

3D Printer Based Open Source Calibration Platform for Whisker Sensors

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Introduction

- Whisker sensors are a type of tactile sensor increasingly used in robotics. [1]–[3]
- Calibration of sensors remains a cost prohibitive and time-consuming process. [1], [4], [5]
- We present a low-cost open-source calibration and testing platform for whisker sensors based on an off-the-shelf 3D printer

Hardware Components

- 3D Printer** A Prusa i3 (MK2) [6].
- Whisker Sensor Mount** secures the whisker onto the printer bed.
- Whisker Sensor** is of a similar design to [7].
- End Effector** a metal ruler.

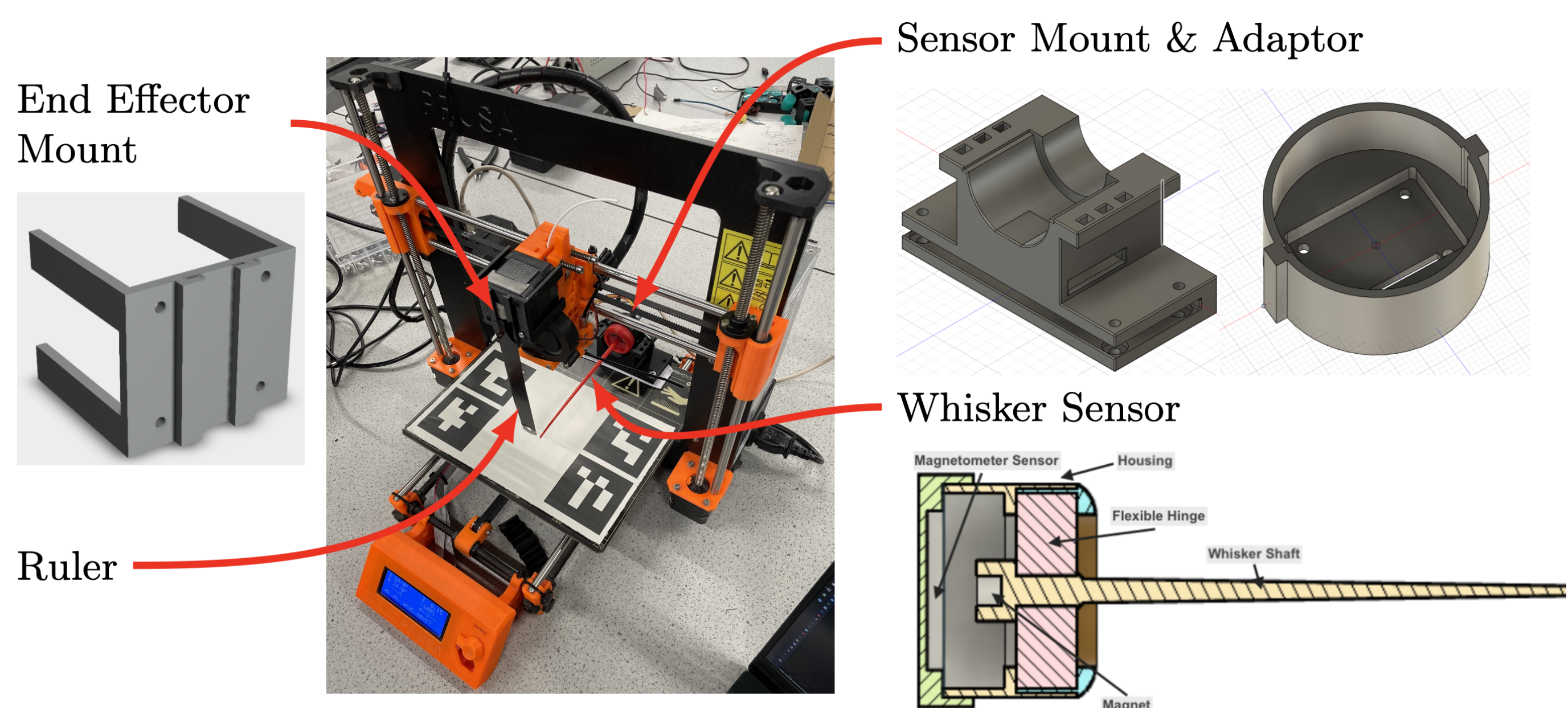


Figure 1. Calibration Platform Overview

Software Components

- Printer Driver** Interface with 3D printer via GCode [8].
- Sensor Driver** Read whisker sensor via serial at 800 Hz.
- ROS integration** Publishes sensor data to ROS topics and controls the printer via a service interface. Uses foxglove for visualization and rosbag for data acquisition.

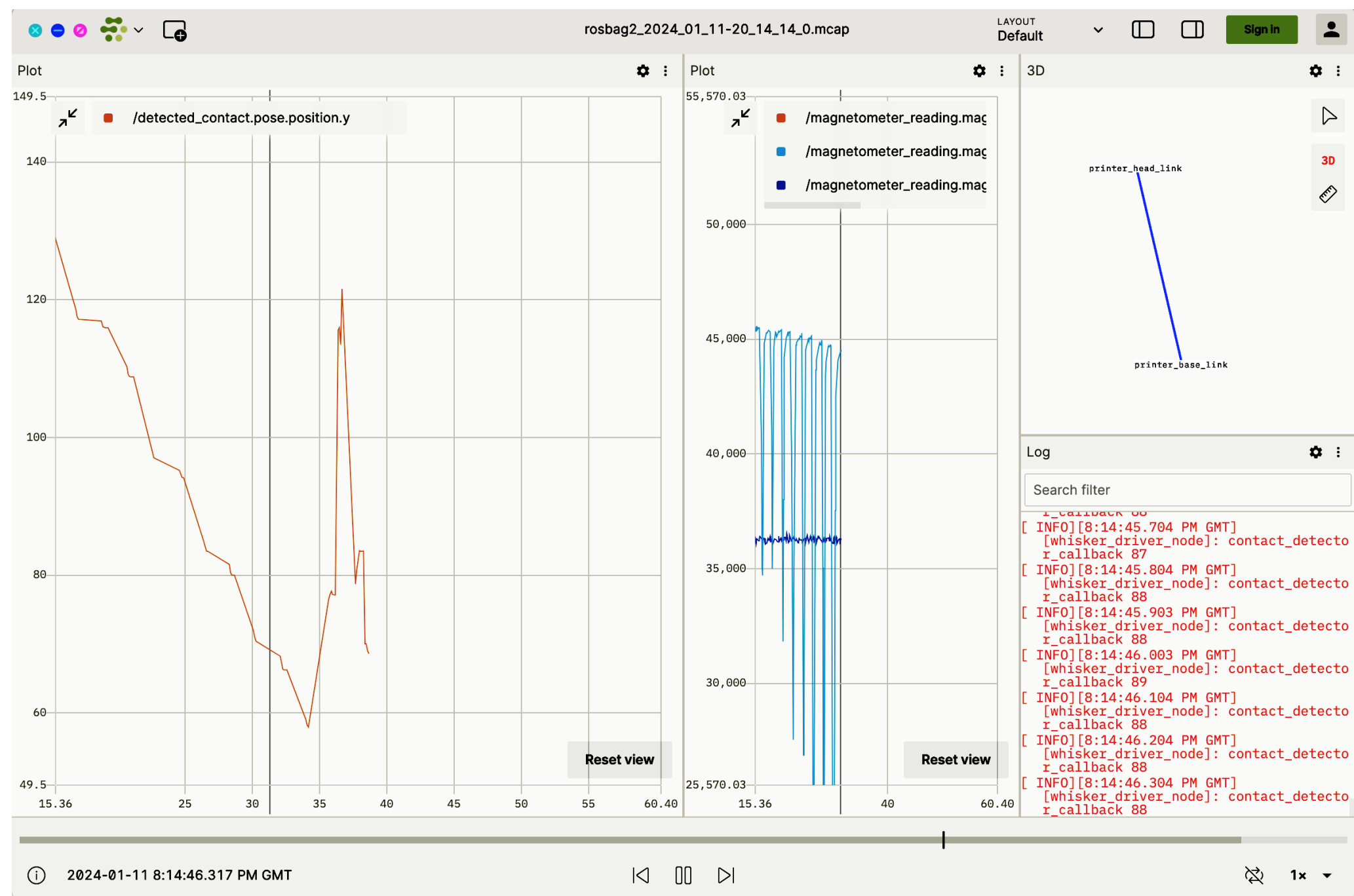


Figure 2. Live visualization of the sensor system via Foxglove

Open Source

All project artefacts are available at <https://github.com/FoR-Group1/OpenWhisker>. Would you like to know more? Do you have something we can collaborate on? Scan the QR code below.



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Calibration Results

Printer head is driven to make contact with the whisker sensor at a series of radial distances. Sensor data is recorded along with 3D locations of the printer head.

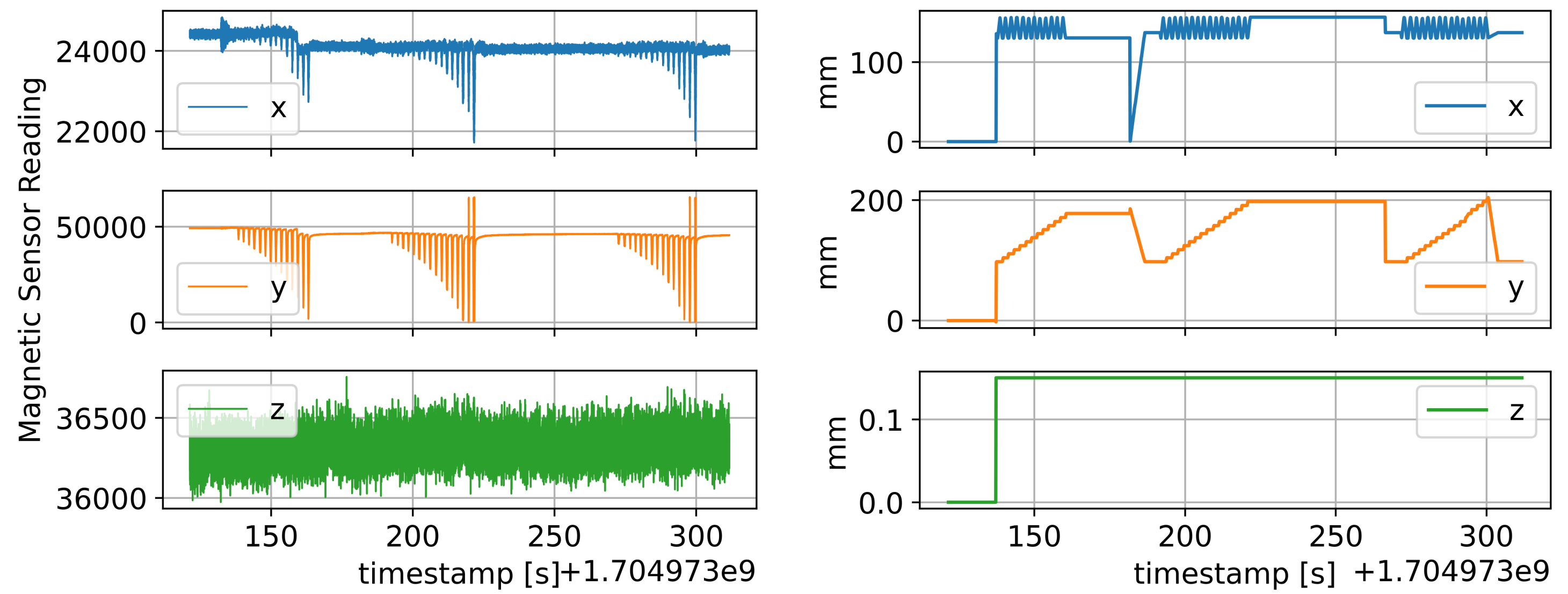


Figure 3. Raw Magnetometer (left) and 3D Printer Data (right) from 3 consecutive Calibration Routines

Taking the second derivative of the sensor data, a correlation between contact location and sensor reading can be regressed using a polynomial model.

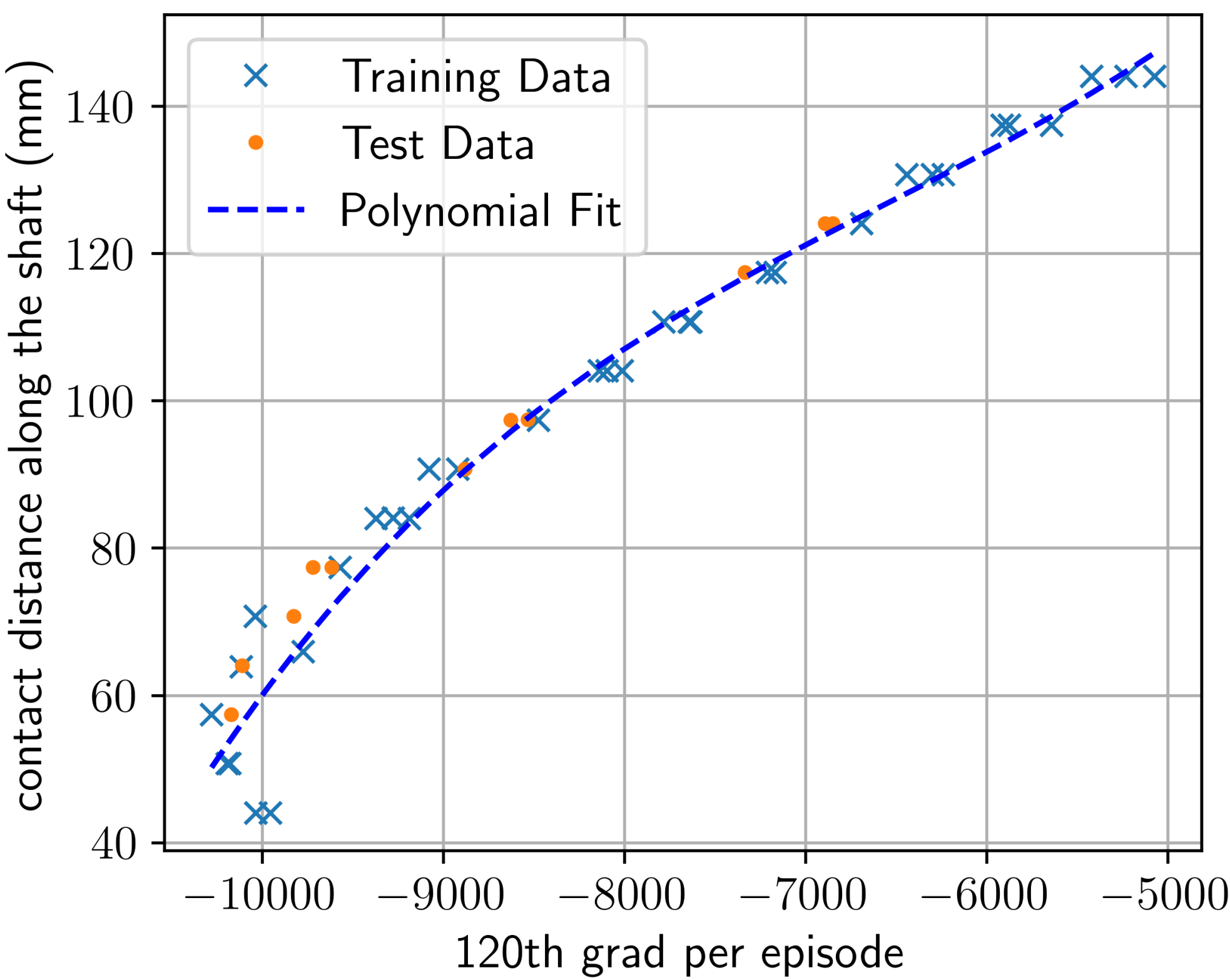


Figure 4. Polynomial Regression of the relationship between 120th sample of y in each episode and the radial contact distance x

If a contact is made within 70mm from the tip of the whisker, the contact location can be accurately inferred to within 2mm by the model.

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