represented by numerical simulations. The software sequentially identifies and runs simulation trials that it believes will be most informative given the results of previous trials. The results of new trials are incorporated into the software’s model of the system behavior. The updated model is then used to pick the next round of new trials. This process, implemented as a closed-loop system wrapped around existing simulation code, provides a means to improve the speed and efficiency with which a set of simulations can yield scientifically useful results.

The software focuses on the case in which the feedback from the simulation trials is binary-valued, i.e., the learner is only informed of the success or failure of the simulation trial to produce a desired output. The software offers a number of choices for the supervised learning algorithm (the method used to model the system behavior given the results so far) and a number of choices for the active learning strategy (the method used to choose which new simulation trials to run given the current behavior model). The software also makes use of the LEGION distributed computing framework to leverage the power of a set of compute nodes. The approach has been demonstrated on a planetary science application in which numerical simulations are used to study the formation of asteroid families.

This work was done by Michael Burl and Esther Wang of Caltech, and Brian Enke and William J. Merline of SWRI for NASA’s Jet Propulsion Laboratory. Further information is contained in a TSP (see page 1).

This software is available for commercial licensing. Please contact Dan Broderick at Daniel.F.Broderick@jpl.nasa.gov. Refer to NPO-47919.