Emad Samuel Malki Ebeid
esme@mmmi.sdu.dk
RM-EBS 2021

Assignment 2: IMU data visualization through BRAM and CPU.

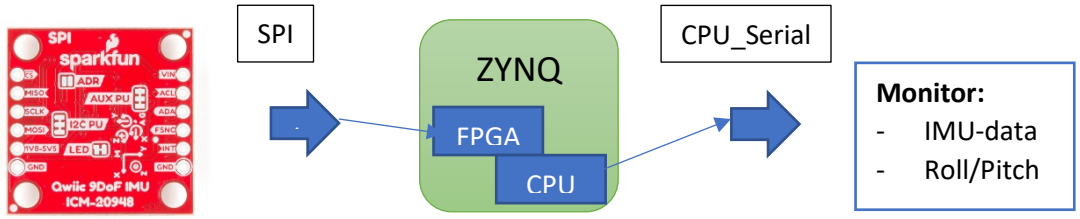
Aim: building a digital circuit that interacts with an IMU using SPI, stores the data in the BRAM, and transfer them to the CPU. Processing the received data.

Project description:

Design a digital circuit to interface with the IMU from the FPGA side, store the gyro x,y,z, and the accelerometer x,y,z values in the BRAM. Write a C code to access and read the data from the BRAM.

Fuse the gyro and the accelerometer data by building (or finding) in C a Kalman Filter to estimate the attitude of the robot (Roll and Pitch) and visualize them in the serial port.

The layout of the project:



Bonus point: build the Kalman filter in hardware using HLS.

Document the outcome:

- Explain in detail the developed components/interfaces in your project.
- Explain how the circuit works. You may use a flow chart to show how the data are transferred.
- Explain how the design is tested.

Use parts of the code and screenshots from the simulation to answer these questions. Make 2 minutes video to explain how the project works. Upload the video to YouTube or other media channels and add the link to the report.

The is no page limit but use the space wisely. The submission should include the report in pdf format + Vivado project (please assure all source files are included in the project).
Submission deadline: 23:59 15/11/2021.

*https://learn.sparkfun.com/tutorials/sparkfun-9dof-imu-icm-20948-breakout-hookup-guide