EE663- Project 6 Report
QNX – STM32 Servo Motor Control

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Overview:

The aim of the project is to control PWM for driving servo motor.

- The voltage input signal +5v to -5v is read by the QNX
- The servo is controlled using STM32 board.
- The stream of the ADC value is sent to QNX via GPIO.

Cover Page:

Project title	:	QNX – STM32 Servo Motor Control.
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Analysis / Design:

The basic idea of the project is to read the Analog input signals from the function generator and communicate to the STM 32 via GPIO and finally control the motor.

Hardware configuration:

The function generator is connected to Vin pin 43 of the QNX for the ADC conversion. Now after the converted values was received and manipulated, the output was sent via STM32 and read via PORTA of the STM32. Finally, the Port B GPIO was used as AFR to control the Servo motor.

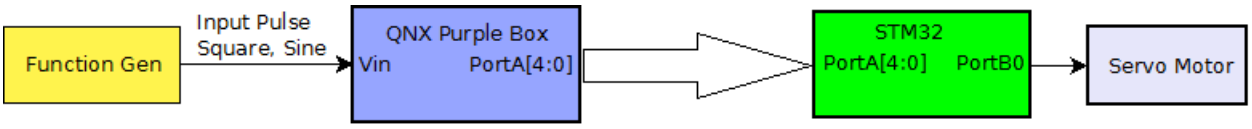

Figure1: Hardware configuration

Software Approach:

The main task of this project was the interface of the QNX and the STM32. Initial work involved setting up of the QNX board to receive the input signals from the function wave generator. For this purpose, we had to configure the ADC values. With the help of the Helios documents we could deduce the sequence of register configuration to make the ADC conversion. Select the Input Channel, Input Range, 6 Perform an A/D Conversion on the Current Channel and Wait for the Conversion to Finish. After the sequence was received the lower and upper bytes were shifted and appended. Finally, the received value was mapped to a range of 16 values.

The converted data was transmitted via the parallel port A. Since there was a limitation of serial port linking up with the QNX and STM32. We used the approach of reading the data parallel. For this purpose, first 4 pins of port A in both QNX and STM32 was used to receive and transmit values respectively. Once the values were received from Port A in STM32 this was multiplexed to the PWM channel CCR2 register with the respective pulse width factors. In this way, we could control the servo motor via the inputs from the function generator. The motor performed as per the inputs, like, when sine wave was fed as input the motor rotation was smooth, while for a square input the transition of motor from one end to another end was very fast. Also, while the voltage was varied the speed of the needle of motor also varied accordingly.

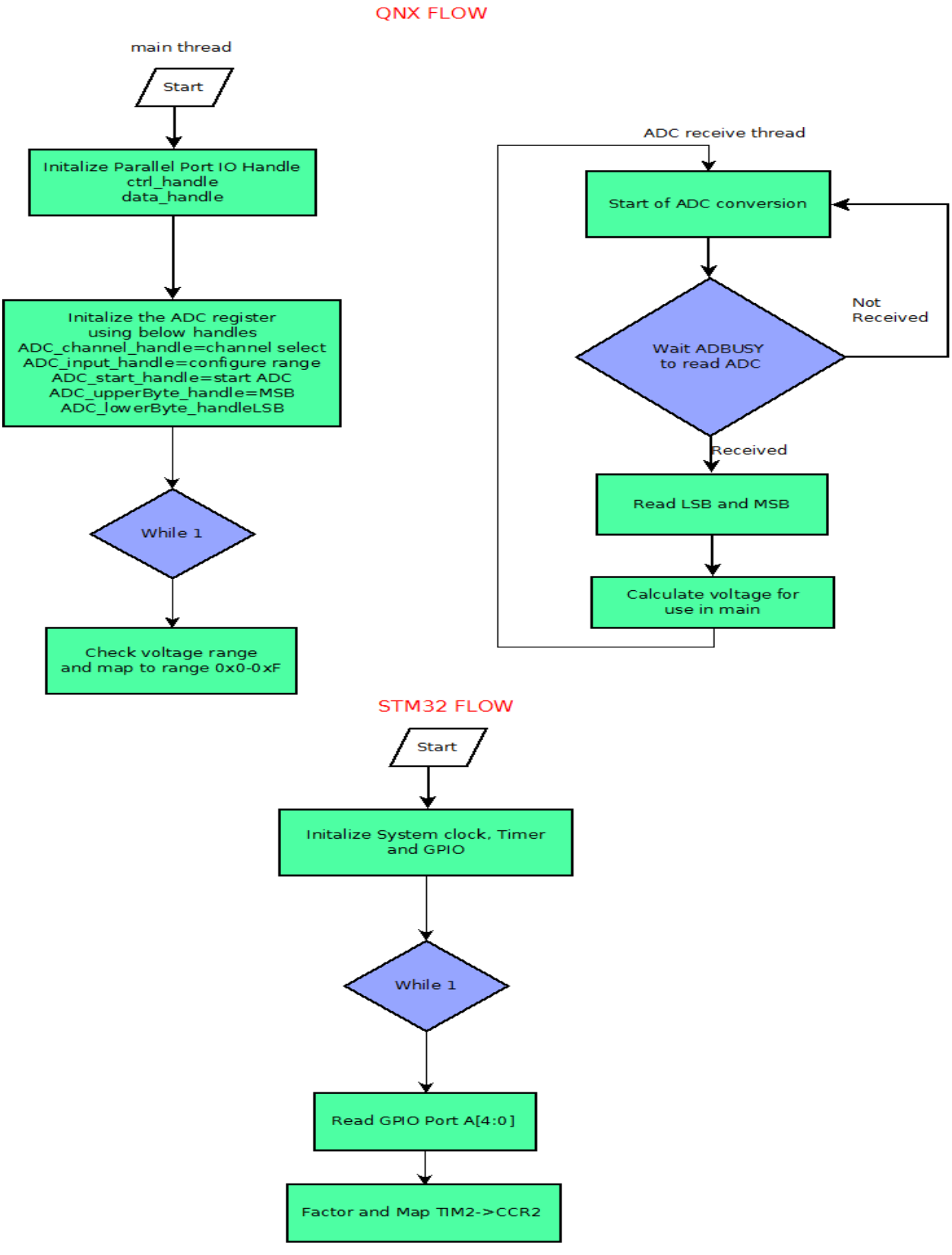

Figure2: Software flowchart

Test Plan:

- The QNX and STM32 program were developed parallel. So, both required independent testing before plugging both via GPIO.
- The testing for QNX was done using series of debug printf statement against each range.
- While the STM32 used the same program structure as that of project 2, but here rather than software defined input we drive the input signal using function generator. Debugged using the debug mode in keil to check the values at the registers.
- Integrate both the board parallel and do the testing.
- Finally vary the inputs from sine, saw tooth and square pulse and with altering amplitudes to see how smoothly or swiftly the motor needle moves.

Project Results:

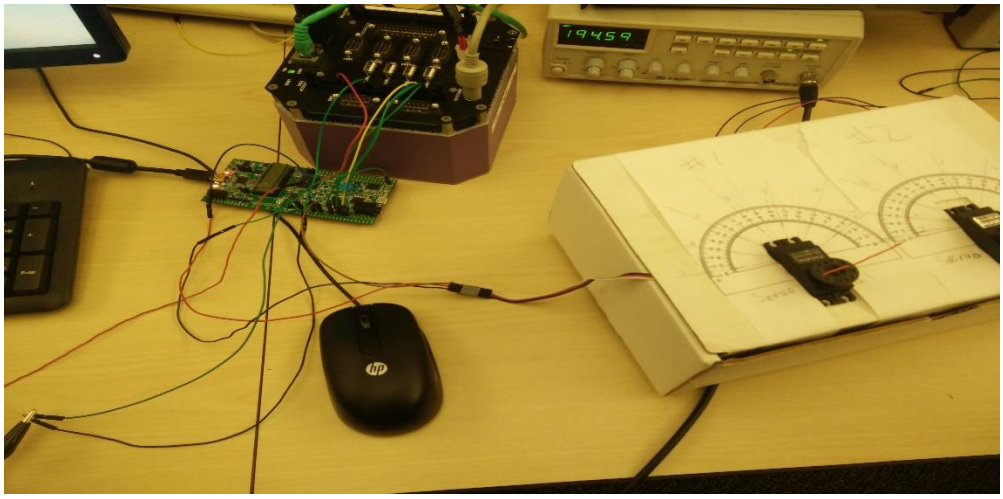

Figure3: Hardware Connections

Lessons Learned:

- Understand ADC operation and how to configure ADC on a QNX board.
- Using parallel port to interact outside world from QNX perspective.
- Interfacing two different system forming a real time embedded system loop.
- Develop habit of looking alternate approach when limitation arises. For ex, here serial port constraint between QNX and STM32 was avoided with parallel data transfer method.
- Debugging the code and to work with RTOS in background.

Submission:

The QNX and STM32 project to control servo motor using the analog input values project was thus successfully developed, tested, and verified.