A Model Effort

Martin Cenek is a model faculty member. So to speak.

The UAA Assistant Professor of Computer Science and Engineering is at the center of work to synthesize EPSCoR results into functional models. He's currently working on three different model efforts, the most ambitious of which mimics a Kenai River-scale salmon fishery.

"We built this high-fidelity agent-based model that captures stakeholders, for five groups of fishermen and two species of salmon, and the dynamics of interaction among them," he explained. "This created a framework that we can ask questions of, and it will give us very informative answers."

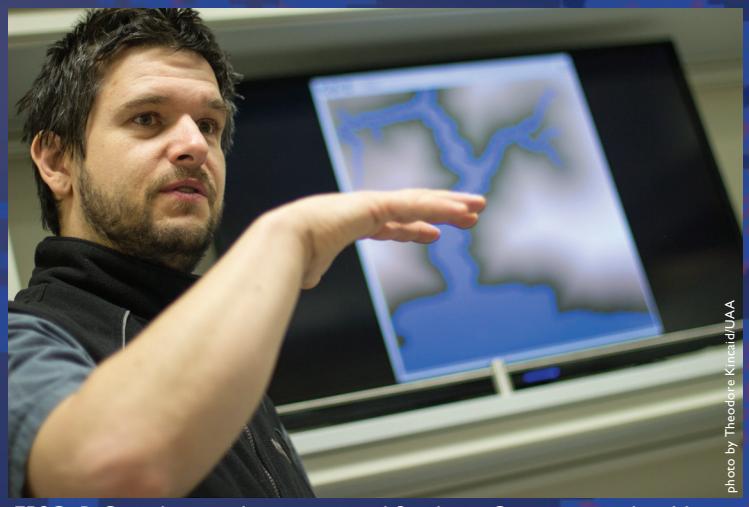

photo by Theodore Kincaid/UAA

EPSCoR Coordination, Integration and Synthesis Group researcher Martin Cenek discusses his agent-based fisheries model.

The fishery model incorporates a number of data sources from Southeast and Southcentral Alaska, such as delivery harvest data for the Kenai gillnet fleet, fishing tag information, and even the number of portable toilets ordered for Kenai beaches as a proxy for dipnetter numbers. The model uses data from the Kenai but does not recreate its geography, instead creating a generic watershed. It uses probabilistic interactions to capture the feedbacks between various "agents," including salmon and multiple classes of human users, and use them as the basis for an accurate and predictive simulation of the overall social-ecological system. Cenek said it's worked, as demonstrated by its reproduction of real-world dynamics.

"For example, the dipnetter effort and harvest of the model was 94 percent correlated to the actual measured data for the last 32 years," he said. "So we know that something is working."

Cenek plans to downscale the model for home use, and will produce both a simplified version to teach students about fisheries management, and a more complex one for resource managers in which they can adjust various factors to test hypotheses. "Since it is predictive it can be used by resource managers to ask questions: What if I enact or implement this policy, how is that going to affect this system of the Kenai?"

Cenek also plans to build an agent-based model of subsistence hunting patterns incorporating data from the EPSCoR Northern Test Case. Meanwhile, he's building two other models that use EPSCoR data, one of social networks and the other of semantics patterns.

The social network model is based on CIS surveys of Southcentral elected officials, resource managers, and members of non-governmental organizations, in which respondents identified the individuals with whom they collaborate. Cenek translated this information into a network of circles and lines that visually represents individuals and their connections.

By removing various individuals from the social network model, Cenek said, he can see how networks complement each other, and where they are susceptible to change. For example, he said, a group of heavily interconnected individuals can easily lose an individual member without a major impact on the network's connectivity. On the other hand, he noted, "if I have these stakeholders connected like raisins on a shoe string, and one of them drops out, all of a sudden I don't have a network, I have two disconnected networks that do not talk to each other."

Cenek said the next step is to ground-truth results through comparison with semi-structured interviews by EPSCoR researchers. He plans to construct a similar network for Southeast Alaska and will also use data about networks in Sweden and Greenland.

Finally, Cenek has been building a semantic analysis tool that sifts through media coverage to spot keywords and map their use over time. Cenek has been mining KTVA-TV in Anchorage and the Homer Tribune and Peninsula Clarion newspapers for articles about local fisheries, then turning usage of key words in the articles into visualizations of word use over time. "We are rendering these 3-dimensional blobs," he said. "That blob is the semantic concept flow through time and how it shrinks and then expands based on the season or policy or a law or environmental change, and how the news media talk about it."

Cenek stressed that the tool offers more than just statistical analysis because it considers the words' context as well; for example a user could compare and contrast appearances of "salmon" with ecological keywords or with economic ones. He said he's creating visualizations both for home use and for the UAA Planetarium and Visualization Theater, and will make the tool available for public use via a web portal.

Alaska EPSCoR

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