Monthly Meeting (February 2020)

Date: February 25, 2020

Time: 2:15pm - 3:21pm
Location: Park Seismic Office

Attendees:

In the office: Choon Park and Jin Park
Via Skype: Josefin Starkhamma and Nils Ryden

Topics regarding Administrative work:

1. February Invoice and Progress Report
    - The invoice numbers from Park Seismic (PS) and Norrfee Tech (NT) need to be the same to submit to MnDOT, such as 01-2010, 02-2020, and so on.
    - Each month, PS and NT each party needs to fill out the Invoice form and Progress Report form provided from MnDOT along with Work Hours Breakdown sheet as a supporting document. Then, Jin will gather the forms and submit them to MnDOT.
2. Progress Blog
    - The blog is only for four of us (not open to the public yet) to put the work that has been done by each investigator and to share the progress among the investigators. To become an author to the blog, members need to admit the invitation sent by Jin.
    - Jin tried to explain how to use the blog by screen sharing with Choon's help.
    - Josefin logged in to the Blog and tried to post something.
    - Jin will update how to use the blog as she also was still learning to build/use it.
3. Budget for Hardware components
    - Josefin noted that the quotation of National Instruments was a bit higher than our initially proposed budget. However, Moms (i.e., tax) can be ignored since we are considered as a company not individuals.
    - Choon asked if those are all we needed to build the hardware or if there would be more?
    - There will be more components in addition to the NI list, such as items for building wireless access pointer and battery converter, and 1 more year of LabVIEW license.
    - More hardware components will be needed for source development.
    - Choon emphasized that the hardware components are the most critical part of our project so we don't want to compromise.
    - We need to readdress the budget for hardware components and reallocate our project budget since it is capped by 300k. We may consider shortening our project period to 18 months or even earlier.

- The changes on our budget allocation or the length of our project can only be done by MnDOT, after their committee meeting if we submit an official request with amended the budget proposal and project period.

Topics regarding Technical work:

1. General Flowchart and Schedule

    - Early stage agreement needed between PS and NT for software and hardware development
        i. How many channels needed for one longitudinal array: Choon emphasized this is the most critically important topic we have to decide at the earliest stage because it will determine the overall integrity of the result as well as the general configuration of the hardware system. He also stressed that it can be soon tested from one of the recent field data sets collected by using spatially oversampled MEMS array. He will soon post the test result on the blog. Josefin mentioned the current design will have a total of 64 channels with two 32-channel boards that can be allowed within the proposed budget limit for this part of the project. She also mentioned it can be expanded up to 96 channels by inserting one more board if necessary. All discussed possible channel configurations such as 5 of 12-channel arrays, 4 of 16-channel arrays, 2 of 32-channel arrays, and so on. Josefin also mentioned MEMS are cheap elements that can be added at any time without much cost. Choon proposed a possible multi-receiver-stacking approach to increase the SN ratio of collected records simply by using multiple MEMS per channels.
        ii. How may longitudinal arrays are needed transversely: All agreed that this is also important because it will determine how densely along the transverse direction the survey will measure within a total 6-ft width. The current goal is to achieve the 1-ft spacing between the arrays. However, it is more important to come up with the optimum configuration for one array because the transverse sampling interval can always be changed with more of such arrays. Nils and Josefin stressed the actual transverse width measured by one longitudinal array is only a few centimeters (e.g., 2-3 cm).
        iii. All agreed we should not make any compromise for the number of channels per array simply because of the budget limit.
    - Spatial Aliasing Issue: If a fewer number of channels are used to make a given length of the longitudinal array (e.g., 25 cm), then the excessively long spacing between channels (e.g., ≥ 3.0 cm) may cause the spatial aliasing of direct airwaves on the processed dispersion image, which may adversely interfere and reduce the overall accuracy of the result. All agreed this topic should be considered through both the acquisition (i.e., optimum channel spacing) and the software analysis (i.e., how to attenuate the airwave energy) approaches. The software approach will soon be tested by using both real field data and numerical modeling data sets.

- Stacking can be an answer to attenuate the airwave energy: Choon proposed the multi-receiver-stacking approach previously mentioned reducing the air-wave energy. This topic of attenuating air-wave energy will have to be continuously considered through both hardware and software approaches in the future.
- Source development – All agreed that the bouncing ball is the most effective approach at this moment. But, additional schemes will have to be added so that we can control impact times (or how often impacts are made) and impact strengths. We will continue to discuss this topic as we go.
- GPS data – longitude, latitude, velocity, and temperature (1 GPS point value is enough?): Josefin stressed the GPS the sensor can save not only the regular LAT/LON data but also many other information such as moving speed, time stamps, etc. We all discussed several options in saving GPS data (i.e., LAT/LON at a minimum for now); for example, saving periodically like once every 1 second, or saving every measurement by linking to the triggering mechanism, etc.
- Temperature data: Josefin stressed that a separate temperature sensor will be installed to measure the temperature of HMA at the time of measurement. We will discuss the format for all accessory data sets (e.g., GPS and temperature) further as we go.

2. Data Format

- LabView's format (TDMS format) is too general to use for this particular project. Choon proposed a new format that can fall in-between TDMS and the current format (PS format) used in the ParkSEIS. which will be the foundation of the new software package to be developed for this project. It was posted in the blog. Josefin also offered we can come up with other new formats as far as they can facilitate the speedy transmission of acquired data to be fed to the software package for pseudo-real-time analysis.
- Choon proposed that the KGS format (Nils used before) would work for now because it is the simplest solution so that existing field data sets in Lund can be converted for immediate testing by using the software modules here in CT. All agreed to go with KGS format for a while as a data-exchange format.
- Choon stressed that he can modify the KGS format if Nils provides the source codes in C that converts TDMS to KGS. But it should be done later after a clear idea about the final data format is established.
- Josefin raised concern about MetLAB and LabView running simultaneously? This was related to the regular executable module that can be prepared by MetLAB and/or LabView. All agreed that this topic will have to be further discussed in the near future.
- Choon stressed out that the run time analysis cannot be a true real-time process. There will be a gradual build-up of lag between the incoming data and the analysis result.
- Choon asked Nils to keep sending field data sets in KGS format so that he can test several key issues ASAP.

Agreed to do this month:

1. Each member will start using the Blog.
2. Jin will update how to use the blog later since she also was still learning to build the blog and use it.
3. Choon will test how many channels in one array should be the best configuration for our project with the recent field data sets collected by using spatially oversampled MEMS array and will soon post the test result on the blog.
4. Josefin will send the Invoice forms for February by next weekend (3/7)

The meeting adjourned at 3:21 pm.

The next meeting will be on March 31.