Collaborative Research: ITR: Interactive Software Systems for Expert-Assisted Image Analysis and Classification of Aquatic Particles

ABSTRACT

This project involves research on methodologies and algorithms for the automated and semi-automated classification and counting of particles in the upper ocean. The work will harness ideas from computer vision, machine learning, and image analysis to extract features from several different types of optical instruments used to study planktonic marine organisms and detritus, and then classify them so that they can be automatically recognized, sorted and counted. The goal is to develop systems that will automatically classify the majority of marine particles and flag the unusual or difficult-to-recognize features for human interpretation. Feature classification systems will be developed around three different classes of instruments that yield images of three different types of particles: epifluorescence microscopy (bacteria and nanoplankton), FlowCam (phytoplankton including types responsible for harmful algal blooms), in situ cameras (zooplankton and detritus). A variety of image classification methods will be investigated including ones based on neural networks and support vector machines. Reference images will be made from phytoplankton from the collection of the Center for Culture of Marine Phytoplankton and from plankton in samples taken from the Gulf of Maine. Images recorded in past expeditions and on at-sea expeditions funded elsewhere will also be used. As part of the project, a pattern recognition package will be added to the Phytopia educational multi-media CD-ROM used in schools and colleges.