

**HOMEWORK 5** - due May 7. Please hand in paper for homework and e-mail matlab files for labs.

- 1) (a) Calculate the minimum repeat cycle time needed to completely image the earth at 5 m resolution with an optical sensor in a sun synchronous orbit at 800 km altitude. The data downlink rate is 30 megabytes per second. The sensor has a single band that requires 1 byte per pixel for data storage. Assume that all the data are collected during the ascending cycles which cross the equator at noon, local time. (b) How does the minimum repeat cycle time change if the resolution is changes to 10 m?
- 2) (a) Make two different 3 by 3 filters that can be used to smooth or low-pass filter an image. (b) How can these same filters be used to roughen or high-pass filter an image.
- 3) (a) Explain what is meant by a station mask of a satellite receiving station. (b) What is meant by georeferencing a satellite image?
- 4) (a) How can a 1-byte array of numbers be used to represent a region where the overall elevation change is -1000 m to 1000 m. (b) What is the vertical step-size that can be represented in this case.
- 5) Develop a formula for measuring the height of a building  $h$  using a single optical image from a satellite orbiting at an altitude of  $H$ . The focal length of the camera is  $f$ . Assume that the building height  $h$  is much less than the altitude of the satellite. Using this formula explain why this technique will fail when the picture is taken directly above the building.