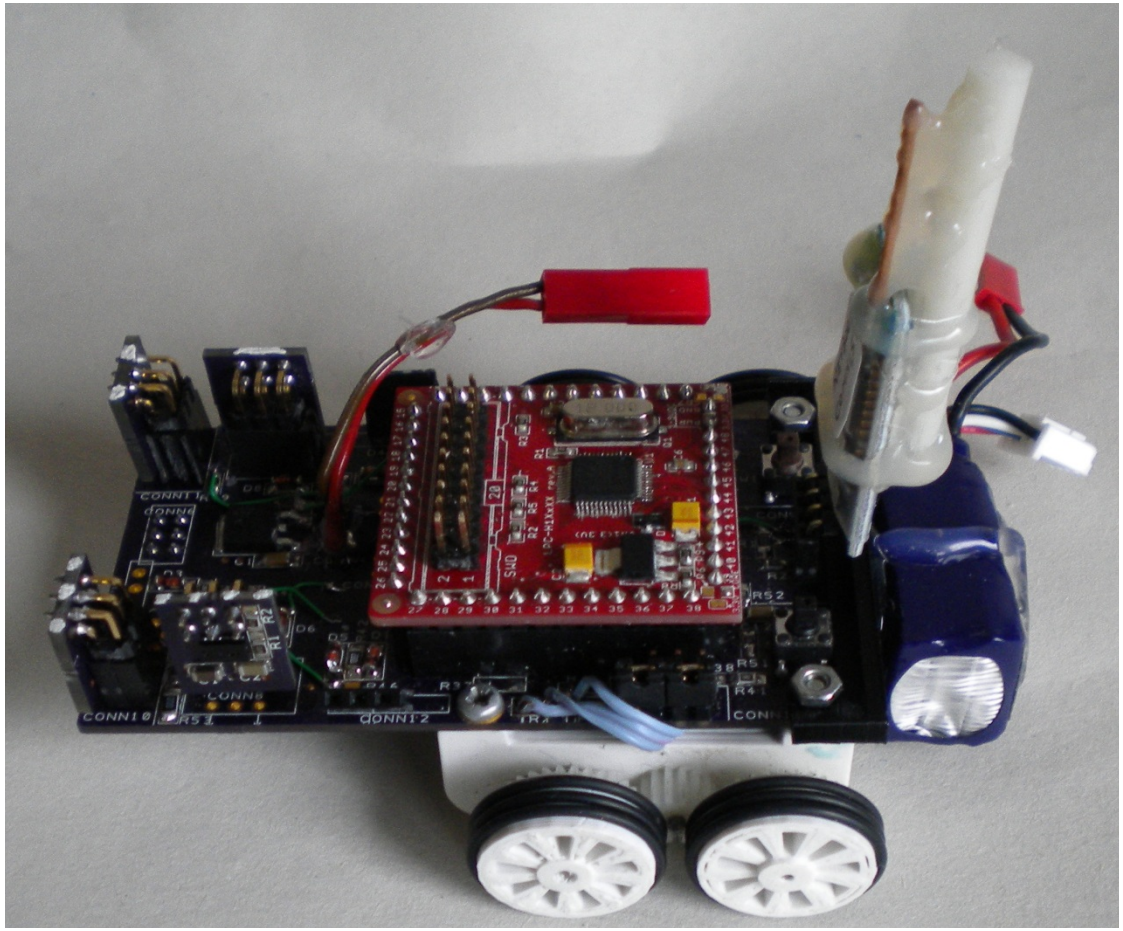
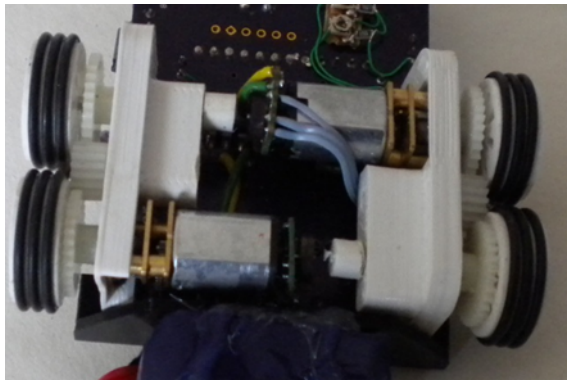
# Duncan's EFT



# Easy, Fast Turtle

- First attempt at a four-wheel mouse
- IET triathlon compatible motors
- My established analogue motor drives
- Hamamatsu digital sensors
- Bluetooth comms
- Olimex ARM board to avoid soldering problems
- VL6180X time of flight sensors

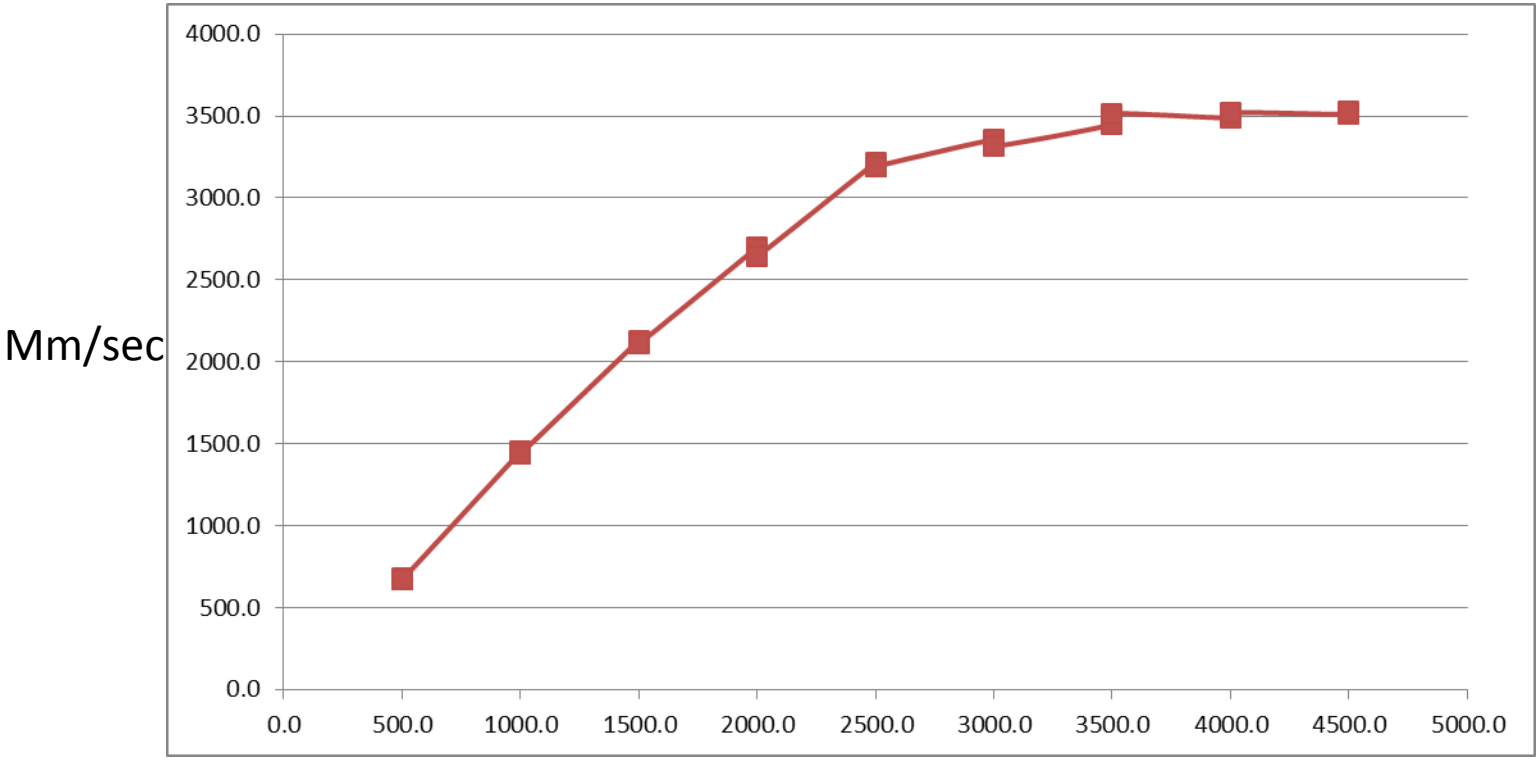
# Effective Fancy Traction



- 10:1 motors with magnetic encoders
- Four wheels geared in pairs
- 3D printed wheels trued up on lathe
- Three O rings per wheel for tyres
- 3D printed side chassis. Shaft holes drilled on mill.

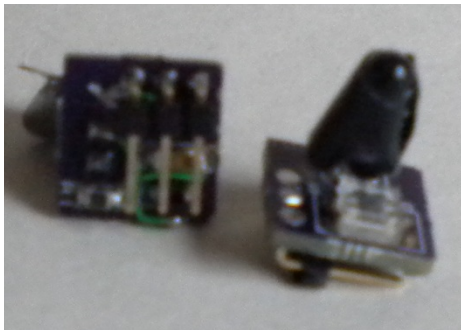
# Electronic Friendly Technology

- The drive electronics worked well.
- Useful to about 3 metres/second



# Effortless Favourite Technique

- Hamamatsu sensors with amplified LED drive
- “Presence” sensors for line markers and walls
- Pluggable for IET triathlon
- Spaces for six Hamamatsu sensors. Never more than four in use at a time.



# Elegant File Transfer

- Bluetooth module for comms
- 9600 baud
- Can download new flash image via comms
- Modified aerial for stronger signals

# Evaluating Flight Time

- VL6180X time of flight laser sensor
- I2C interface
- Complex beast with lots of registers!



Table 25. Register summary

| Offset | Register name | Reference |
|---|---|---|
| 0x000 | IDENTIFICATION__MODEL_ID | Section 6.2.1 on page 43 |
| 0x001 | IDENTIFICATION__MODEL_REV_MAJOR | Section 6.2.2 on page 43 |
| 0x002 | IDENTIFICATION__MODEL_REV_MINOR | Section 6.2.3 on page 43 |
| 0x003 | IDENTIFICATION__MODULE_REV_MAJOR | Section 6.2.4 on page 44 |
| 0x004 | IDENTIFICATION__MODULE_REV_MINOR | Section 6.2.5 on page 44 |
| 0x006 | IDENTIFICATION__DATE_HI | Section 6.2.6 on page 44 |
| 0x007 | IDENTIFICATION__DATE_LO | Section 6.2.7 on page 45 |
| 0x008:0x009 | IDENTIFICATION__TIME | Section 6.2.8 on page 45 |
| 0x010 | SYSTEM__MODE_GPIO0 | Section 6.2.9 on page 46 |
| 0x011 | SYSTEM__MODE_GPIO1 | Section 6.2.10 on page 47 |
| 0x012 | SYSTEM__HISTORY_CTRL | Section 6.2.11 on page 48 |
| 0x014 | SYSTEM__INTERRUPT_CONFIG_GPIO | Section 6.2.12 on page 49 |
| 0x015 | SYSTEM__INTERRUPT_CLEAR | Section 6.2.13 on page 49 |
| 0x016 | SYSTEM__FRESH_OUT_OF_RESET | Section 6.2.14 on page 50 |
| 0x017 | SYSTEM__GROUPED_PARAMETER_HOLD | Section 6.2.15 on page 50 |
| 0x018 | SYSRANGE__START | Section 6.2.16 on page 51 |
| 0x019 | SYSRANGE__THRESH_HIGH | Section 6.2.17 on page 51 |
| 0x01A | SYSRANGE__THRESH_LOW | Section 6.2.18 on page 52 |
| 0x01B | SYSRANGE__INTERMEASUREMENT_PERIOD | Section 6.2.19 on page 52 |
| 0x01C | SYSRANGE__MAX_CONVERGENCE_TIME | Section 6.2.20 on page 52 |
| 0x01E | SYSRANGE__CROSSTALK_COMPENSATION_RATE | Section 6.2.21 on page 53 |
| 0x021 | SYSRANGE__CROSSTALK_VALID_HEIGHT | Section 6.2.22 on page 53 |
| 0x022 | SYSRANGE__EARLY_CONVERGENCE_ESTIMATE | Section 6.2.23 on page 53 |
| 0x024 | SYSRANGE__PART_TO_PART_RANGE_OFFSET | Section 6.2.24 on page 54 |
| 0x025 | SYSRANGE__RANGE_IGNORE_VALID_HEIGHT | Section 6.2.25 on page 54 |
| 0x026 | SYSRANGE__RANGE_IGNORE_THRESHOLD | Section 6.2.26 on page 54 |
| 0x02C | SYSRANGE__MAX_AMBIENT_LEVEL_MULT | Section 6.2.27 on page 55 |
| 0x02D | SYSRANGE__RANGE_CHECK_ENABLES | Section 6.2.27 on page 55 |
| 0x02E | SYSRANGE__VHV_RECALIBRATE | Section 6.2.29 on page 56 |
| 0x031 | SYSRANGE__VHV_REPEAT_RATE | Section 6.2.30 on page 56 |
| 0x038 | SYSALS__START | Section 6.2.31 on page 57 |
| 0x03A | SYSALS__THRESH_HIGH | Section 6.2.32 on page 57 |
| 0x03C | SYSALS__THRESH_LOW | Section 6.2.33 on page 58 |



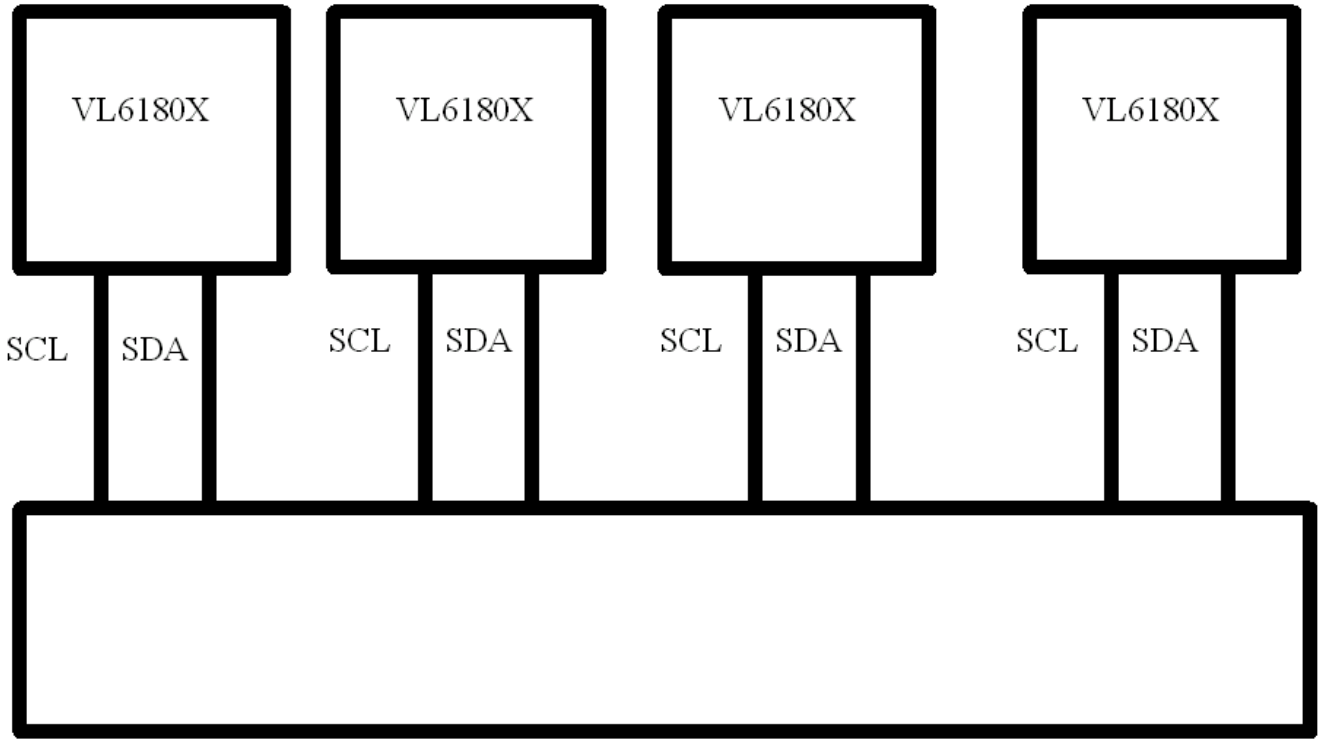
Table 25. Register summary (continued)

| Offset | Register name | Reference |
|---|---|---|
| 0x03E | SYSALS__INTERMEASUREMENT_PERIOD | Section 6.2.34 on page 58 |
| 0x03F | SYSALS__ANALOGUE_GAIN | Section 6.2.35 on page 59 |
| 0x040 | SYSALS__INTEGRATION_PERIOD | Section 6.2.36 on page 59 |
| 0x04D | RESULT__RANGE_STATUS | Section 6.2.37 on page 60 |
| 0x04E | RESULT__ALS_STATUS | Section 6.2.38 on page 61 |
| 0x04F | RESULT__INTERRUPT_STATUS_GPIO | Section 6.2.39 on page 62 |
| 0x050 | RESULT__ALS_VAL | Section 6.2.40 on page 62 |
| 0x052:0x060 (0x2) | RESULT__HISTORY_BUFFER_x | Section 6.2.41 on page 63 |
| 0x062 | RESULT__RANGE_VAL | Section 6.2.42 on page 64 |
| 0x064 | RESULT__RANGE_RAW | Section 6.2.43 on page 64 |
| 0x066 | RESULT__RANGE_RETURN_RATE | Section 6.2.44 on page 64 |
| 0x068 | RESULT__RANGE_REFERENCE_RATE | Section 6.2.45 on page 65 |
| 0x06C | RESULT__RANGE_RETURN_SIGNAL_COUNT | Section 6.2.46 on page 65 |
| 0x070 | RESULT__RANGE_REFERENCE_SIGNAL_COUNT | Section 6.2.47 on page 66 |
| 0x074 | RESULT__RANGE_RETURN_AMB_COUNT | Section 6.2.48 on page 66 |
| 0x078 | RESULT__RANGE_REFERENCE_AMB_COUNT | Section 6.2.49 on page 66 |
| 0x07C | RESULT__RANGE_RETURN_CONV_TIME | Section 6.2.50 on page 67 |
| 0x080 | RESULT__RANGE_REFERENCE_CONV_TIME | Section 6.2.51 on page 67 |
| 0x10A | READOUT__AVERAGING_SAMPLE_PERIOD | Section 6.2.52 on page 67 |
| 0x119 | FIRMWARE__BOOTUP | Section 6.2.52 on page 67 |
| 0x120 | FIRMWARE__RESULT_SCALER | Section 6.2.53 on page 68 |
| 0x212 | I2C_SLAVE__DEVICE_ADDRESS | Section 6.2.55 on page 68 |
| 0x2A3 | INTERLEAVED_MODE__ENABLE | Section 6.2.56 on page 69 |

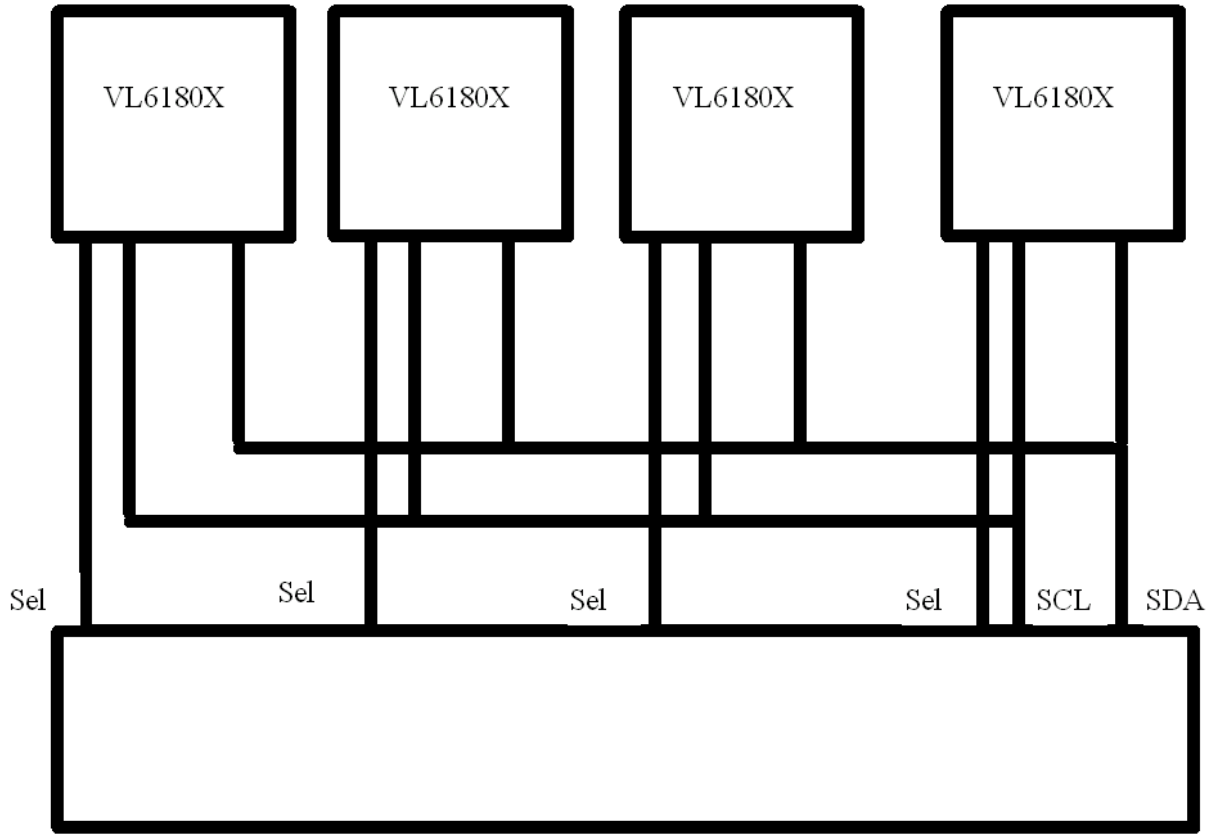
# Extra Fiddly Transfers?

- I2C is quite slow (400kHz)
- 80uS to read or write a byte
- 4 sensors wanted

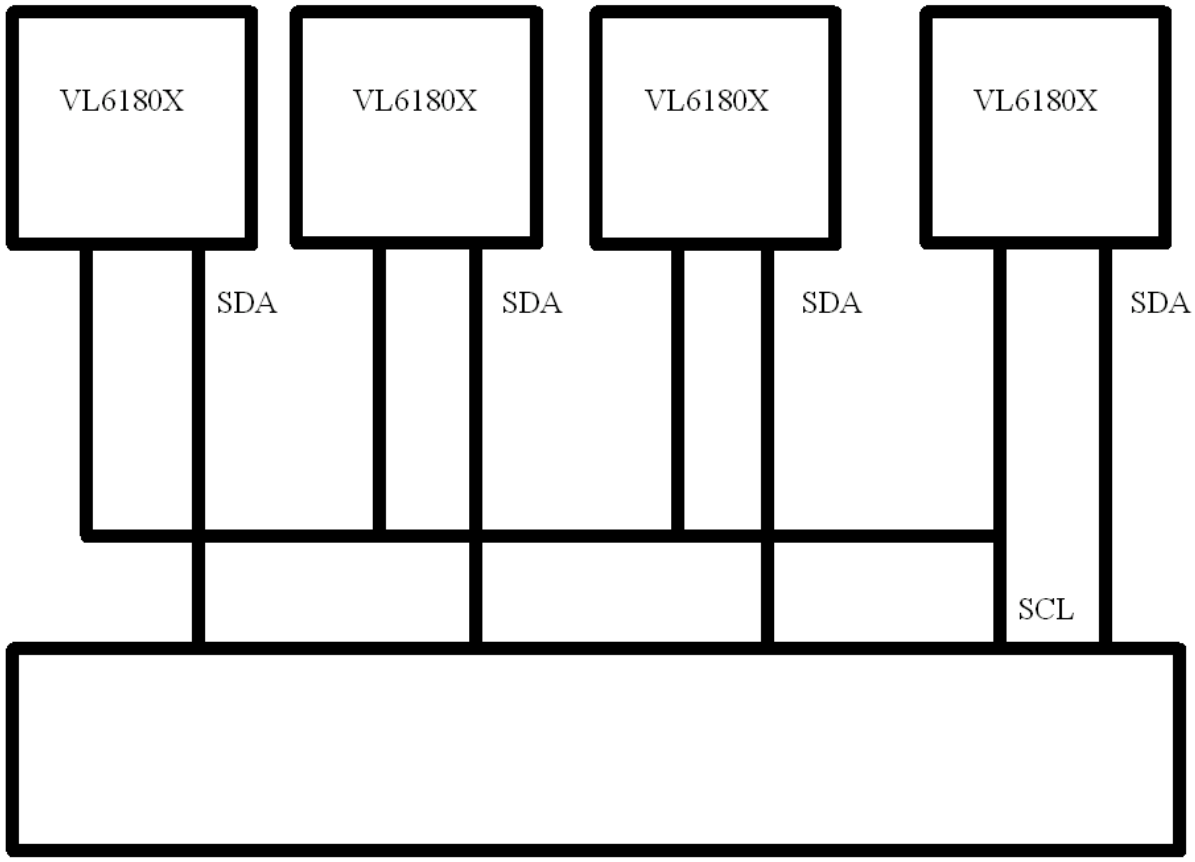
# Each of Four Things



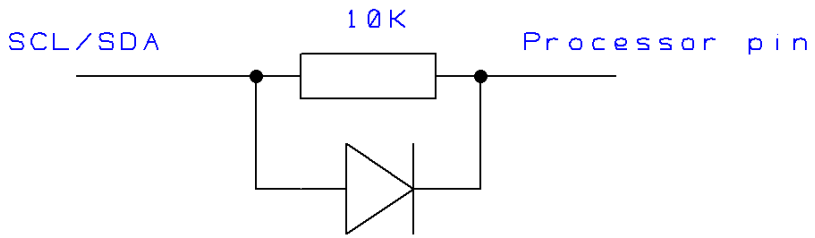
# Expected Four Trick



# Even Faster Triumph



# Easy-Fix Touch



# Evaluate Final Treatment

# Endless (expletive deleted) Trouble

- The Olimex board was a pain to design a PCB for.
- I thoughtlessly had a +5V next to a signal line.
- I ended up hand soldering LPC1115 QFP48s three times after letting the magic smoke out.

# Why Duncan's EFT?

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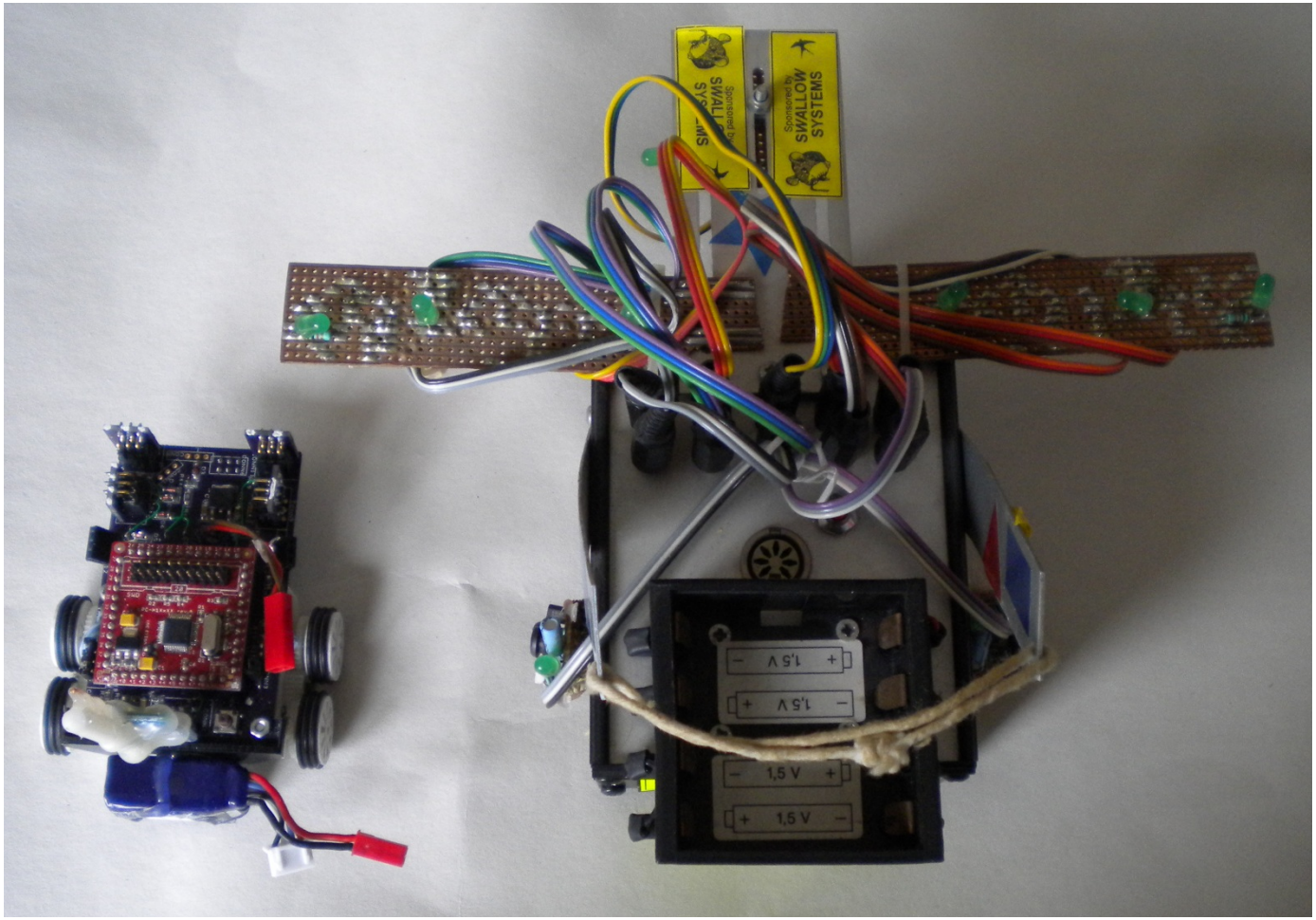
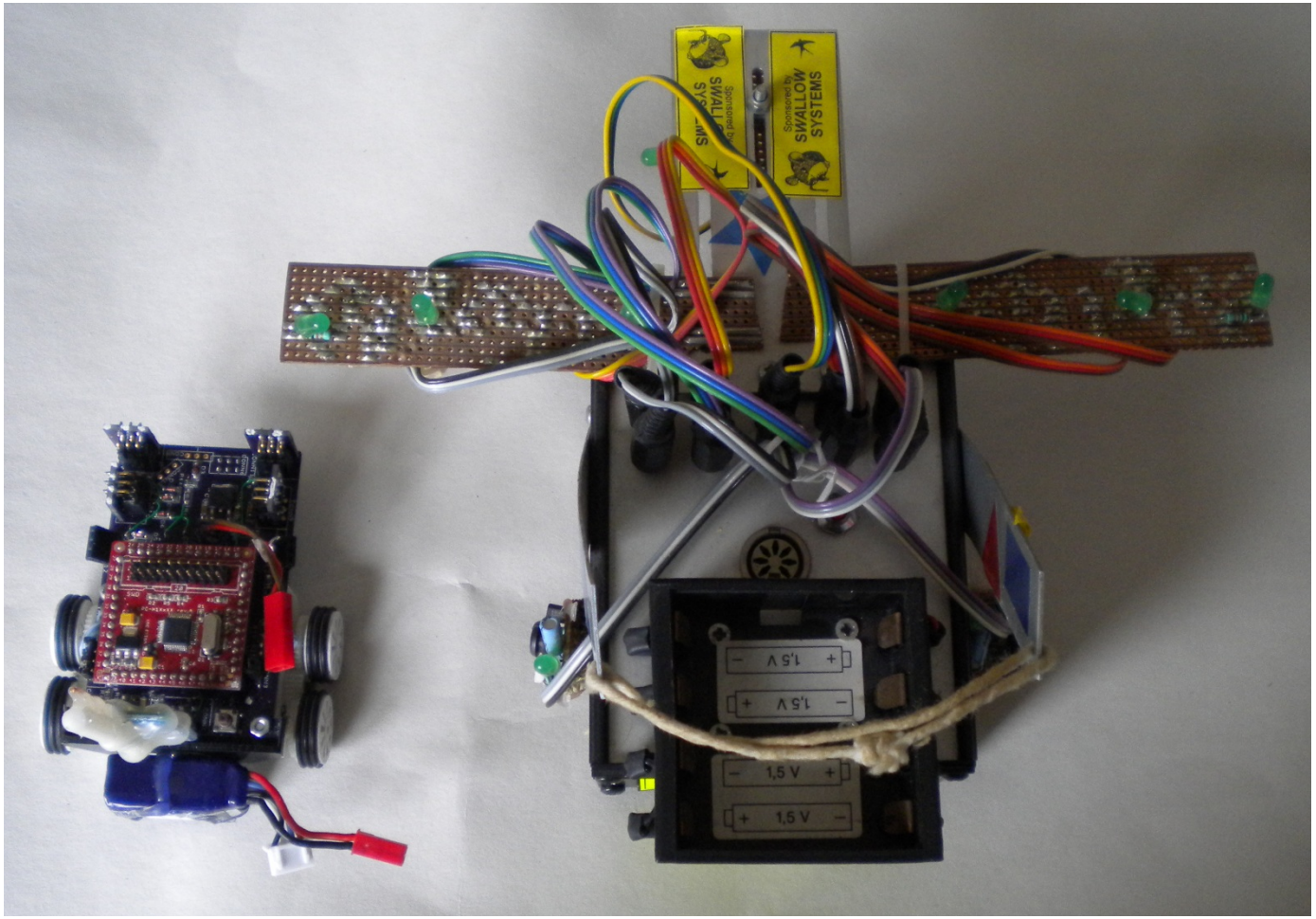



Compared to my first maze-solver

# Why Duncan's EFT?




It is my newt.