Digital Making

workshop day for Our Dynamic Earth[1], August 2019

[1] (and the Centre for Life)

OBLIGATORY SAFETY MESSAGES

The Plan

- Build confidence in digital making

- Have some ideas for future direction

- ...

- Profit!

The Plan

- Build confidence in digital making

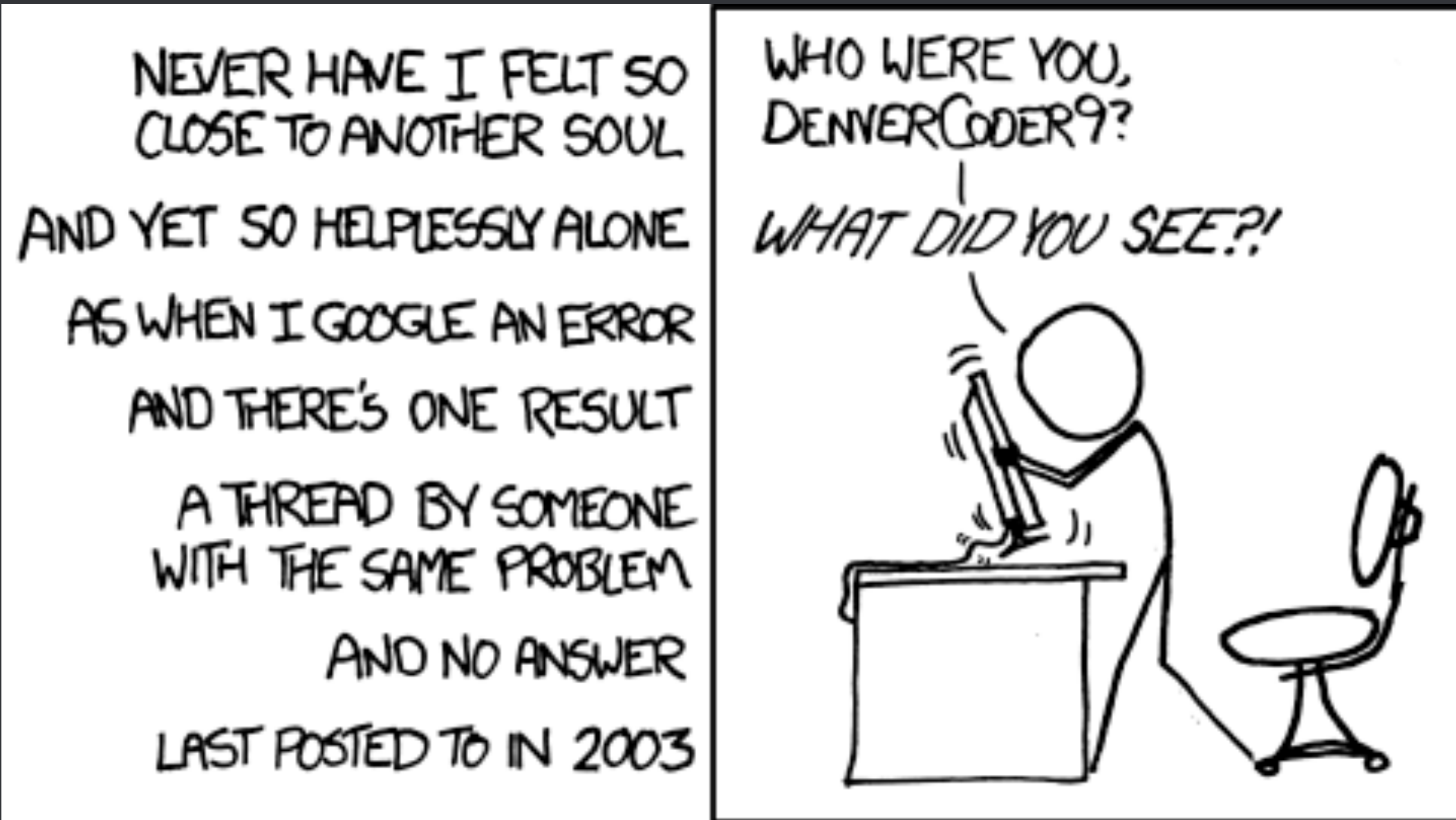- Have some ideas for future direction

- Lunch

- Profit!

The Plan

- Build confidence in digital making

- Lunch

- Have some ideas for future direction

- Profit!

The Approach

- Learn by doing real stuff

- Make deliberate choices about technologies

- Crib from others, continuously

- …

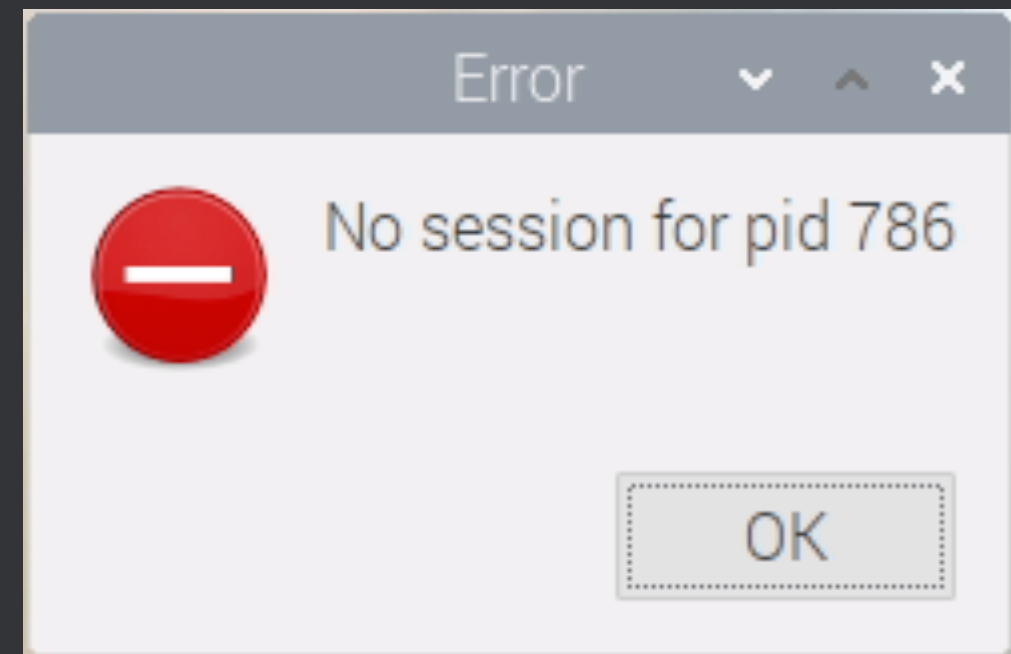# Cribbing from others

FLASHING LIGHTS

Pi quirks

If you see an error like this, the shutdown menu won't work. You'll need:

`sudo shutdown -h now`

or:

`sudo reboot`

...in a Terminal.

Error

No session for pid 786

OK

FLASHING LIGHTS

Python functions

```python
def sequence():
    red.on()
    sleep(1.0)
    ...
    red.off()


sequence()
```

Python functions with variables

```python
def sequence(delay):
    red.on()
    sleep(delay)
    ...
    red.off()


sequence(0.7)
```
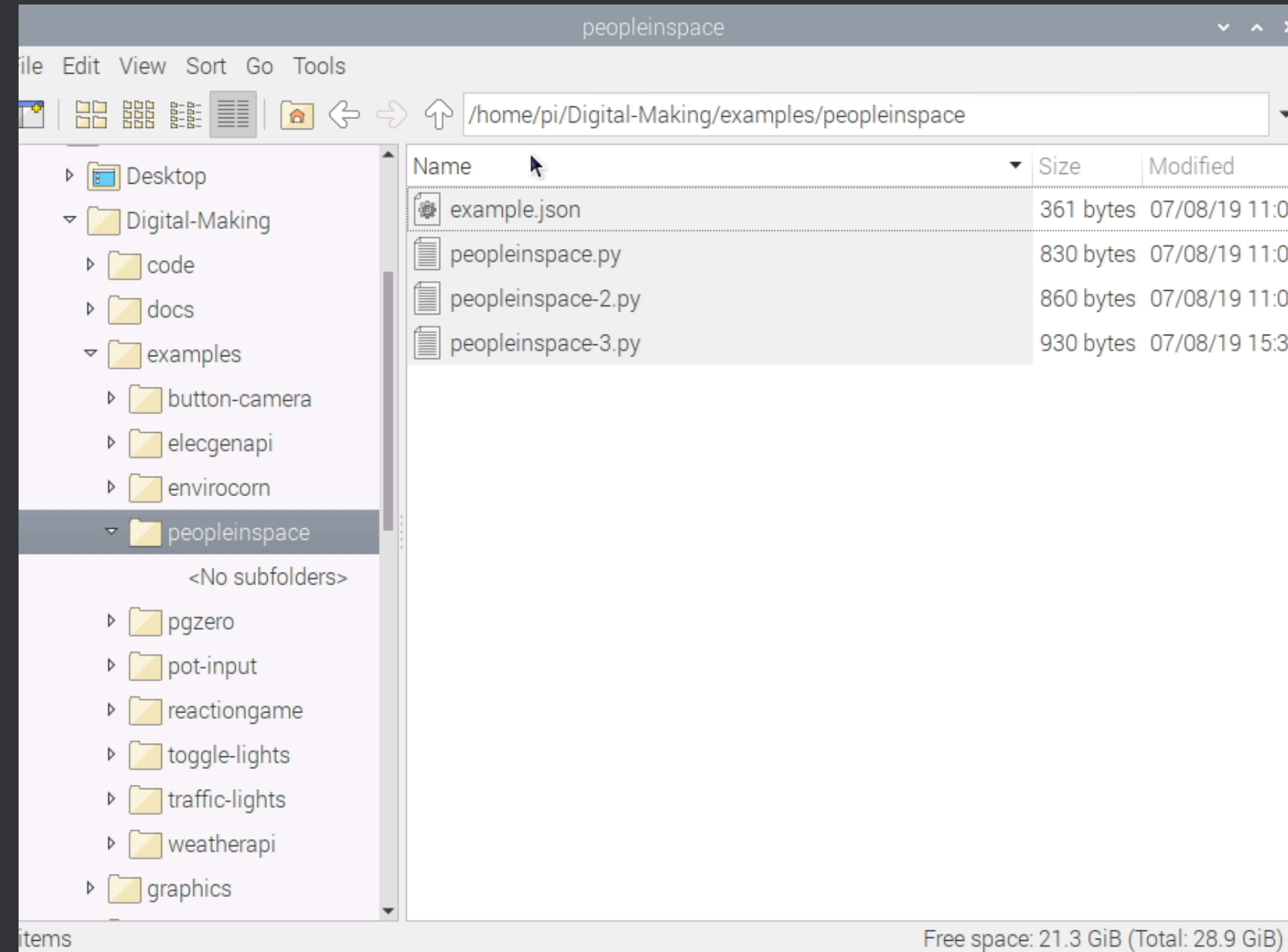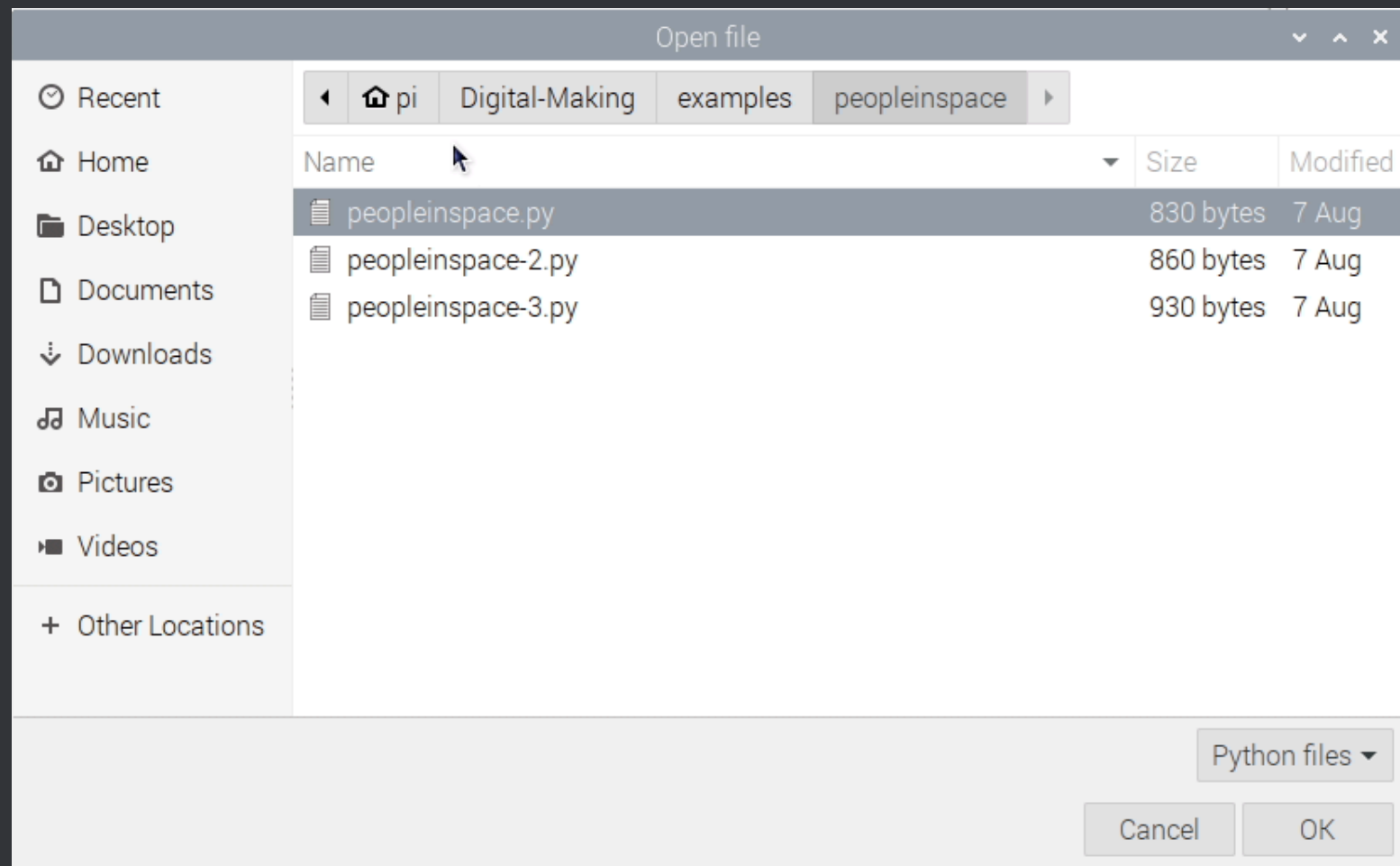
Flashing Lights

- There's no single 'correct' way...

    - ...but conventions are useful

- Instructions are *hard*

- Libraries

- Documentation

- Experimentation

Programming as
Digital Lego

Carousel

Pi quirks (2)

Activity	Difficulty	Where?
Toggle Switches & RGB LEDs	Easy	Side Station →
Electricity Generation API	Hardish	← Main Table
Cameras, buttons and Twitter	Moderate	Side Station →
Weather APIs	Easy... or insanely hard	Side Station →
Envirocorn	Medium	Side Station →
People in Spaaaaace	Medium	← Main Table
PyGame Zero	Hard, because badly-written	← Main Table
Motors, Lights and Buttons	Hard	Side Station →
Analogue Input	Easy-ish?	Side Station →

Python3

- **Databases** — SQL
- **Web**
  - Twitter (Twython)
  - APIs
    - National Grid
    - People in space
    - Weather (pyowm)
  - Dashboards
    - Graphs
    - Control
  - Scraping
- **Image processing** — PIL
- **Performance**
  - Numpy — Pandas
  - Profiling
- **HATs**
  - Scrollphat
  - Blinkt
  - Envirophat — Light, pressure…
  - ExplorerHAT — Motors
  - Inkyphat
  - Microdotphat
  - UnicornHAT
  - PianoHAT
  - Capacitance sensing
  - Audio output
- **GPIOzero**
  - LED
  - Button
  - Analogue input
    - Tilt sensor
    - Potentiometer
    - Sensors
      - Pressure
      - Force
      - Bending
      - …
  - Servo
- **GUI**
  - Camera (picamera)
  - GUIzero
  - PyQT
- **PyGameZero**
  - Graphics
  - Sound
  - Keyboard
- **NeoPixel LEDs**
- **Network**
  - MQTT
  - NetworkZero
- **Graphs** — matplotlib
  - pie
  - bar

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