

CALIFORNIA INSTITUTE OF TECHNOLOGY

ME/CS 132b, Spring 2011

**Problem Set #2**

Due: Apr 14th, 2011

Readings: LaValle, Sections 4.2, 4.3, and 5.3.

1. [15 points] Complete `elevmap_to_slopemap.m` to generate a slope map from the elevation map (stored in `elevation_map.mat`). Assume that the pixel size is 0.5 m. We define the slope value (in degrees, always non-negative) at each cell as the steepest slope from its cell center to the center of its 8 neighboring cells. Include the completed code and the slope map in your submission. In MATLAB, you can use `imagesc` for displaying the slope map.
2. [15 points] Assume the vehicle radius is 2 m. Dilate the slope map by the vehicle radius, so that we can treat the vehicle as a point. At each pixel, the new slope in this dilated slope map is given by the maximum slope among all pixels within the vehicle radius (i.e. draw a circle of the vehicle radius centered at that pixel, any cell that is “touched” by the circle should be included) in the original slope map. The dilated slope map should have the same number of pixels as the original slope map. Include the code and the dilated slope map in your submission.
3. [10 points] Assume the safe slope for the vehicle is 20 degrees. Generate a cost map in 8-bit (0–255, ‘`uint8`’ in MATLAB) where anything at or above the safe threshold has a cost of 255, and the rest is linearly scaled between 0 and 255. Include the code and the cost map in your submission.