

EE / CprE / SE 491 – sdmay18-12

Pilot Biometrics - ECG Waveform Captures Report 4

2/23/2018 – 3/9/2018

Client: Rockwell Collins

Point of Contact: JR Spidell

Faculty Advisor: Dr. Tyagi

Team Members:

Ryan Gallus - Team Lead

Justin Bader - Filter Design Lead

Zachary Glanz - Filter Design Lead

Kory Gray - Operating Systems Lead

Andrew Jones - Algorithm Design Lead

David Kirpes - Circuit Design Lead

Weekly Summary

Past Week Accomplishments

- Finished testing artificial neural network (ANN)
 - Began tweaking algorithm to work effectively using heart rate variability (HRV) metric
 - Determining value weights
- Building labeled training set for ANN
 - Gathered large amount of data from previous studies
 - Determining valid labels for heart rate variability based stress detection
 - Most studies won't release their labeled data
 - Labeling can be done by hand through measuring HRV
- Continued work on ADC configuration and interface with microcontroller
 - Designed user interface for setting ADC register values
 - Built housing for connection between ADC and microcontroller
- Continued work on linux reconfiguration
- Adjusted power supply for reliability
- Performed analysis on data outputted from the ADC
 - Comparing to test data from online sources
 - Attempting to calculate real HRV

Pending Issues

- Linux image is still causing problems
 - OS team is researching board support packages and drivers
 - Reconfiguring image on microcontroller
- ADC configuration still yielding unexpected results
 - ECG waveform output inconsistent with test data
 - Difficulty in measuring HRV

Individual Contributions

Team Member	Contribution	Weekly Hours	Total Hours
Ryan Gallus	Sifting through example ECG waveform data from online research databases to build a labeled training set using heart rate variability as the method for stress detection.	5	85
Justin Bader	Still working on ADC integration. Designed and begun making a harness that will make it easier to plug in and power the adc to the microcontroller. Worked on an interface to make it easier to set register values on the ADC. Still can't get good measurements out of it though.	10	73
Zachary Glanz	Read up on Linux BSPs and drivers, as we need to reconfigure our image.	7	86
Kory Gray	Read through reports by a student at University of Iowa, have gotten many ideas to make data received from sensors more clear. And worked on getting linux reconfigured.	6	69
Andrew Jones	Have thoroughly tested ANN verified that it works correctly. I am now customizing the algorithm to fit the needs of our project. This involves saving the weights for future use, adding a value that is affected by heart rate variability to detect over stress, and other small tweaks.	8	72
David Kirpes	I have been making small adjustments to the power supply and I have been doing some more data post-processing as needed. I ordered a battery and am waiting for that to arrive to hook up the whole power supply setup to the boards.	7	86

Comments and Extended Discussion

- Still waiting for battery to arrive, as well as a fourth ECG lead. The fourth lead may solve our ADC configuration problem and once the battery arrives, the whole system will be mobile.

Plans for Coming Week

- Keep testing different configuration settings for the ADC.
 - Compare this against test data until our ECG waveform output makes sense
 - Ensure we can measure HRV from the waveform
- Re-configure the linux image for the microcontroller
- Build a housing for the entire project, including battery, power supply, ADC, microcontroller, and all connections
- Train ANN on labeled data set
 - Test with validation data
 - Tweak until we reach an acceptable level of accuracy