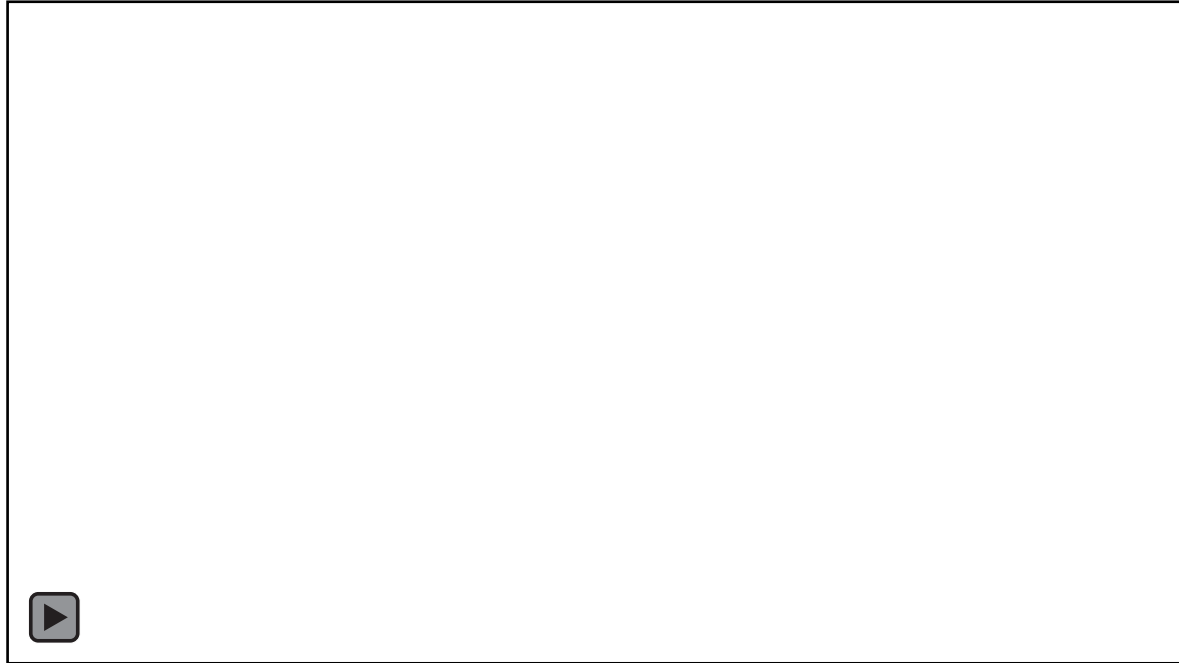
Soldering workflow

1. Heat your soldering iron
2. Tin the tip of your soldering iron
3. Clean off the excess tin of your iron with a (brass) sponge
4. Heat both the solderpad and pin
5. Add solder
6. Clean your soldering tip



Soldering

Soldering wires



Soldering

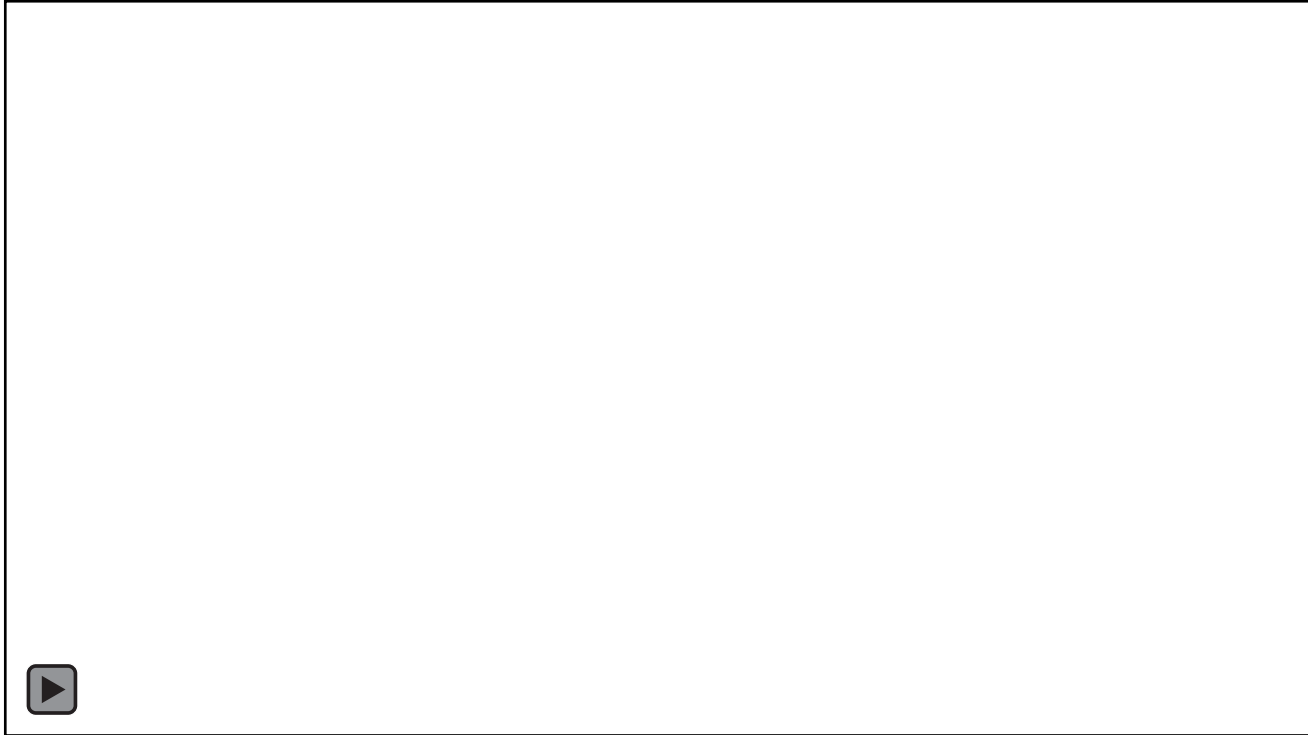
Wire soldering workflow

1. **Strip the wires.**
2. Slide **heat shrink** over one of the wires.
3. **Twist the wires together.** Solder is not glue and breaks easily. The only thing holding these wires together is this twist.
4. **Apply heat.** Always heat the wires from underneath. Use the large part of the tip to generate more heat.
5. **Apply solder to the joint.** Touch the solder to the top of the wire while maintaining contact with the soldering iron from below. Once the solder starts to flow, more along the twisted wire until the joint is fully covered.
6. **Clean the flux** using methyl hydrate or flux removal chemicals.
7. Put the **heat shrink** over the connection and add heat



Soldering

THT & SMD



Soldering

THT soldering tips

- When making a circuit on a perfboard, start with **drawing a sketch of the layout** of your circuit design.
- **Test your circuit on a breadboard** before soldering.
- You can **use the legs of the components** as additional wire to make connections.
- You can use **wick** or a **solder-pump** to remove solder from components.



Soldering

Cleaning your iron

Over time the tip of the soldering iron can build up excessive flux and oxidation.

Prevention: Always dab the tip on the sponge after completing a join. Always ensure that the tip is tinned, especially when you turn off the iron.

Maintenance: If the tip is oxidized or has hardened flux on it you can use sandpaper to gently rub off the corrosion. *Only do this while the iron is cold!* You can use steel wool to scrape off excess material when the iron is hot.



Soldering

Rapid prototyping

Want to quickly secure your electronics in a prototype.

Gluegun - glue doesn't damage electronics and can even be used as an insulator.

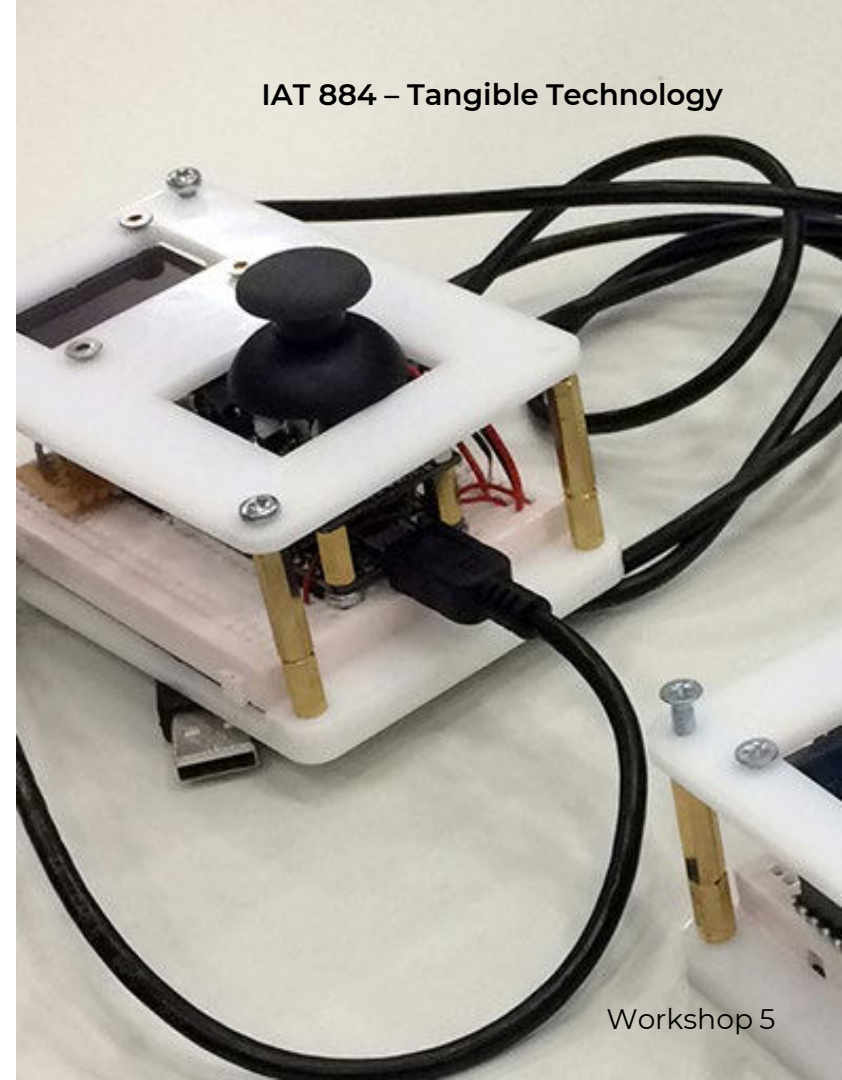


Soldering

Casing

However, think about different kinds of cases that can protect your electronics.

You can use these kinds of spacers to create enclosures or level components (see the joystick in the picture).

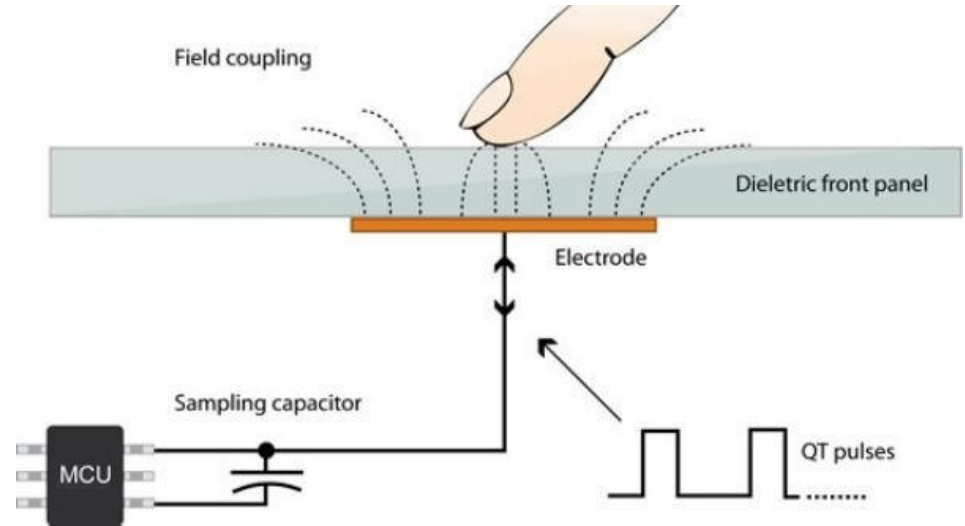


IAT 884 – Tangible Technology

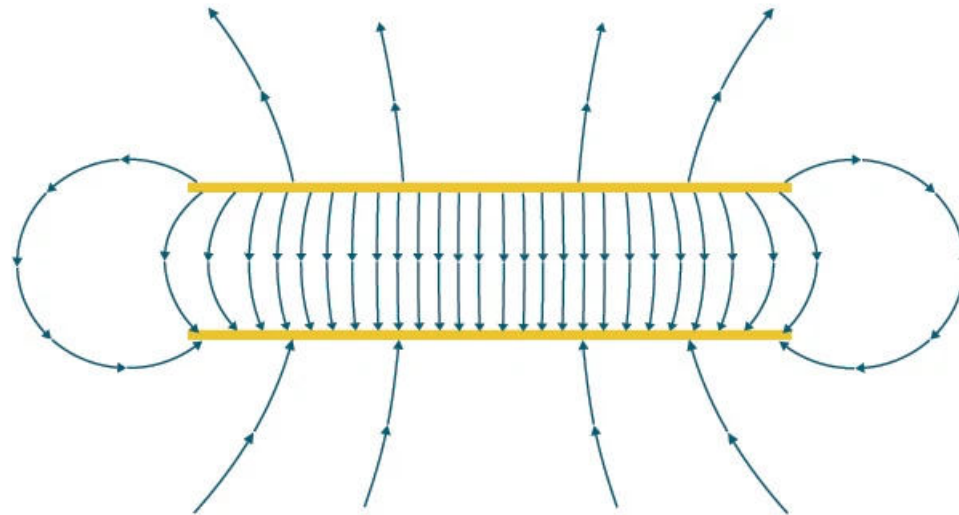
Cap Sense

Cap Sense

Capacitive sensing is a technology, based on capacitive coupling, that can detect and measure anything that is conductive or has a dielectric different from air.



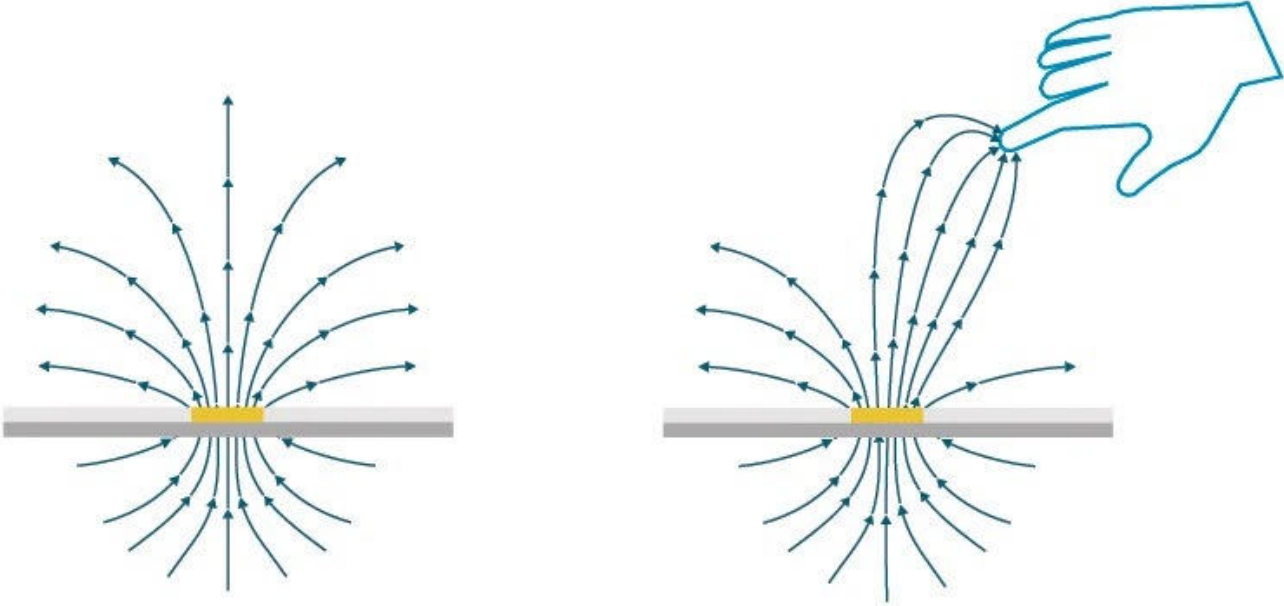
Cap Sense



— Electrode
—> Electromagnetic field

Capacitor

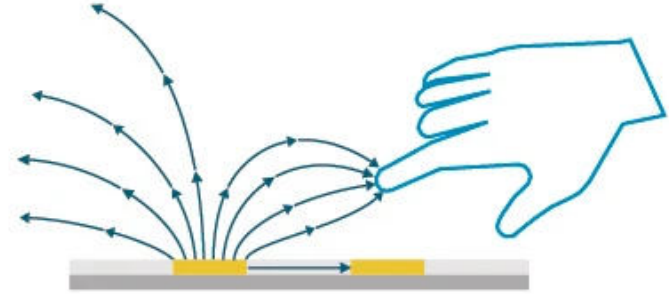
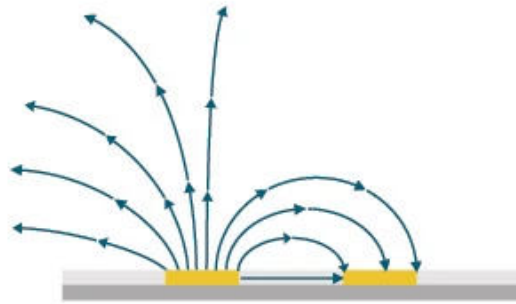
Cap Sense



- Electrode
- PCB
- Electromagnetic field

Self capacitance

Cap Sense



- Electrode
- PCB
- Electromagnetic field

Mutual capacitance

Exercises

Exercises

Download the Week 5 Handout on the [wiki](#).

Get as far as possible with the exercises during the lecture time. Complete them at home if you can't finish.

Send a document with your name, screenshots of your circuits, and answers to the questions to ahv1@sfu.ca.

Deadline: Sunday 11.59pm