

Senior Scientific Applications Specialist

Expertise Geographic Information Systems, Spatial Data Analysis and Visualization, Numerical Model Processing, Data Management Tools

Education B.A. (Geography), 1993, University of Colorado

Professional Experience

2008 – Present *Itasca Denver, Inc., Colorado*
Senior Scientific Applications Specialist

1996 – 2007 *Geomega, Inc., Boulder, Colorado*
GIS Analyst/Programmer

1996 *The Nature Conservancy, Boulder, Colorado*
GIS Manager

1993 – 1995 *Chester Environmental, Boulder, Colorado*
GIS Technician

Project Experience

Spatial Data Analysis: Worked extensively with numerous raster and vector formats in 2 and 3 dimensions to perform GIS analysis and modeling. Specific examples include: (1) calculated tunnel density per grid cell at a Nevada mining site by intersecting a 3D finite difference grid with buffered 3D lines representing tunnels; (2) built hydrologically correct DEMs for surface flow analysis using local knowledge of stream beds, irrigation and diversion ditches, dams, and other features affecting surface flow; (3) developed an algorithm to produce transient groundwater recharge input files for a regional groundwater model in Alaska incorporating land use and soil permeability data, depth to water table information, temporal climatological data and surface water contributing and receiving data derived from slope and surface flow analysis; (4) automated the creation of MODFLOW LAK2 packages with an algorithm that utilizes raster and vector analysis to select lake cells and a model conductivity array to compute conductivities for the new lake cells; (5) mapped groundwater flows from nodes on a 3D finite-element model to a predefined (by chemistry sampling) 3D finite difference grid incorporating spatial proximity, conservation of water volume, and a scientifically defensible distribution algorithm; and (6) developed 3D transient particle tracking code for a finite-element groundwater model flow package at a Massachusetts industrial site at a time when there were no out-of-the-box transient particle routines available.

Geochemical Modeling: Designed and built a front-end for geochemical models to predict water quality in open-pit mining for pit-lake and waste rock piles. The model runs with a back-end database storing model input data and parameters and model output results. A GUI simplifies model input data processing by, for example, allowing modelers to input groundwater flow data from numerous groundwater models and interpolating the flows to user-specified timesteps for the chemistry model. Worked closely with geochemists to ensure the various special analytes like pH, alkalinity, C, and S were handled correctly in the code. Spatial pre-processing tools include an algorithm to intersect a 3D finite difference grid with a ground surface (raster or TIN) to compute the surface area (oxidation area) intersecting each finite-difference model cell.

GIS and Database Development: Designed, developed and deployed a GIS using MapObjects, Visual Basic and SQLServer. With this application, non-GIS specialists can display and query environmental data stored in a RDBMS without needing to know SQL or be familiar with various GIS data formats and projections. Users query sample data by multiple attributes and display those data on a map with default or user-specified symbology. Multiple data-graphing options also were built into the application. Typical GIS functionality (pan, zoom, legend editing) was built from scratch. As development continued, the application was updated based on the MapWindow framework, leveraging MapWindow's built-in GIS functionality and utilizing PostGIS as a spatial data-storage and analysis option.

Scientific Visualization: Analyzed, interpreted and visualized soil and groundwater sample data. Built environmental databases and performed QA/QC on the data. Performed variogram analysis to interpolate subsurface soil and water data in geologically controlled systems. Experience with CTech's EVS-Pro software for 3D groundwater plume modeling, geologic modeling and 3D visualization. One example of groundwater visualization concerned a shallow, confined plume of chromium (VI). This visualization assisted the client to negotiate a favorable settlement in a litigation case. Expertise in utilization of EVS-Pro is based upon formal training by CTech's Advanced Training program and through the use of the program on more than 15 different projects over the past 10 years.