**WNR (Wireless Neural Recorder)**

Rice University

Weekly Progress Report 6

10/9/2015 - 10/15/2015

**Agenda for meetings**

Mentor Meeting:

1. Discuss progress with BLE development
2. New products on the market that can satisfy power constraints
3. Discuss power constraints

**Activities this week**

1. CC2650 BLE development. Ideally should have first prototype, but we did not meet this deadline.

**Problems encountered**

1. Could not figure out BLE environment from TI.

**Time devoted to project this week**

|  |  |  |
| --- | --- | --- |
| **Name** | **Tasks Accomplished** | **Hours Spent** |
| Stephen Xia | * BLE development on CC2650 | 7 |
| Tingkai Liu | * Research specifications on Intan Chip * Begin development on CC2650 | 7 |
| Xin Huang | * Research BLE technologies * Survey some more BLE chips | 4 |
| Yuan Gao | * Research compression and power constraints | 4 |
|  | **Team Total** | 22 |

**Meetings Minutes**

Mentor Meeting – 10/15/2015, 12:30PM - 1:30 PM

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

Completed objectives:

1. BLE development
   1. Difficult to work with. We have not been able to modify code for personal use.
   2. Will go to TI fabshop and 1 on 1 on Thursday and Friday and see if we can get anywhere
   3. New Nordic chip released, which has about 10% better power consumption than TI CC2650 and is smaller
2. Power Constraints
   1. Theoretically feasible
   2. Intan Chip: Sample from 16 channels at 1 Ks/s = 16 Ks/s
      1. Each channel requires 2.14 uA and ADC requires 514 uA
         1. 514 + 2.14 \* 16 = 542 uA
      2. Amplifier: 200 uA + 7.6 uA per Hz = 200 + 7.6 \* 16 = 330 uA
      3. Total current draw = 542 + 330 uA = 880 uA -> round up to 1 mA
   3. Transmission with CC2650
      1. 6.1 mA at 0 dBm
      2. Total: 1 + 6.1 mA = 7.1 mA
         1. Round up to 10 mA -> require 24 \* 10 = **240 mAh battery**
            1. round up because we don’t know what things like SPI will take
   4. Battery
      1. P13
         1. 1.4 V
         2. 300 mAh
         3. 7.8 x 5.6 mm
      2. P312
         1. 1.4 V
         2. 170 mAh
         3. 7.7 x 3.4 mm
3. System Size
   1. CC2650: 4 x 4 mm for 16 channel.
   2. Intan Chip: 4.8 x 4.1 mm
   3. Battery:
      1. P13: require two in series
         1. (5.6 \* 2) x 7.8 mm = 11.2 x 7.8 mm
      2. P312: requires four batteries (2 in parallel with 2)
         1. (7.7 \* 2) x (3.4 \* 2) mm = 15.4 x 6.8 mm

**Expenditures**

* nRF52-preview-DK x 4 = $71.25 x 4 = $285.00
* 60 Powerone Size 312 Mercury free = $16.95
* 60 Powerone Mercury Free Hearing Aid Battery Size: 13 = $17.45
* CC-DEVPACK-DEBUG = $15
* Total Expenditures this week= $285.00 + $16.95 + $17.45 + $15 = **$334.40**

**Action items list**

|  |  |  |  |
| --- | --- | --- | --- |
| **Action item** | **Owner** | **Due date** | **Status** |
| Research Wireless/BLE technologies | Xin Huang | 10/23/2015 | 40% |
| Survey analog front-end chips for neural recording | Tingkai Liu | 10/23/2015 | 70% |
| Research analog front-end circuits for high SNR amplification | Stephen Xia | 10/23/2015 | 70% |
| Battery module research/survey | Xin Huang | 10/23/2015 | 99% |
| Intan Chip/Analog front-end power consumption research | Tingkai Liu | 10/23/2015 | 50% |
| Wireless transmission power consumption research | Stephen Xia | 10/23/2015 | 50% |
| Research compression algorithms | Yuan Gao | 10/23/2015 | 30% |
| CC2650/CC2640 BLE Development | Xin Huang | 10/23/2015 | 2% |

**Additional Comments/Questions for Mentors**