SEISMIC ROAD TRIP: USING EXISTING STUDENT EXPERIENCE AS A BRIDGE TO NEW INSIGHT IN COMPUTER LITERACY

James Wolfer [1]

Abstract — *One important aspect of effective instruction is to bridge the intellectual span from existing student experience to the acquisition of new knowledge. This work-in-progress describes one demonstration designed to use a student's experience traveling on roads damaged by regional freeze-thaw cycles as a segue into discussions ranging from seismic detection to geographic information systems for a computer literacy course. Specifically, this report describes the use of data from accelerometers built into the hard-drive protection component of an off-the-shelf computer coupled with GPS data to form a seismic picture and a Google-Map overlay of a typical road trip.*

Index Terms — Computer Science Pedagogy, Seismic Sensors, GPS, Technology Education

INTRODUCTION

One important aspect of effective instruction is to bridge the intellectual span from existing student experience to the acquisition of new knowledge. This is particularly important for a computer literacy student with limited background. Wolfer [1] reported on a system of demonstrations designed to build insight into computing for these students. This work-in-progress extends that work by leveraging a student's experience traveling on roads damaged by regional freeze-thaw cycles as a segue into discussions ranging from seismic detection to geographic information systems.

DESCRIPTION

Many modern notebook computers contain accelerometers to detect a fall and minimize data loss by parking the hard drive heads. For one such computer, the Apple Macbook Pro, a software library has been constructed to allow programs to read and display the accelerometer output [2]. Typical output for a short segment is shown in Figure 1.

Figure 2 shows accelerometer data plotted over a 50 km. road trip with the computer on the floor of the automobile. By visually analyzing this output, data such as engine vibration and start-stop acceleration become readily apparent. This data was time-stamped before acquisition, and thus can be correlated with GPS samples taken at one second intervals, providing an approximate location for various acceleration events. While the GPS data can already be used as input to Google Earth [3] to form a visual overlay, future work will try to ascertain areas of rough pavement induced by freeze-thaw cycle, and overlay that information as well.

CONCLUSION

This combination of tools serves to illustrate concepts ranging from seismic sensors to geographic information systems using data from a simple road trip familiar to every student.

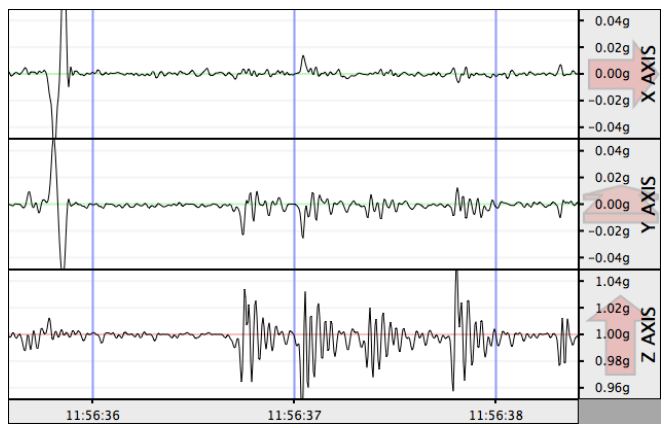

FIGURE 1
TYPICAL SEISMAC OUTPUT

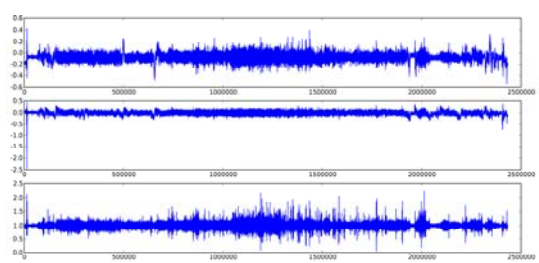

FIGURE 2
SEISMIC ROAD TRIP

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References

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[3] Google Earth, http://earth.google.com/