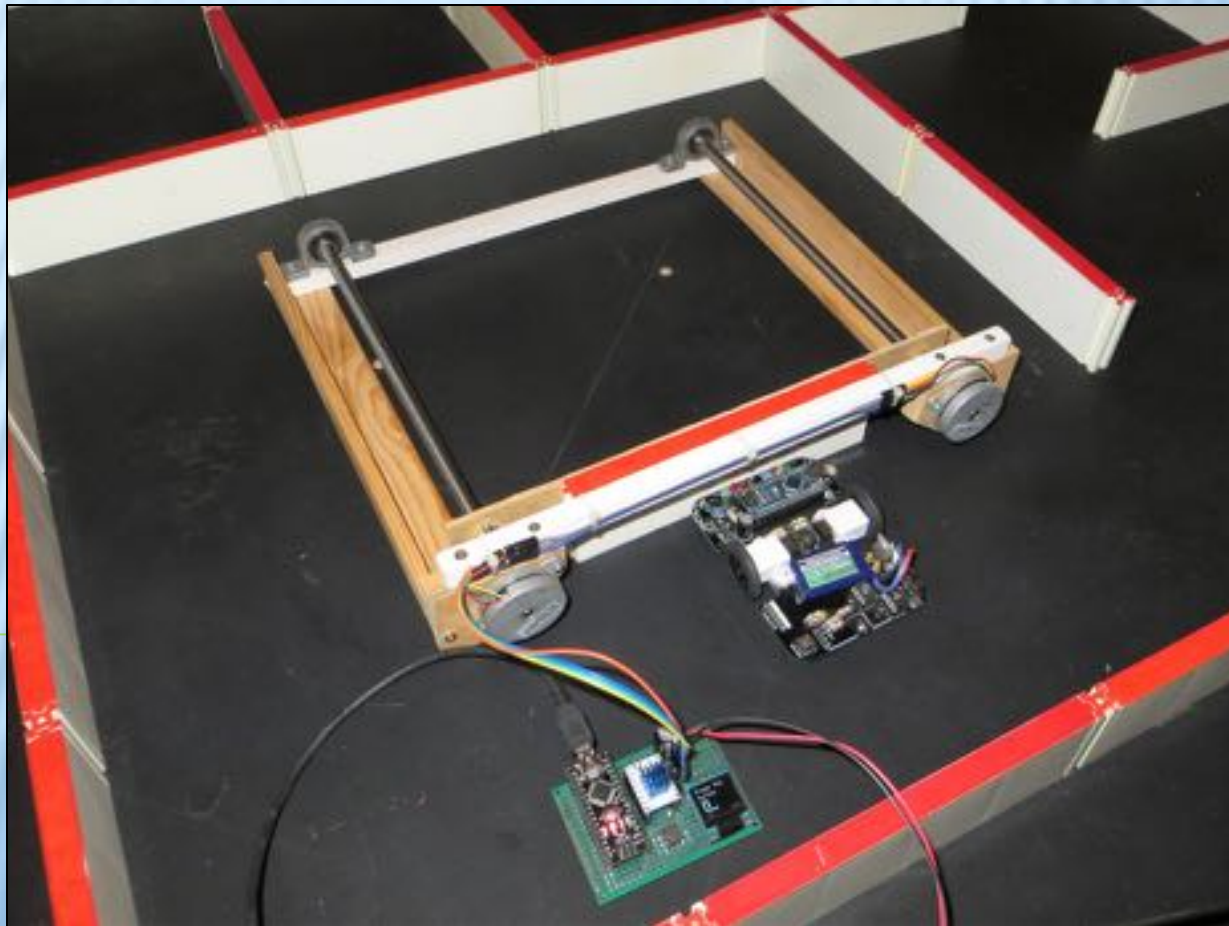


The Calibration Thingy

(a diagnostic tool)

By Derek Hall

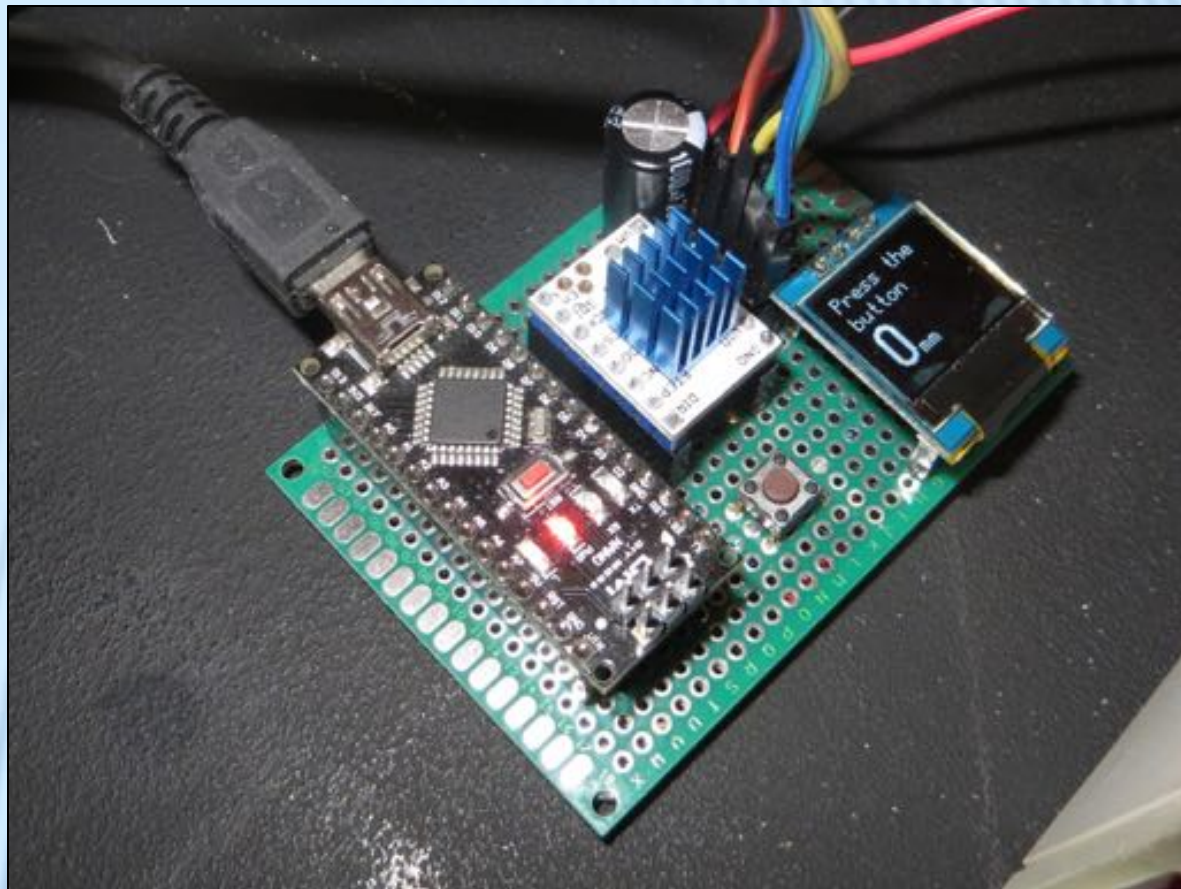
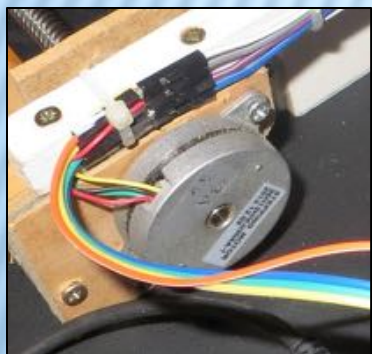
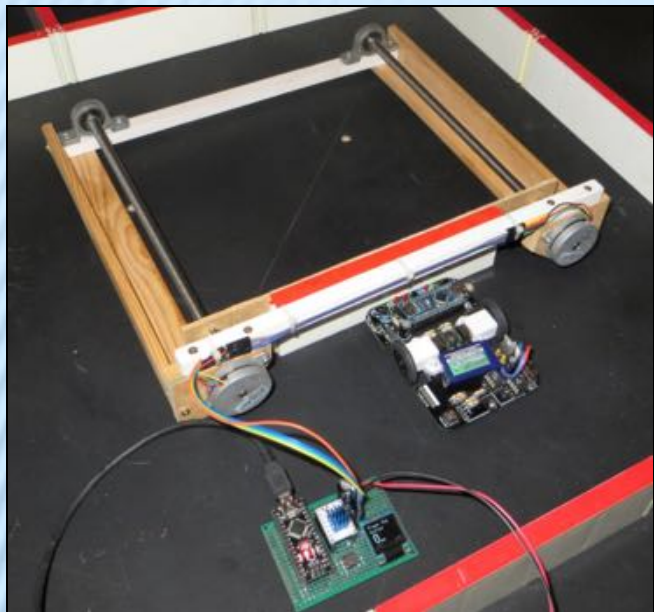
1. The Purpose of the Calibration Thingy.
2. How it was Constructed.
3. Using the Device.
4. Analysing and Using the Results.



1. The Purpose of the Calibration Thingy

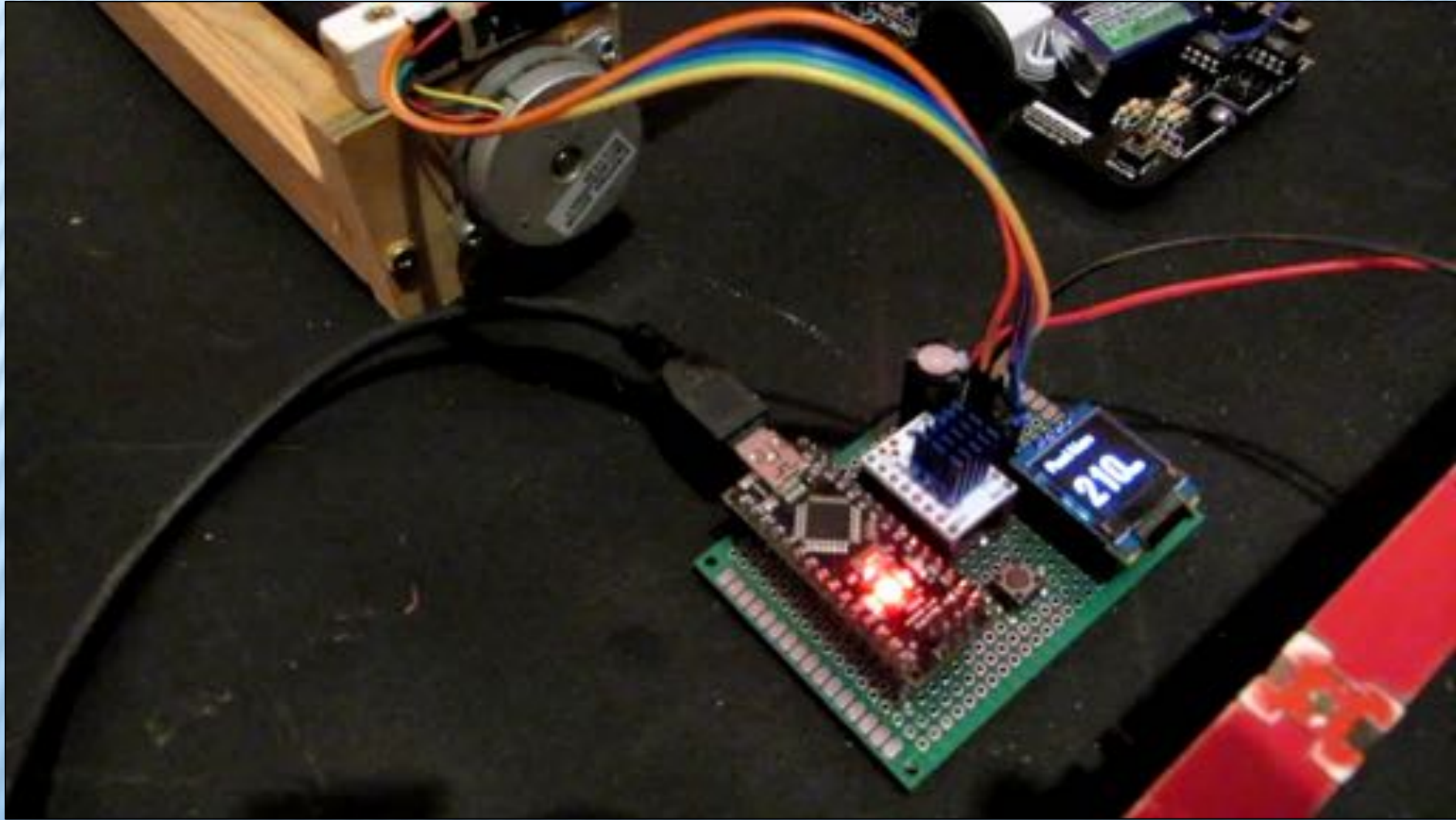
- Understanding in detail what the sensors are seeing.
- Record readings precisely with multiple wall positioning.
- A portable unit that can be placed in any maze.
- Enable precise calibration of mouse wall sensors.
- Compare detailed and graphed sensors readings for different lighting, wall & base types.

2. How it was Constructed

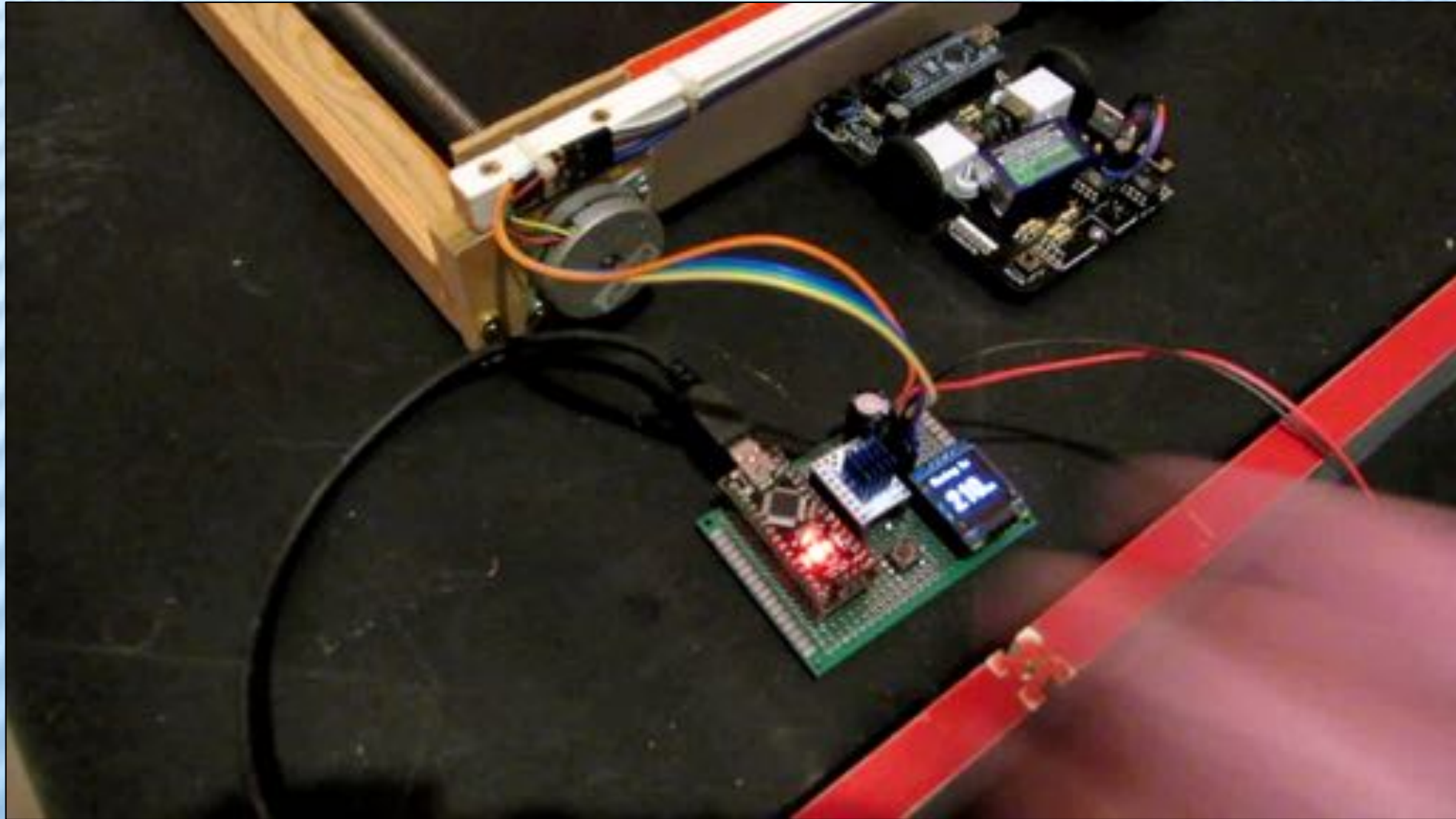


Arduino Nano
.9° Stepper motors x 2
Lead screw gears x 2
OLED Display
TRINAMIC TMC2130 Stepper driver

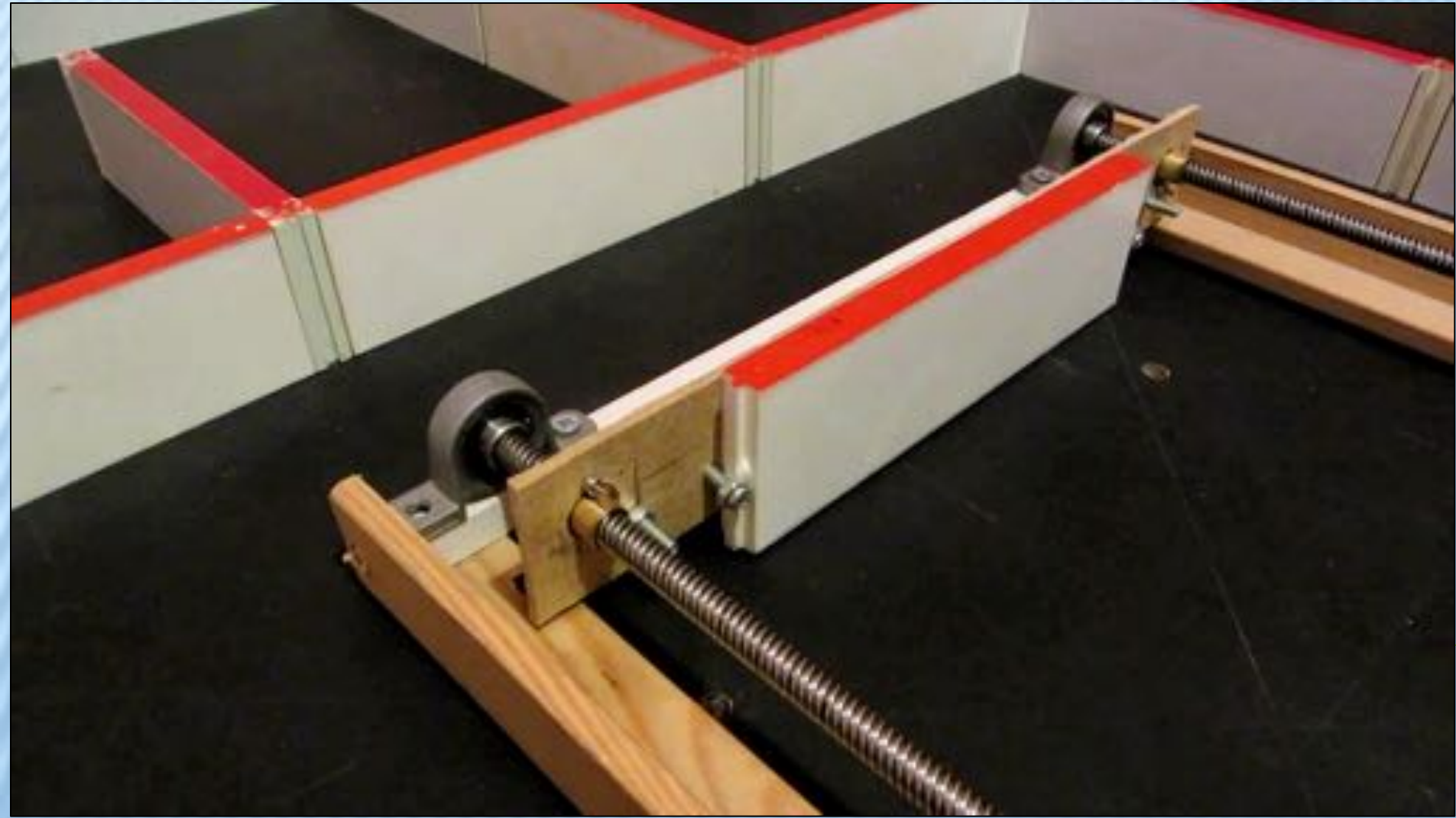
Setting the zero position for calibrating the front sensor



Setting the distance of the wall to 210mm



Moving the wall 1mm at a time

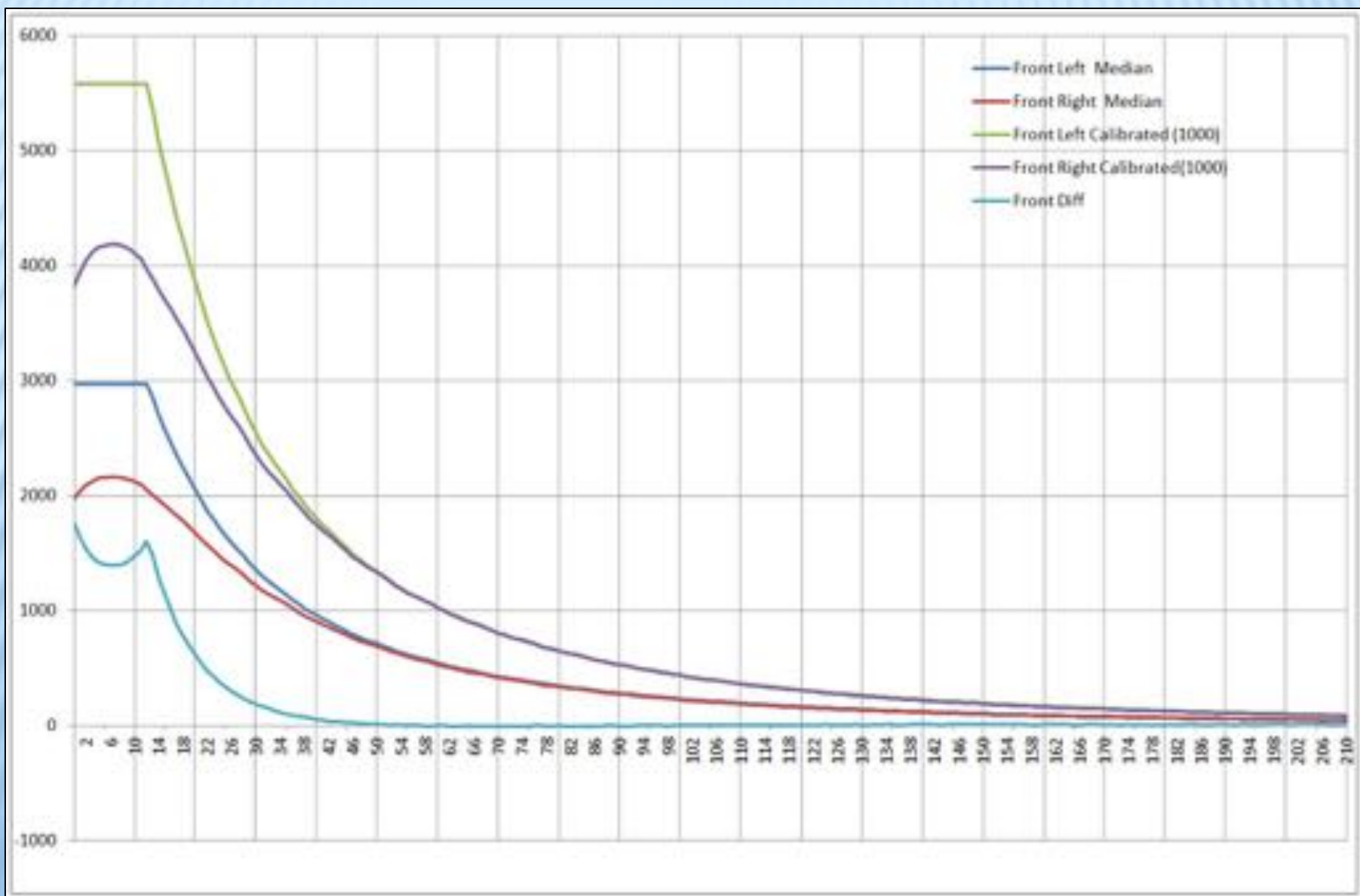


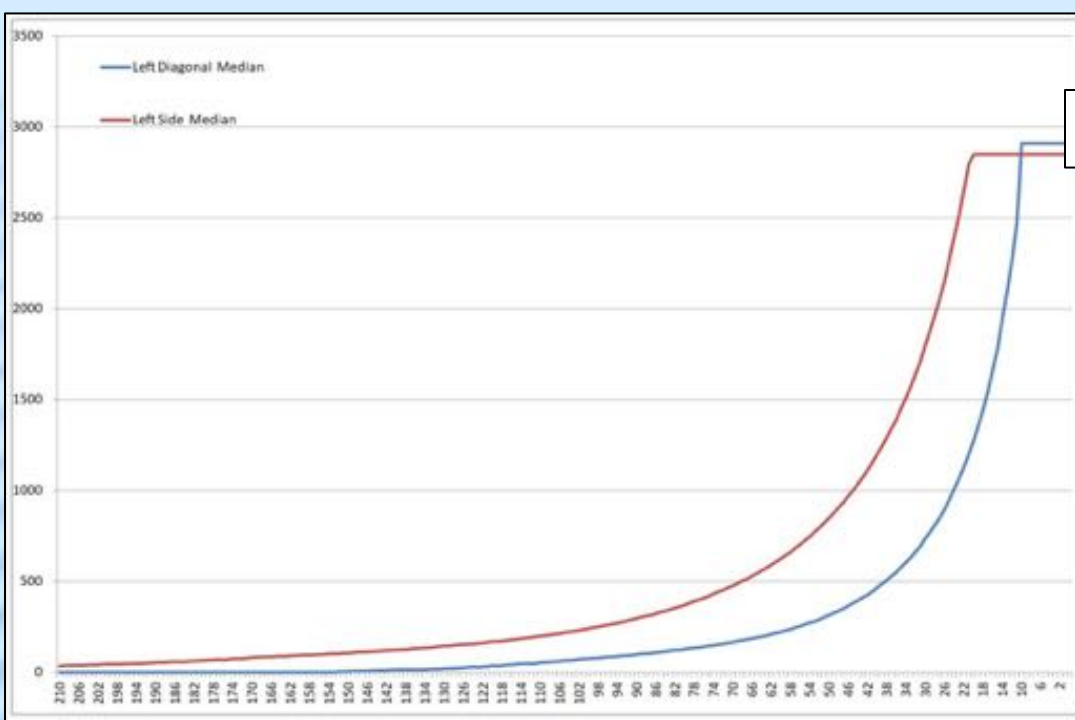
PC interface control sheet

The screenshot shows a Microsoft Excel spreadsheet with the following sections:

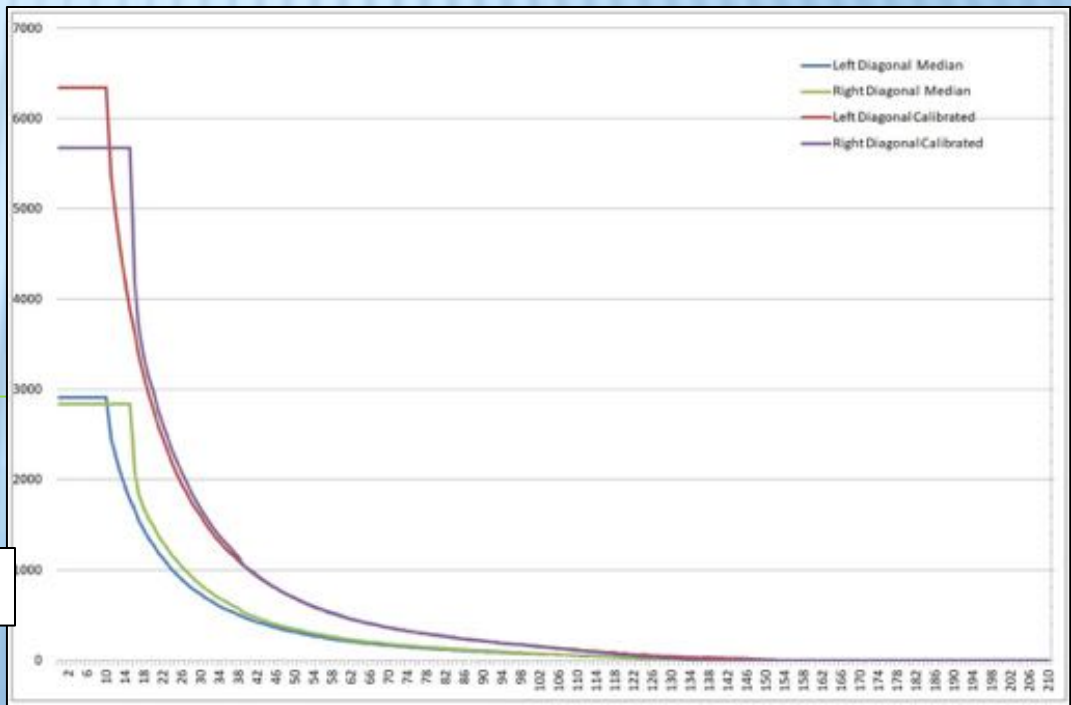
- Mouse controls:** A table with columns 'Open' and 'Close', and rows for 'Start', 'Stop', and 'Reset'.
- Thing controls:** A table with columns 'Open the thing' and 'Close the thing', and a 'Reset worksheet' button.
- Position:** A table with columns 'Normal', 'Car1', and 'Car2', and rows for '1000', '500', and '500'.
- Data Table:** A large table with columns: 'mm', 'Front Left', 'Front Right', 'Min', 'Max', 'Diff', 'Average Front Left', 'Front Left', and 'Front Right'. Rows 9 through 36 contain numerical data for each of these categories.

mm	Front Left	Front Right	Min	Max	Diff	Average Front Left	Front Left	Front Right
200	48	49	48	49	1	48.5	48	49
201	49	48	48	49	1	48.5	49	48
202	50	48	50	49	1	49.5	50	48
203	50	50	50	50	0	50	50	50
204	51	50	51	50	1	50.5	51	50
205	52	50	52	50	2	51	52	50
206	52	51	52	51	1	51.5	52	51
207	53	51	53	51	2	52	53	51
208	53	52	53	52	1	52.5	53	52
209	54	52	54	52	2	53	54	52
210	54	53	54	53	1	53.5	54	53
211	55	53	55	53	2	54	55	53
212	55	54	55	54	1	54.5	55	54
213	56	54	56	54	2	55	56	54
214	56	55	56	55	1	55.5	56	55
215	57	55	57	55	2	56	57	55
216	57	56	57	56	1	56.5	57	56
217	58	56	58	56	2	57	58	56
218	58	57	58	57	1	57.5	58	57
219	59	57	59	57	2	58	59	57
220	59	58	59	58	1	58.5	59	58
221	60	58	60	58	2	59	60	58
222	60	59	60	59	1	59.5	60	59
223	61	59	61	59	2	60	61	59
224	61	60	61	60	1	60.5	61	60
225	62	60	62	60	2	61	62	60
226	62	61	62	61	1	61.5	62	61
227	63	61	63	61	2	62	63	61
228	63	62	63	62	1	62.5	63	62
229	64	62	64	62	2	63	64	62
230	64	63	64	63	1	63.5	64	63
231	65	63	65	63	2	64	65	63
232	65	64	65	64	1	64.5	65	64
233	66	64	66	64	2	65	66	64
234	66	65	66	65	1	65.5	66	65
235	67	65	67	65	2	66	67	65
236	67	66	67	66	1	66.5	67	66



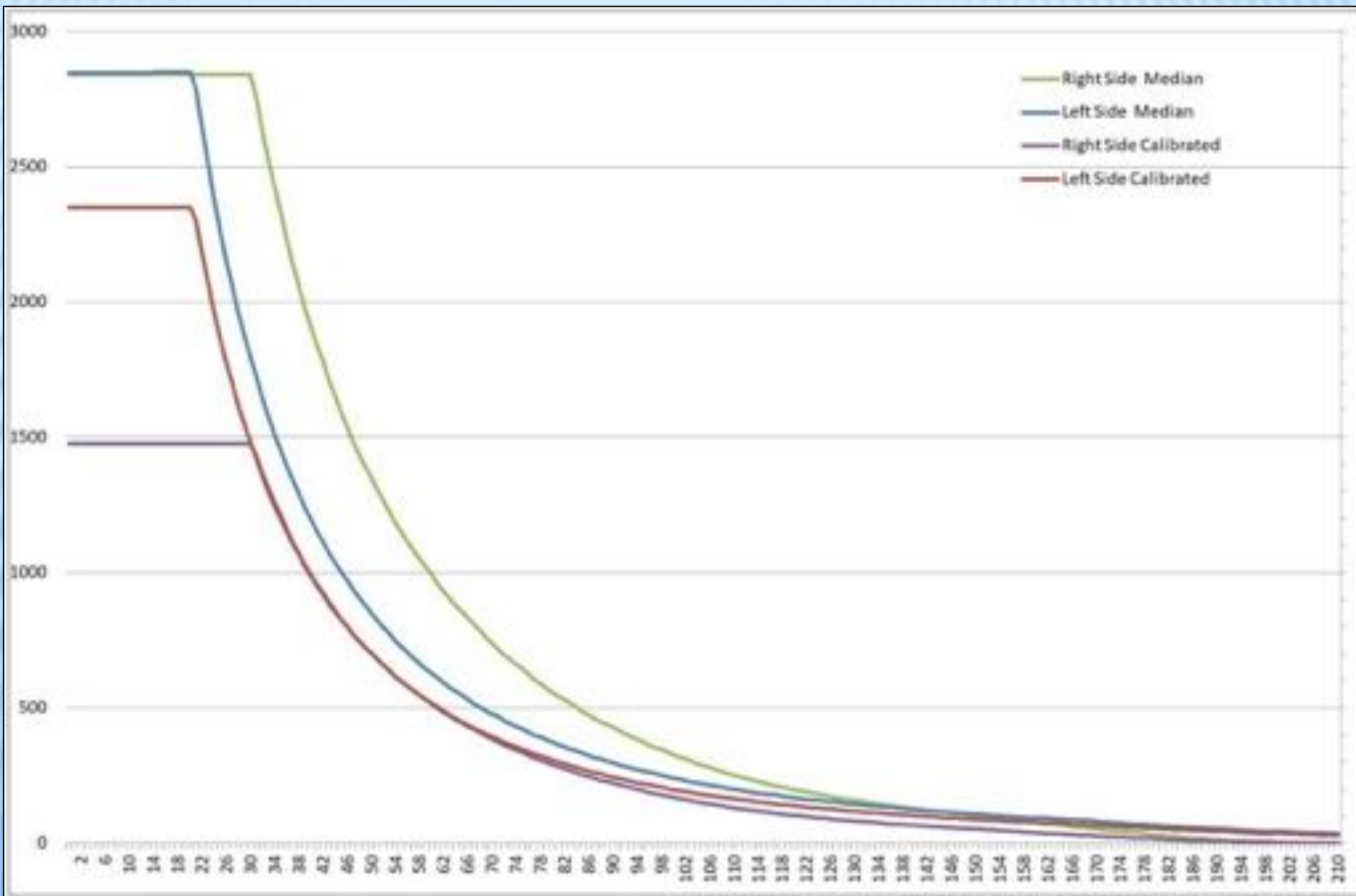


Here we can see....



Here we can see....

Affect of calibration

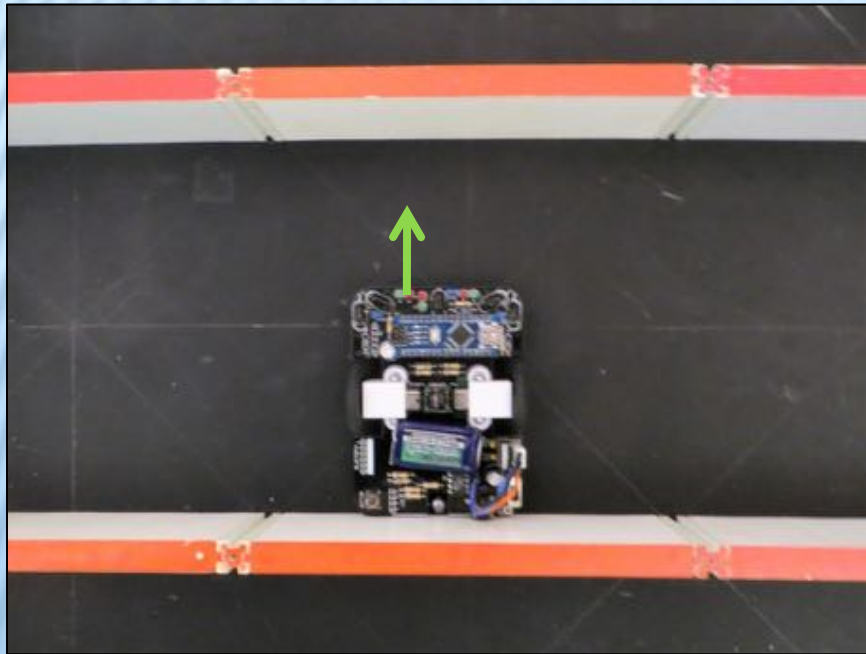


4. Analysing and Using the Results

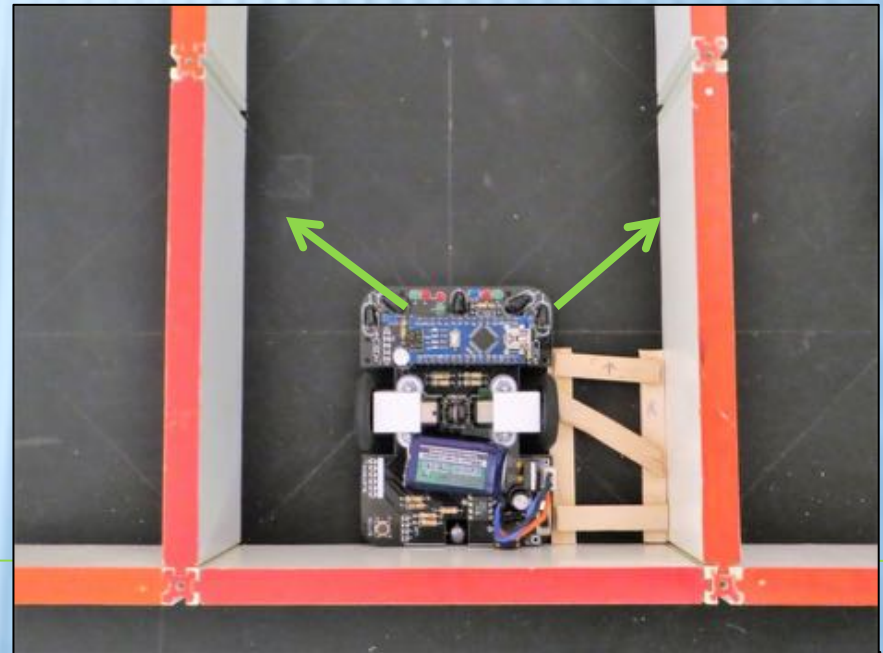
Removing sensor sensitivity issues by calibrating the sensors using the following formula:
$$\text{SENSOR VALUE} \times \text{NORMAL VALUE} \div \text{CALIBRATION VALUE}$$

The *sensor value* is the direct reading from the sensors.

The *normal value* is set at whatever you want it to be.



The *calibration value* for the front sensor is recorded from a front wall, with the mouse against the back wall.



The *calibration value* for the side sensors is set with the mouse in the centre of the corridor.

Summary

By using the formula: $\text{sensor value} \times \text{normal value} \div \text{calibration value}$, only a calibration value has to be determined in each new maze. Adjusting the scale means the “Calibration Thingy” is not required for each calibration as the recorded curve stays the same for each individual sensor.

