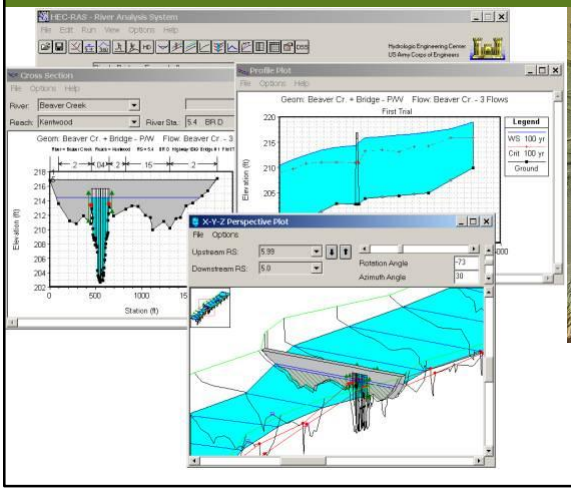
Digital Terrain Applications



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Engineering

- CAD
- Route planning and design
- Earthwork calculation
  - Profiles
  - Cut-and-fill
- Visualization

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Military

- Flight simulation
- Cruise missile navigation

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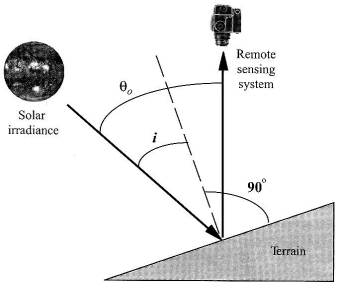
Remote Sensing

- Illumination variation caused by slope and aspect (and shadow) effects
- Correction methods



$$L_H = L_T \frac{\cos \theta_o}{\cos i}$$

L_H = radiance observed for a horizontal surface (i.e., slope-aspect-corrected remote sensor data)
L_T = radiance observed over sloped terrain (i.e., the raw remote sensor data)
θ_o = Sun's zenith angle
i = Sun's incidence angle in relation to the normal on a pixel.

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Climatology

- Micrometeorology
  - Wind field model (simulated wind-tunnel)
  - Sunlight model
- Volume change of glaciers
- Solar radiation calculation

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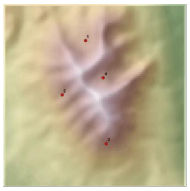
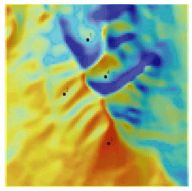
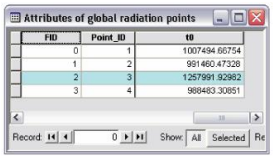
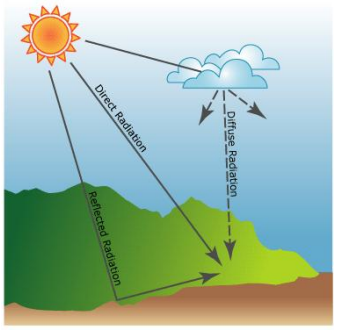
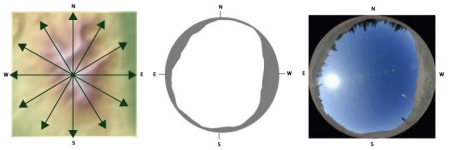
Solar radiation (ArcGIS Tools)

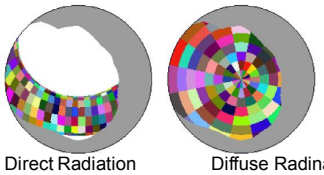












Direct Radiation
(Viewshed + Sunmap)

Diffuse Radination
(Viewshed + Skymap)

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Water Conservancy

- Dam design
- Water level - reservoir volume function

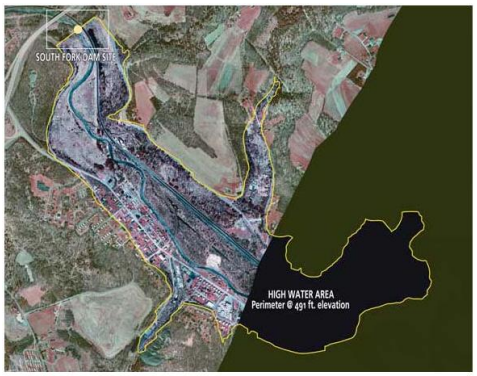

Figure 1. This high-resolution aerial photograph of the Johnstown, Pennsylvania, area is overlaid with the high-water line of former Conemaugh Lake at the time of the catastrophic flood in 1889. Using GIS technology coupled with topographic data, the National Park Service was able to determine the lake's perimeter, calculate the volume of the tremendous flood, and compare the results to historical volume estimates.

The Great Johnstown Flood in 1889.
http://www2.nature.nps.gov/ParkScience/index.cfm?ArticleID=74

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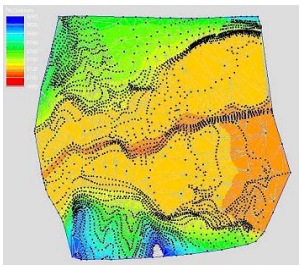
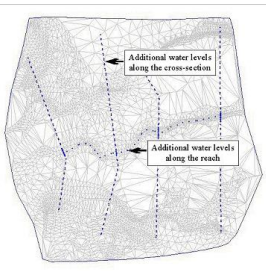
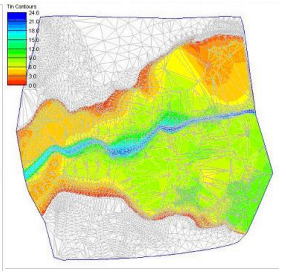
Hydrology

- Floodplain delineation
  - HEC-RAS & HEC-GeoRAS
    - Hydrologic Engineering Centers River Analysis System (http://www.hec.usace.army.mil/software/hec-ras/)
- Bridge & embankment design



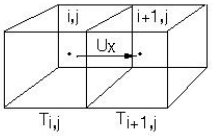




Others…

Groundwater toolset

- Darcy flow & Darcy velocity: volume of water flowing per unit time through a unit cross-sectional area normal to the direction of flow.
- Particle Track (advection - groundwater "flow direction")
- Porous Puff (dispersion)



$$U_x = -T_{i+1/2,j} \cdot \frac{\partial h}{\partial x}$$

KML Reference:

http://code.google.com/apis/kml/documentation/kmlreference.html

Sketchup Pluginfor ArcGIS:

http://sketchup.google.com/download/