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.