Test of Steering Wheel Sensor on Viking Race Car

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Contents

1 Introduction

The purpose of the experiment is to test the steering wheel sensor on Viking's race car. This involves measuring the voltage output of the sensor and correlating it to the angle of the steering wheel.

2 Setup and Execution of the Experiment

A connection has been made between the race car's steering wheel sensor and the test bench. The sensor is supplied with 5 V. The 5 V serves as a range where it is possible to read the position of the steering wheel on the scale between 0 V and 5 V. This value needs to be converted to an angle.

The probes have been calibrated to ensure accurate data collection. The data is sampled at a frequency of 2.5 Hz, with each sample being captured at an interval of 0.4 seconds[1]. The system has a resolution of 12 bits, allowing precise voltage readings. The oscilloscope model used for the experiment is a Rohde & Schwarz (exact model number to be added later).

The test setup involves the Zynq-based Master Controller, where we sample data at 2.5 Hz. The physical arrangement of the setup and materials is outlined in the following subsections.

2.1 Test Setup

The sensor is connected to the testbench instead of the X90 Master Controller.

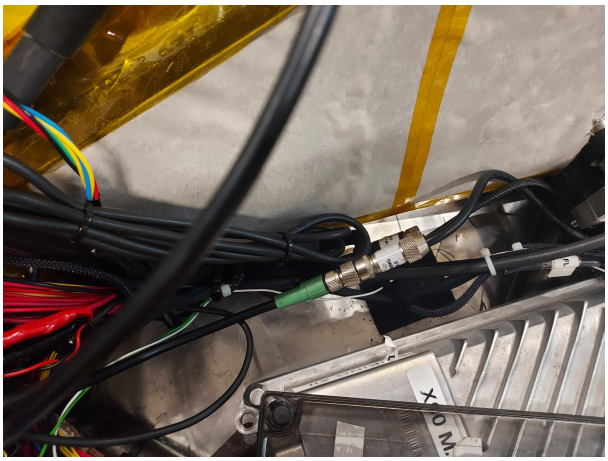


Figure 1: Connection between race car and testbench.

The testbench has a scope connected to allow for data collection.

[1]The sample rate is limited by the print speed in the terminal.

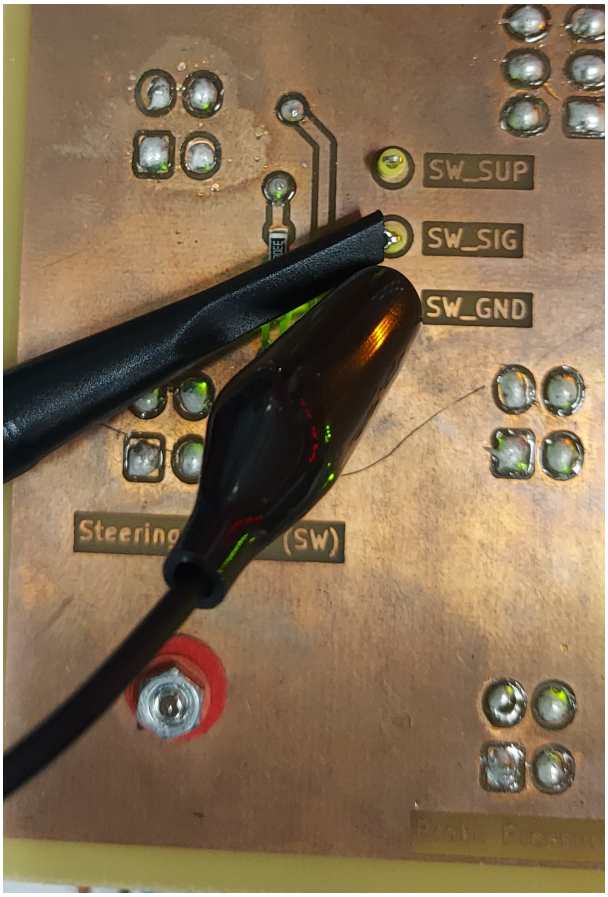
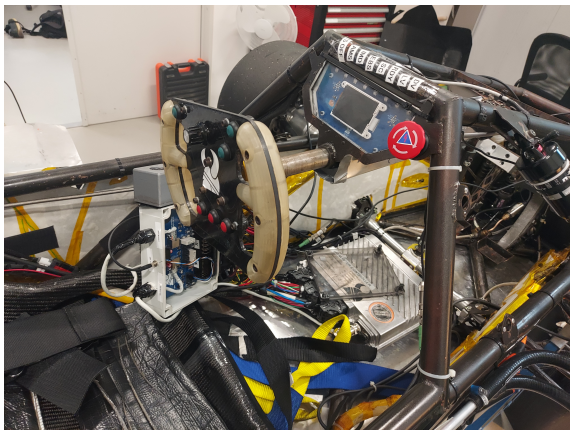
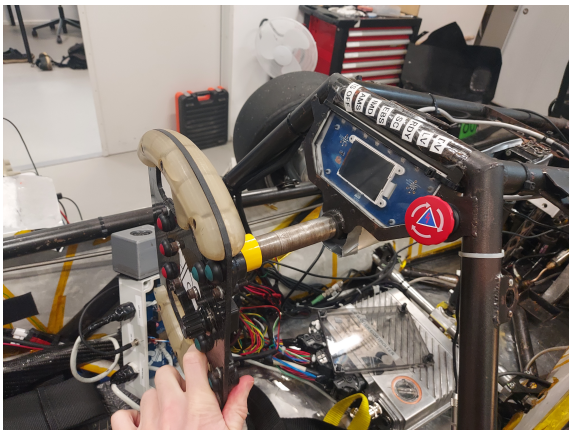


Figure 2: Circuit on the testbench.

The experiment was executed by moving the steering wheel from left to right (from rail to rail).



(a) Wheel at one angle.



(b) Wheel at another angle.

Figure 3: Results from voltage tests.

The materials used in this experiment include:

- Steering wheel sensor mounted in the Viking race car
- Cables for power and signal transmission

- Zynq-based Master Controller for data collection
- Rohde & Schwarz oscilloscope (model TBD) for voltage measurement

2.2 Sampling and Data Acquisition

We are sampling data at a rate of 2.5 Hz on the Zynq platform. The data is collected using the custom `mc_xADC` library, which is designed to read ADC values and convert them to voltage levels. These voltage values are then mapped to the corresponding steering angles in another abstraction layer in the Master Controller code.

3 Data Collection & Results

3.1 Data Collection

The data is collected with the purpose-built library `mc_xADC`. This library is capable of reading the ADC value and converting it to a voltage. The result regarding voltage collection can be seen in fig. 4.

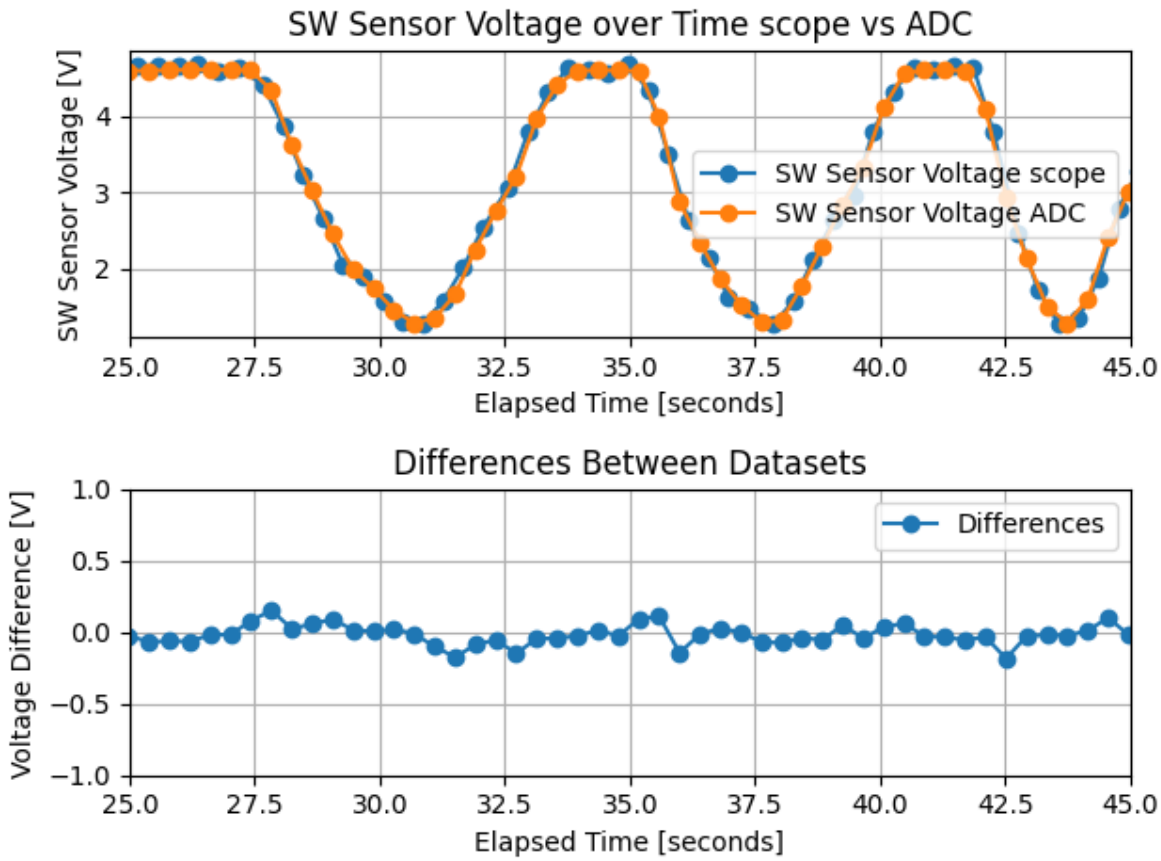


Figure 4: Result from voltage test.

3.2 Results

The collected data shows consistent readings between the measured voltage and the steering wheel's angle. While the voltage data was collected during the test, the angle will be calculated in another abstraction layer, not at the level of this test.

4 Conclusion

The experiment has shown that the sensor readout is working with the new Zynq-based Master Controller. The calibration of the probes and the overall test procedure provided consistent and precise data collection. The results demonstrate that the steering wheel sensor performs as expected and is suitable for integration into the Viking race car.