Collaborative Learning in Distributed Seismography

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Distributed efforts in calculating the epicenter

While many collaborative learning systems still artificially impose collaboration on the community of learners our approach aims to support real collaborative learning. Working on distributed seismography collaborative effort is essential to integrate temporal-spatial measures into shared computations and the creation of seismic maps. Besides, persisting complexities and fuzziness in the nature and instruments of measurement as well as dispute on theoretic approaches afford participants to specify and argue about their sometimes conflicting research decisions and conclusions. Affordances of the field yield to potential learning goals of students moving from peripheral participation to the epicenter of the activity.

The need to collaborate follows from the procedure to find the epicenter. The students need a framework to calculate the distance to the epicenter. They should also be able to share the data with all other groups also hit by the earthquake. Finally, they must be able to share and discuss the results with the remote groups in order to learn collaboratively.

The environment we are presenting in this work consists of a seismograph network, a computer network that allows the sharing of the data generated and, most important, the tools that enables students and teacher to process this information. This environment allows the students to learn about geophysics by engaging in seismographic research contents, methods and tools, develop and apply basic concepts and methods of mathematics and physics, discover the potentials of collaboration, reflect upon the impact of scientific research and the limits of human nature. To support these learning goals and provide a computation-augmented environment for collaborative learning about real-world problems, tasks and solutions the following design principles were applied:

Orientation on expert workflow, activity structures and tools.
Visualization supports concept understanding and the (re-)creation of common grounds.
Integration of online and offline, individual and collaborative, in-class and distributed activities.
Flexibility to adapt the environment to the local conditions and individual constraints

Collaborative Learning with the SeismoFreeStyler

For supporting student activities, a system was developed which consists of three different programs: a central server with communication and data exchange functions between the groups, a locally installed client program, and a data processing module called SeismoFreeStyler which allows the students to process the data of the different seismographs for calculating the epicenter's location. The system provides a working area, which is meant to support the workflow of the students' activities. A workflow is represented as a network of different types of nodes, each one implementing a step further towards the calculation of the epicenter.

This setting allows different kinds of collaborative learning activities: Collaboration inside one group, collaboration among groups in the same earthquake region and collaboration among groups in different regions. Since the sensor network is connected to the WWW, students of any part of the world may be able to do the calculations and learn from an earthquake. Following our approach to collaborative learning, students from different cultural backgrounds but sharing the fact of living in seismic active areas (e.g., Japan, Chile and Italy) can work together. It is also possible to integrate students not subject to earthquakes but who are willing to learn and share others' problems. For students living in seismic areas, this is an opportunity to understand the phenomena. It may be a way of reducing fear and anxiety.