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An open-electronics temperature controller

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Schematics

PC

Versatile experiment control software

Suitcase size platform

Temp control

Solenoid valve

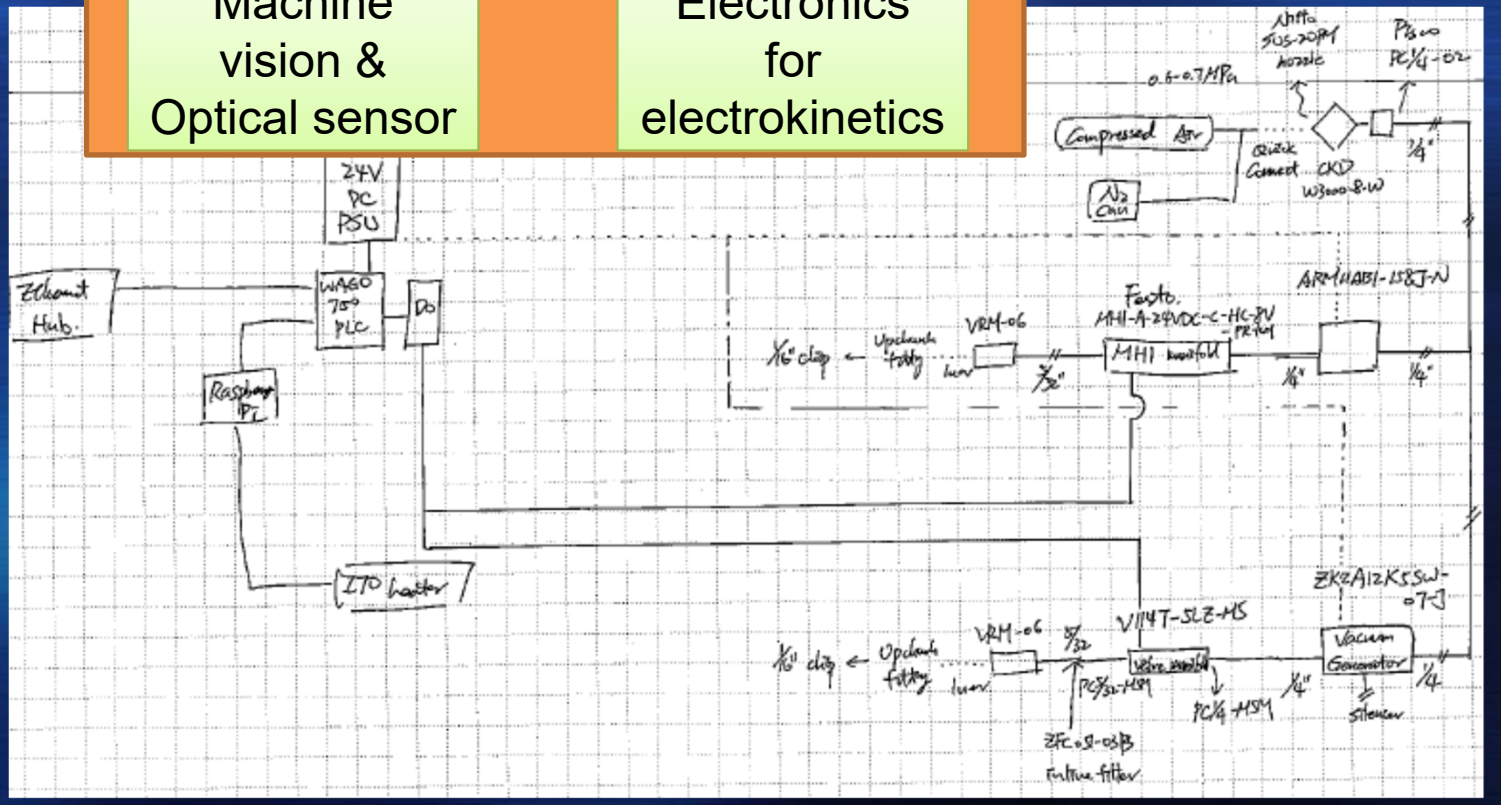
regulator

Microfluidic chip

Machine vision & Optical sensor

Electronics for electrokinetics

Portable Pressure source



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An open-electronics temperature controller

- Arduino powered temperature controller
  - MAX31855 thermocouple amplifier
  - 0.25°C resolution
- Python based control GUI for PC and mac.
- Utilize Python, PyQT4, Pyqtgraph, lxml, numpy
- Fast plotting from Pyqtgraph and Numpy.
- Features direct control with fuzziness and PID mode.
- Supporting K type thermocouple (one-wire sensor, IR thermopile etc)
- Transparent ITO heaters with 12V or 24V PSU

Code: (current)
Python:496 lines
Arduino:138lines

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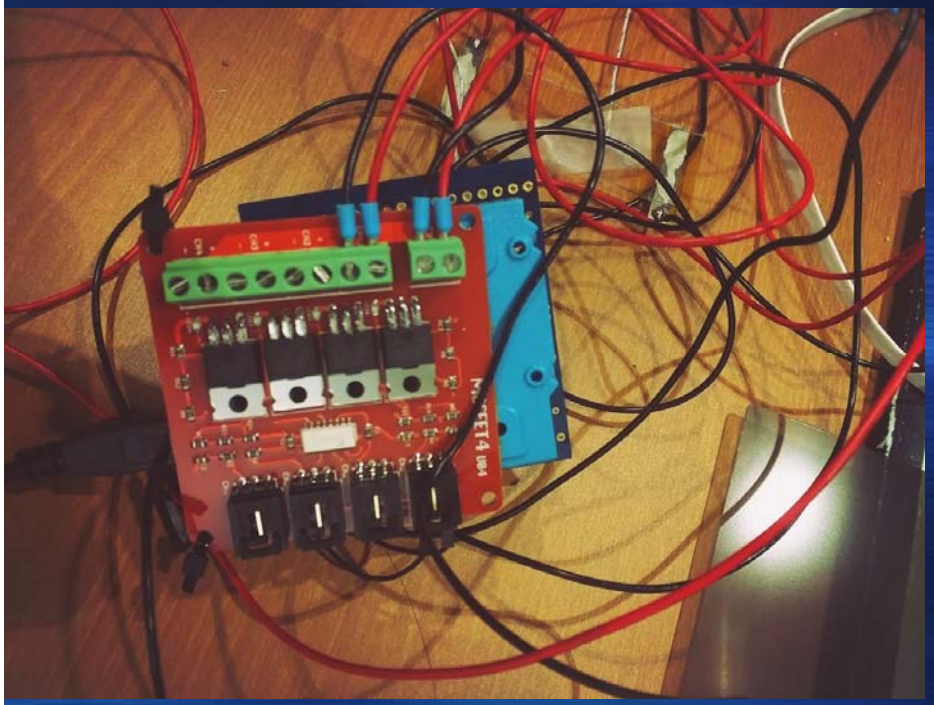
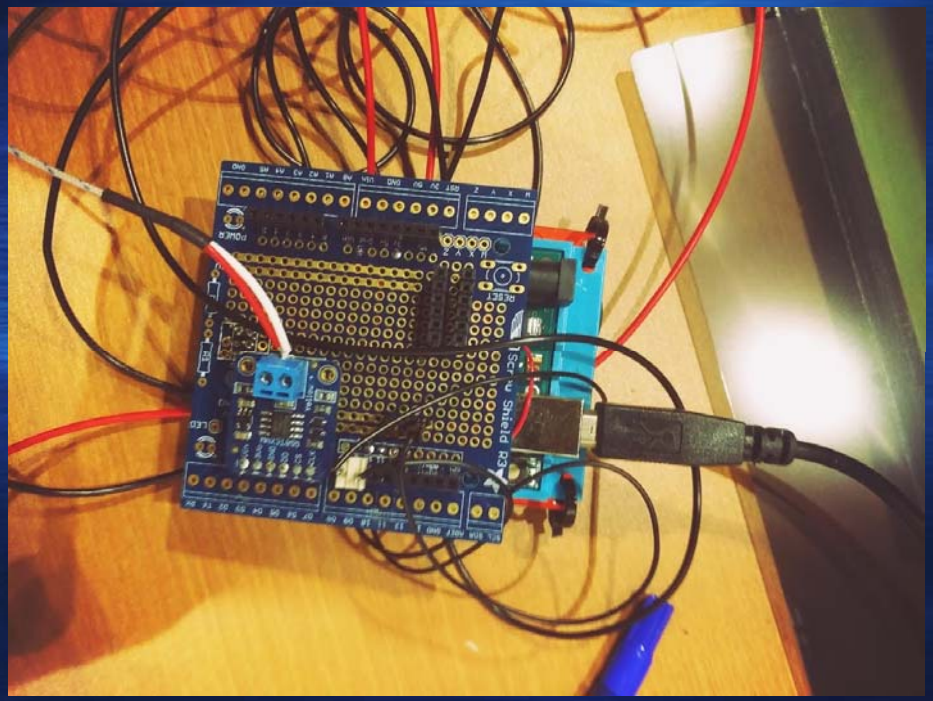
Photo of the Arduino board





MOSFET to heater

Thermocouple amplifier

Arduino UNO Logic processing

Serial comm

PC

Python GUI

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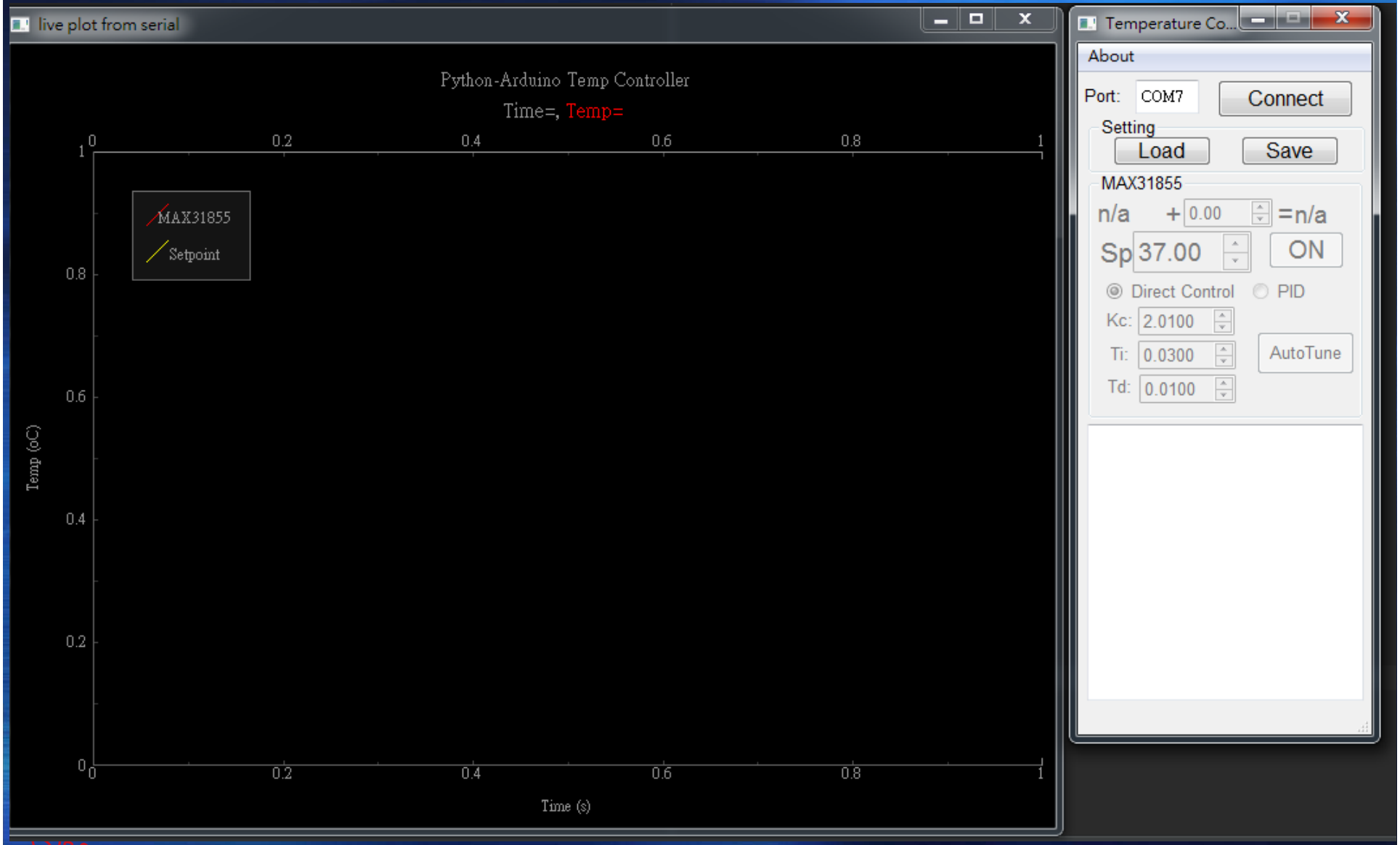
live plot from serial
Python-Arduino Temp Controller
Time=, Temp=
MAX31855
Setpoint
Temp (oC)
Time (s)
0
0.2
0.4
0.6
0.8
1
Temperature Co...
About
Port:
COM7
Connect
Setting
Load
Save
MAX31855
n/a
+
0.00
=n/a
Sp
37.00
ON
Direct Control
PID
Kc:
2.0100
Ti:
0.0300
Td:
0.0100
AutoTune

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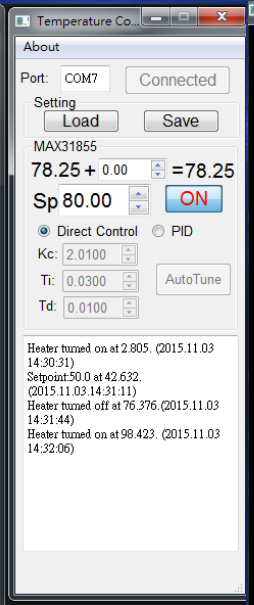
Fuzziness in direct heating decreases oscillation

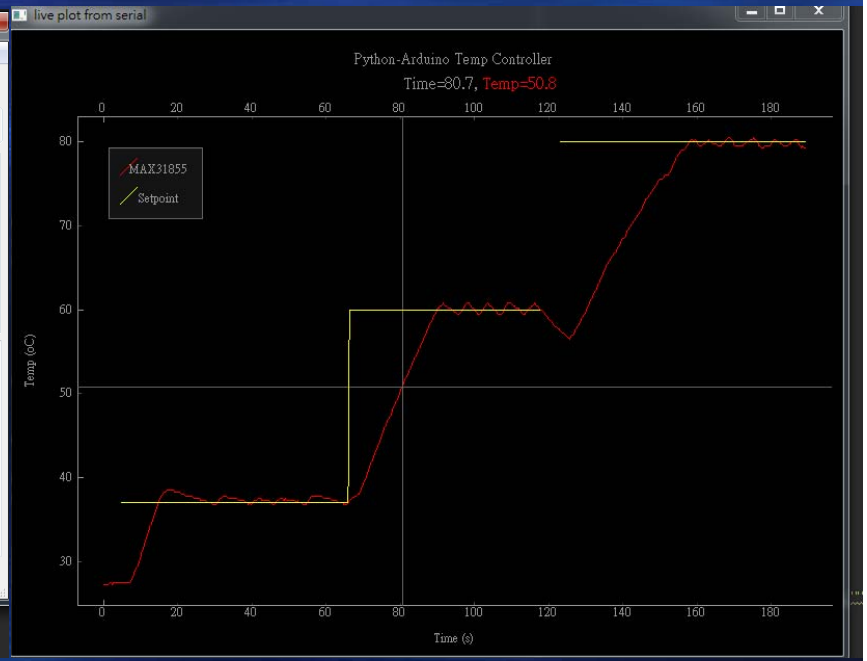
With fuzziness code

- PWM output modulated as temp closes to setpoint
- No overshoot
- Less oscillation

Simple control

- Simple yes or no logic control
- Have oscillation though less significant at high temperature





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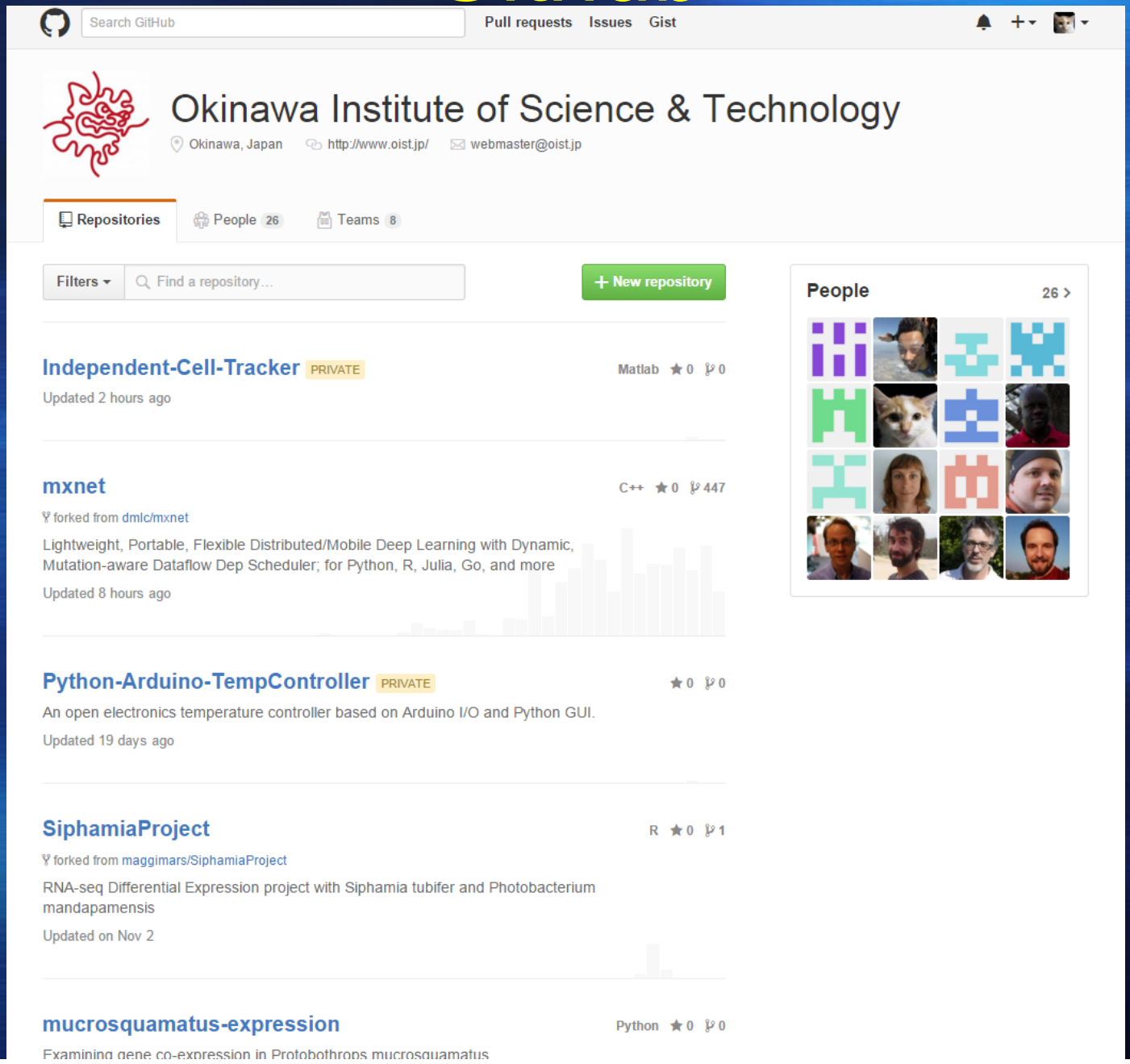
Github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