Intro to Touch Sensors

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Why Touch Sensors?

• Some can provide a non-contact interaction point: useful in a time when people don’t want to touch things
• There are lots of different types, and they don’t all work the way you might expect
• Not going to cover: touchscreens. Far too many variants, would take too long
Basic Types

1. **RESISTIVE**
   - Your body’s electrical resistance becomes part of the circuit
   - Needs two points of contact
   - Can’t measure proximity

2. **CAPACITIVE**
   - Your body’s capacitance affects the frequency of an electronic oscillator
   - Can be truly non-contact
   - Can interfere with one another, or become unresponsive with long cables
Downsides of Touch Sensors

- **No haptic feedback**: no audible or tactile ‘click’
  - add LED or buzzer chirp;
  - accessibility: would a non-sighted person know your input was there?

- **No hardware latching**: state doesn’t survive power cycle
  - don’t use them for safety-critical input

- **Always drawing some power**
  - allow for parasitic loads on battery power
Resistive: Makey Makey®

- Hardwired as either USB 12-key keyboard or game controller
- Needs solid contact to work
- No longer open source; quite expensive
- Popular in education and rehab because it “just works”

Image credit: Makey Makey LLC / makeymakey.com
Capacitive: TTP223

- Each sensor acts as a momentary switch
- **Incredibly** cheap: ~$3 for 2
- Easy to use
- Quite sensitive
- No debouncing needed
- Has sense invert (NH/NL) and (soft) latching option
- Some have built-in LED trigger indicator
Capacitive: TTP229-BSF

- Usually sold as an 8 or 16 key touchpad
- TTP229-BSF uses an I²C-lish protocol: TTP229-LSF is I²C
- Needs to be polled frequently to catch all touch status changes
- Single/multi key modes selected in hardware
- Cheap: ~$4

Image credit: Universal Solder
Capacitive: MPR121

- 12 inputs, I²C
- Cheap(ish): $4.50 for small breakout
- NXP may have discontinued this sensor, but still available
- Has IRQ line that goes low on state change
- Works well with stripboard and alligator clips
Other touch options

- **Microchip SAMD µc as USB HID device**
  - Such as Adafruit Circuit Playground Express
- **Roll your own**
  - Time how long it takes to raise a pin charged from another
  - Needs accurate timing
  - … and lots of signal cleanup to allow for humidity, static, …

Image credits: 1) Adafruit 2) Arduino.cc