Expansion of DIRSIG’s Water Modeling Toolset

Jason Hamel
MS Candidate

Water is one of the driving forces of life on Earth. It is responsible for a large amount of nutrient transport within an ecosystem and is home to a vast amount of plant and sea life. Monitoring water quality has become a large factor in determining the health of a particular aquatic system. Many biological, chemical, and geological factors affect light transport within the water, resulting in spectral radiance changes visible from the surface. Remote sensing offers measurements of this radiance over far greater areas than previous ship sampling studies.

Interest in how human activity affects water quality has moved the focus from open ocean regimes to coastal and near-shore conditions where discharges into streams and runoff from rivers is concentrated. As water researchers expand their studies closer to the shoreline, current models used to explain light transport within the water body become inadequate. Hydrolight, one of the major light transport models used by the oceanographic community, operates to some degree in this new environment but lacks three-dimensional interactions desired for use in DIRSIG.

To supplement this established open-water model, Photon Mapping will be implemented for use in large water scenes. A Monte-Carlo based model originally used within the computer graphics community, Photon Mapping will be expanded to operate within water, a medium that interacts with the light passing through it to a high degree. The planned validation of this model will compare the Photon Mapping results to established Hydrolight output in scenes where Hydrolight is known to function well. A data collection is also planned to compare both the Hydrolight and Photon Mapping output against ground truth and non-simulated satellite or airborne imagery.

Biography:

Jason Hamel graduated from the Imaging Science undergraduate program at the Rochester Institute of Technology. He is currently working on his Master of Science Imaging Science degree with a focus on remote sensing. He has worked for the Digital Imaging and Remote Sensing Lab in the Center for Imagine Science since 1998, mainly modeling spectra of land and water.