imu reader 0.1

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Contents

0.1 Copyright and License

0.2 Introduction

0.3 Hardware

imu reader interconnects three pieses of computational hardware:

1. a PC
2. an Arduino
3. between 1 and 3 Inertial Measurement Units (IMUs)

0.3.1 PC

imu reader has been tested on PCs running Linux (Linux Mint 18 Sarah), macOS (Need to test this and put version), and Windows (Version??). It uses multi-threading and will perform best if multiple processing units (cores) are available.

0.3.2 Arduino

imu reader has been tested with an Arduino UNO. It is expected to work on other models having the same clock speed (16MHz) and sufficient storage.

0.3.3 IMUs

The mpu9250 by InvenSense is nine-axis (gyroscope, accelerometer, compas) motion tracking device.

0.4 Installation

imu reader requires Python3.
We recommend using pip to install imu reader: https://pypi.python.org/pypi/pip

pip install –upgrade pip # pip install imu reader

Pip will automatically install any of the following dependencies if needed:

- h5py
- numpy
- pyqtgraph
- pyserial
- pyqt5

0.4.1 Arduino code

Arduino IDE

Downlaod and install the Arduino IDE. The software can be downloaded from: https://www.arduino.cc/en/Main/Software. Alternatively, Arduino can be installed on Debian systems with: # apt-get install arduino-core

Install imu reader on the Arduino

Install the file `am_tx/am_tx.ino` on the Arduino. This can be accomplished using the Arduino IDE graphical user interface.

Alternatively, using Arduino IDE version 1.5.0 or later, the Arduino can be programmed directly from the command line: `# arduino upload am_tx/am_tx.ino` For more information, see: https://github.com/arduino/Arduino

0.5 Equipment setup

Wire the IMU's to the Arduino, either directly or via a breadboard. [Wiring diagram???]

It is recommended to power the Arduino with an external power source instead of relying on the computer's USB port.

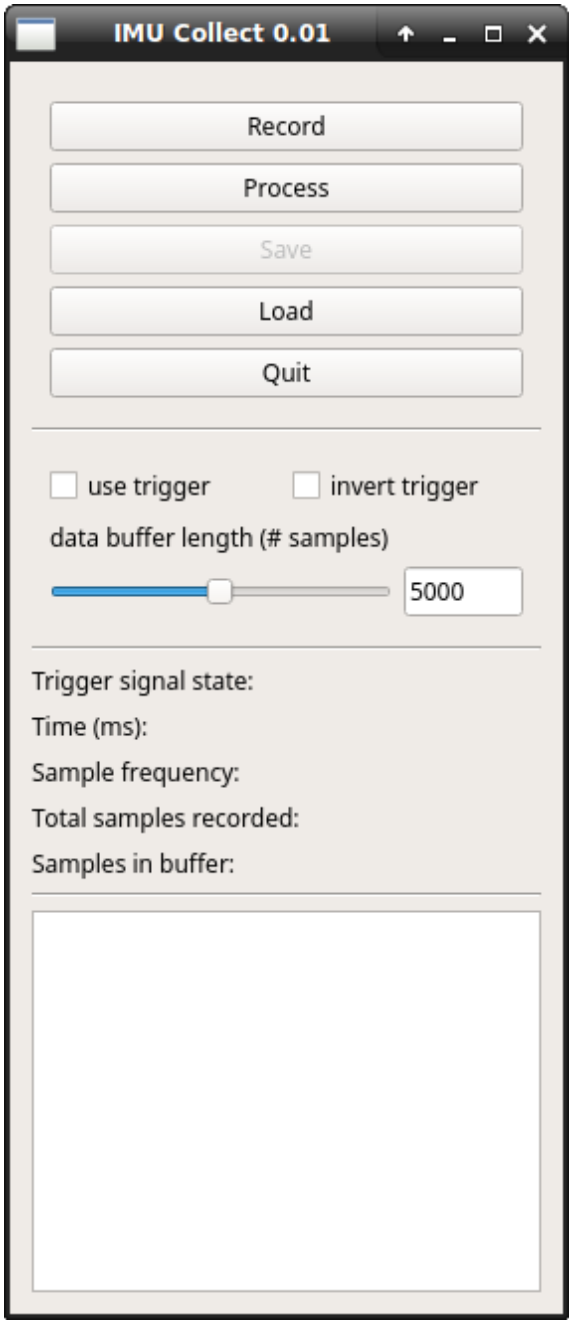

Figure 1: Control panel

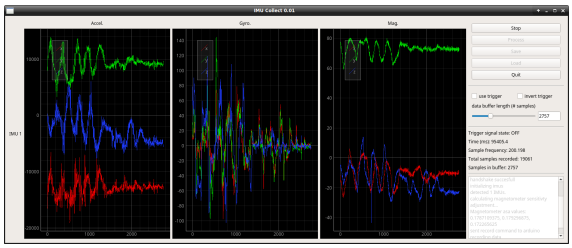

Figure 2: Collecting data from a single IMU

0.6 Collecting data

0.7 Processing data

0.8 Saving and loading

0.8.1 .csv file format

0.9 Settings

0.10 Troubleshooting

0.10.1 Error messages

invalid csv file

The program attempted to read a .csv file, but the format of the data in the file was not valid. See Section 0.8.1 for a description of the .csv file format used by imu reader.

invalid file type: ...

rx failed, no data read from serial

no Arduino found

failed to create connection

handshake failed

no connection, aborting

unable to determine number of IMUs, aborting

The program failed to determine how many IMUs are attached to the Arduino. After the Arduino is initialized, it attempts to determine the number of IMUs by sending a WHOAMI request while signaling each of the three legal chip select pins (Section **??**). It then sends a message to the PC reporting the number of IMUs detected. This error is reported if the PC program sends a command to the Arduino to initialize, but does not receive a message reporting the number of IMUs detected. Make sure that any IMUs are correctly wired to the Arduino (Section **??**) and that the correct code is installed on the Arduino (section 0.4.1, and try resetting the Arduino.