Benthic Event Detection System

2012 Status Report

Program Number: 901006
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In June of 2012 the BEDs team held a Preliminary Design Review[i] (PDR) which included a review of the stable requirements and initial design document, called the System Development Lifecycle Document[ii]. Data and power budgets were also reviewed and showed a high degree of certainty that we can meet our deployment requirements. Significant design work has been done for the mechanical, electrical, and software systems and, despite the typical design challenges, we are moving quickly towards the goal of construction of 6 prototype units for testing in 2013. This prototype deployment will inform the team of necessary changes to maximize science output for a proposed MBARI/UK Monterey Canyon experiment in 2014. Below is recent progress organized by discipline.

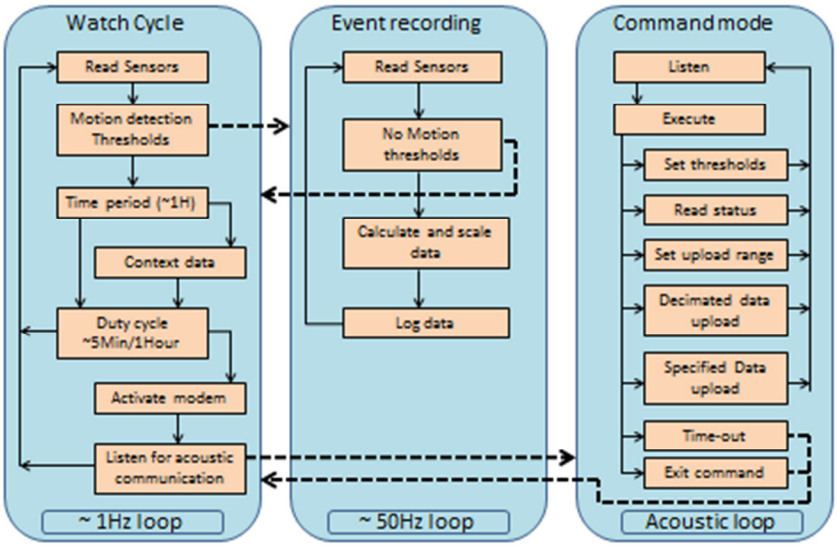

Figure 1 – BED Operational Flowchart presented at PDR

Mechanical

All mechanical components are on order or in fabrication. Currently the titanium endcaps are in the machine shop and the endcap/housing adapter rings are nearly ready to be shipped out for assembly. A battery stick test fit has been completed and the main electrical components are also included in the solid model. Pressure testing will occur in early 2013. All three subsystems that have a mechanical interface outside the housing (modem, transponder, pressure sensor) have been mechanically integrated. The project plans to make use of 4 syntactic foam spheres available in house and will procure the remainder.

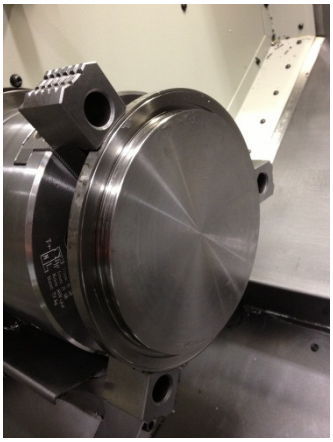

Figure 2 – Housing end cap on lathe

Electrical

The schematic package has been completed and reviewed and components were ordered in the second week of December. Boards are expected to be in house by the end of 2012 pending final component size checks once they arrive. Multiple iterations of the power distribution circuitry have resulted in increased efficiency, redundancy, and load management. The design also includes health monitoring for the housing and the circuit.

Software

Initial software work in 2012 set out to integrate the main motion processing sensor with the processor. The existing API proved to be a challenge to integrate but reliable communication with, and configuration of the MPU 6050 sensor was accomplished. The sensor is configurable across a wide range of motion and the software also makes use of an onboard motion detection algorithm with a user settable threshold. Currently, work is progressing on the user interface allowing a topside acoustic connection to download event data and re-configure the unit. While software eagerly awaits actual hardware on which to operate, progress is being made with a modified test board on the bench. High risk components like the modem can be initially integrated prior to the anticipated hardware delivery in early 2013.

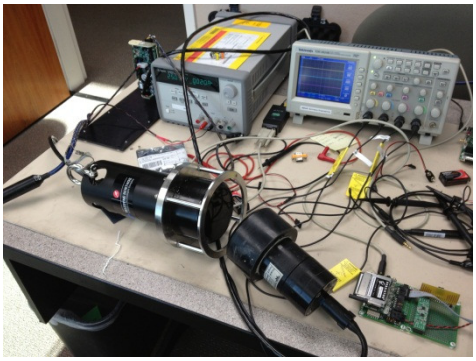

Figure 3 – Benchtop software integration and acoustic communications channel testing.

Early design work on the BED project always left room for a non-human operator to interact with the system. In 2013 the team will be testing the feasibility of BED location, survey, and data download using a Wave Glider outfitted with an acoustic tow body. This development could also allow engineers and scientists to have access to the BED user interface without using a ship. We hope that this more frequent method of communication will allow development and testing to progress more rapidly as we tune these systems. Some initial work was also done in 2012 on relative instrument positioning as a way to augment our AUV/ship/boat based survey. A simulation was created showing the proposed path of 4 BEDs following a stagnation point flow algorithm. Travel times were computed between the BEDs and noise was added to the unknown – sound speed. Figure 4 shows simulated truth versus calculated positions for 4 BEDs. This was a suggestion brought up at the PDR and it utilizes the acoustic modems that are already powered at a regular interval. Some additional software will be necessary, but no additional hardware.

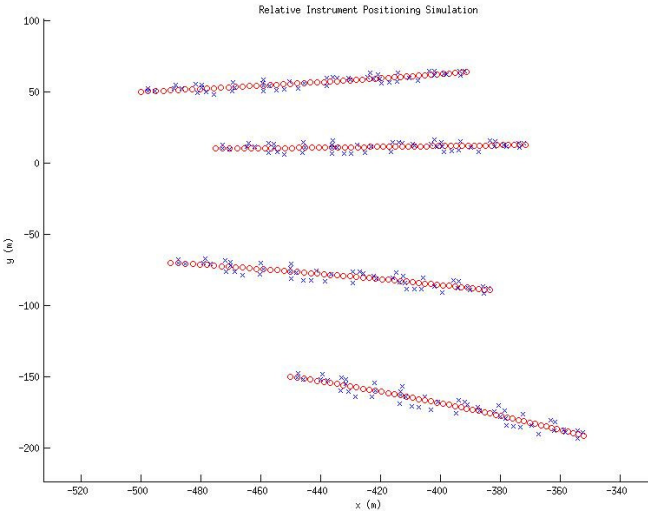

Figure 4 – These simulation results from 4 BED configuration indicate the calculated positions (blue x) are close to the simulation truth (red circles). Random noise was added to the calculated position in an effort to represent the uncertainty of the speed of sound through sediment and the water column. Simulated motion is from left to right.

A revised 2013 schedule is currently in draft[iii] and we are looking forward to the upcoming transition from the lab to the sea.

[i] \\Atlas\ProjectLibrary\901006.BEDS\BEDS.Documents\Project.Reviews\Project.Prelim.Review\PDR-Materials

[ii] \\\\Atlas\ProjectLibrary\901006.BEDS\BEDS.Documents\Requirements\BEDs_SDLC_rev_2.0.doc

[iii] \\Atlas\ProjectLibrary\901006.BEDS\BEDS.Documents\Project.Schedule