**WNR (Wireless Neural Recorder)**

Rice University

Weekly Progress Report 13

12/4/2015 - 12/11/2015

**Agenda for meetings**

Cycle II Documentation Meeting:

1. Discuss new additions that are required
2. Divide up the documentation responsibility

Mentor Meeting:

1. Fall Design Review
   1. Recap on scope of project (design challenge, customer needs, etc.)
   2. Wireless Transmission
   3. Analog Front-End
   4. Compression
   5. Battery and Power

**Activities this week**

1. Analog Front-End:
   1. Discovered issue with reading in 0s.
      1. The number of pulses between Chip select pulses was not 16 (Intan sends 16-bits over SPI: 1 bit per pulse)
      2. Must send data to the Intan Chip at the same time in order to read from the chip; otherwise no data is sent back
   2. Fed in data to the Intan Chip using a function generator with a voltage divider to characterize the chip.
      1. Fed data into one channel, but recorded data from all channels
   3. Measured and plotted power consumption
2. Wireless transmission:
   1. Discovered issue with stack initialization failure
      1. Jumper pins on the experimenter board were not configured correctly: every piece of documentation never mentioned this configuration except for the README file that came with the SDK that no one ever reads
   2. Bluetooth Connection Established
      1. Single slave to single master
      2. Multiple slaves to single master
   3. Data Streaming Established
      1. Can stream from one slave to one master
      2. Can also stream from two slaves to one master
   4. Transmission rate characterized
   5. Power consumption (current draw) measured
3. Compression:
   1. Comparison of MP3 compression and ALZ77 with Huffman Encoding

**Problems encountered**

1. Analog Front-End
   1. Intan Chip/entire circuit is extremely unreliable
      1. Sometimes the circuit would short for no apparent reason. The problem would fix itself after leaving the system alone for awhile.
   2. The signal read from the Intan Chip is extremely noisy
      1. This could be due to the fact that there are many wires in the development circuitry that are exposed to the air
      2. Input voltages are driven really low by a normal resistor, which is noisy by itself
   3. Wrong values were being read from the Chip, though after a while, the issue seemed to resolve itself.
2. Wireless Transmission:
   1. Establishing Bluetooth link and streaming for one client and one master did not translate automatically into being able to do the same for multiple clients and one master
   2. Power consumption was difficult to measure because the MSP430F5438 experimenter board is a closed-circuit by itself
      1. Finally found a pin that can be used to measure current draw.
   3. MATLAB does not realistically calculate the data rate of the packets being received.
      1. Even though if packets are being sent over an interval of 10 seconds, the terminal program run from MATLAB is supposedly receiving all the packets within a period of less than one second. This makes the resulting data rate calculation be an order of magnitude greater than what the client actually sent.

**Time devoted to project this week**

|  |  |  |
| --- | --- | --- |
| **Name** | **Tasks Accomplished** | **Hours Spent** |
| Stephen Xia | * TI MSP430F5438 + TI CC2564 Bluetooth development * Cycle II Documentation | 80 |
| Tingkai Liu | * Intan RHD2000 series analog front-end development * Cycle II Documentation | 72 |
| Xin Huang | * Cycle II Documentation | 10 |
| Yuan Gao | * Compression Characterization * Cycle II Documentation | 17 |
|  | **Team Total** | 179 |

**Meetings Minutes**

Cycle II Documentation Meeting – 12/7/2015, 1:00PM - 2:00 PM

Attendees: Stephen Xia, Tingkai Liu, Xin Huang, Yuan Gao

Location: Brochstein Pavilion

Completed objectives:

1. Cycle 1.5 Specifications are just the High Priority specifications that the fall design review will be graded on
2. Responsibilities of new documents
   1. Cycle III Functional Specs: Stephen Xia
   2. Testing Plan and Results: Yuan Gao
   3. IRB Information: Xin Huang
   4. Team Safety Plan: Thomas
   5. Design Foundation Revision: Xin Huang
   6. Design Strategy Revision: Stephen Xia
   7. Web Documentation: Xin Huang
   8. SVN Archives: Thomas
3. Prepare for fall design review on 12/10/2015 in the evening.

Mentor Meeting – 12/11/2015, 3:00PM - 5:00 PM

Attendees: Stephen Xia, Tingkai Liu, Xin Huang, Yuan Gao, Gary Woods, Hamed Rahmani, Nitin Tandon

Location: OEDK 104

Completed objectives:

1. Analog Front-End:
   1. Voltage rail issue resolved:
      1. The addition of the RHD2000 + LVDS converter was pulling the voltage supplied from the FreeScale Freedom board’s voltage to 0.
         1. Will power from an external power source
   2. 0s are still being read out
      1. SPI communication does not seem to be working still.
      2. Will try writing to the chip and observing what happens
2. Wireless Transmission
   1. Downgrading the IDE seems to have solved the issue of not being able to compile and load the demo code onto the boards.
   2. However, the demos don’t work because the MSP430F5438 cannot initialize the Bluetopia Bluetooth stack.
      1. upon further inspection, the MSP5438 does not seem to see the CC2564
   3. Will have to keep debugging; will have updates for the final design review.
3. Compression:
   1. The data received from Rakesh is very confusing
   2. Dr. Tandon looked at data and concludes that Rakesh has already processed the data.
      1. Dr. Tandon says he will get raw data to us in the next few days
4. Items requested by Dr. Nitin Tandon
   1. Document of all the specifications, problems, and constraints.
      1. Include the calculation of power for all different specifications (e.g. what is power if we use Bluetooth, transmitting at 1 Mbps, etc.)
      2. Create an equation of power based on different frequency parameters
      3. Include a dream list or ideal list of specifications and parts

**Expenditures**

**Action items list**

|  |  |  |  |
| --- | --- | --- | --- |
| **Action item** | **Owner** | **Due date** | **Status** |
| Research compression algorithms | Yuan Gao | 12/11/2015 | 75% |
| TI MSP430F5438 + TI CC2564 Bluetooth Development | Stephen Xia | 12/11/2015 | 70% |
| Intan RHD2000 series development | Tingkai liu | 12/11/2015 | 70% |
| Cycle Three Functional Specs | Stephen Xia | 12/14/2015 | 100% |
| Testing Plan and Results | Yuan Gao | 12/14/2015 | 100% |
| IRB Information | Xin Huang | 12/14/2015 | 100% |
| Team Safety Plan | Tingkai Liu | 12/14/2015 | 100% |
| Revisions to Previous Documents | Xin Huang | 12/14/2015 | 100% |

**Additional Comments/Questions for Mentors**

* Dr. Tandon was actually able to turn up by 3:30 PM
* Dr. Woods had an appointment the previous day, so the meeting was pushed from 12/10/2015 to 12/11/2015