

CMPE 242 Project
ADC Sensor Interface and Motor Drive Integration Testing
HL

This project is designed to implement A/D conversion for sensor interface (industrial IoT for example) and stepper motor drive integration test. In this project, you will integrate ADC sensor input to drive stepper motor:

1. Design and build ADC input circuit with an potential meter to produce output voltage from 0.0 VDC to 3.3 VDC, and connect it to the ADC input pin of your ARM target board.
2. Write C/C++ or python program to call ADC driver and to set sampling frequency to 1K SPS (samples per second).

Then perform the ADC calibration by computing calibration curve: find 10 pairs of input-voltage data vs its output digital value, plot these data, and use linear interpolation technique to plot the linear equation to illustrate the input-output relation. Ideally, for a better ADC, you would have a linear line to link all these 10 points, but in reality, this may not be the case due to the nonlinear characteristics of the ADC.

3. Use FFT program provided in the class to validate the ADC data by computing its power spectrum, based on your result to identify if there is any aliasing, and to make sampling rate change accordingly to remove aliasing if there is any.
4. Integrate the ADC input with PWM motor drive program to realize the stepper motor speed control. As the potential meter increases its output voltage the stepper motor will increase its speed, as the input voltage reaches 3.3 VDC limit, the motor reaches the highest speed, as the input voltage reaches 0.0 VDC, the motor should stop.

Note: Conduct AD conversion data validation by using FFT computation of the ADC data. You can obtain the data by varying the potential meter value to change the analog input to the ADC, then ADC acquire this changes with up to 256 or up to 1024 points. Once these discrete data points are collected, use FFT to calculate power spectrum of your input data points. Plot the power spectrum of the data and submit it in the report.

What to submit:

1. Two-page project report in IEEE format, please down load the paper template from on line.
2. The report should include algorithm description, pseudo code.
3. The report should provide block diagrams of the wire wrapping board, circuit schematics, and photos of the actual implementation, as well as a plot of the validated power spectrum.
4. Submit your report and source code in electronics format on line.

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