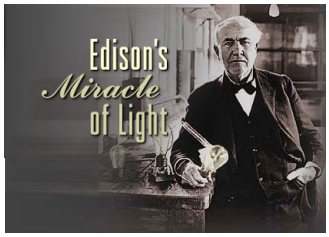
Lighting

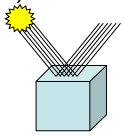


Outline

- Announcements
  - HW II--due Today 5PM
  - HW III clarification
- Lighting
- Example

Lighting

- Basic routines like surf simulate 3D (depth) using perspective
- Humans understand 3D world through
  - perspective information (converging/diverging lines) and
  - Lighting and shadows



Lighting in Matlab

- It is possible to add lights to Matlab figures
  - L=light;
    - Creates default light object
  - L=light('position', [dx, dy, dz])
    - Creates a light set at a particular angle

Light Objects

- Light objects are children of axes
  - Just like lines, patches, and surfaces
- Light objects have only three interesting fields:
  - Position--vector along which the light propagates
  - Color--the color of the light (white is default)
  - Style--either
    - Infinite--axes is filled with light rays parallel to position vector (like the sun)
    - Local--light is a point source (like a light bulb)
      - Position now indicates location of the light

Light Objects

- Light objects are invisible
  - Can only see their effects (light/shadow) on surface or patch objects
  - But, surface/patch properties control these effects based on their properties
    - Facelighting--none, flat, gouraud, or phong
      - None=> no interaction with light
      - Flat => like flat color, face reflects light as plane
      - Gouraud/phong=>analogous to interpolated shading--light effects are spread within polygon
      - Can change with set or using "lighting"
    - Backfacelighting--unlit, lit, or reverselit
      - Determines whether interior faces interact with light

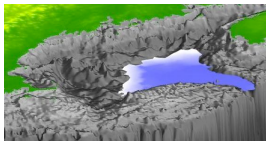
More lights

- Additional ways to create lights:
  - camlight([az, el])--creates light relative to current view
  - Lightangle([az, el])--spedify light in same coordinates as view

Lighting

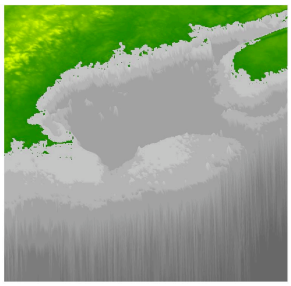
- Lighting is not for the faint of heart, but here are some tips:
  - set(gcf,'renderer','opengl') gives better output and performance
  - Keep track of handles to lights
    - Turn them on or off (change visibility)
    - Move them around

Example: Gulf of Maine Bathymetry



- Today, I'll start leading you through the process of creating my Gulf of Maine visualizations
- We'll start with the bathymetry and add the temp (blue stuff) next week
- This figure has two surfaces, 3 colormaps, and two light sources

Lighting



- With the colors used, it is impossible to see features in the Gulf of Maine