CS 739 Spatial Data Mining

Term Project: Crater Classification on Mars Crater Data Set

Assigned Date: Sunday, March 14, 2011

Educational Goal

Apply Artificial Intelligence and Machine Learning techniques to real-world Mars crater data.

Team

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Phase II: Comparison of Data Sets and Algorithms

(200 points)

Due: 5:30 PM Thursday, March 31, 2011

Requirements

- **Data Acquisition:** Look into HiRISE data, and determine whether or not it will be useful to study.
- **Image Preprocessing:** Apply a blurring filter to the data that we have. Use these blurred images to train and test our model, and compare results with those from regular images. If possible, define a minimum size and maximum size range within which our CDA will be effective.
- **Candidate Identification:** Run an edge detection filter on the images, and then implement a Hough transform to identify crater candidates. Compare end results of this method of candidate identification with the results from the previous method of candidate identification.
- **Feature Selection:** Identify which Haar features which we will use to classify craters. Generate many different Haar features, and then select those which are most useful in classifying craters. Compare the results of using a genetic algorithm versus an adaptive boosting technique for selecting features.
- **Classification:** Train a back propagation neural network using our training set. Classify the test set using this network, and compare it with results from the original AdaBoost algorithm. Implement a support vector machine, run it on the test data, and compare results. We may also want to try Bayesian classification.

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Submission Requirements

1. Generate a report of the results of every test run. In this report, include side-by-side comparisons of techniques and a side-by-side comparison of data sets.

2. Write a brief summary on the effectiveness of preprocessing, differences in classification algorithms, and the relative utility of each DEM and optical data. Also identify future directions of research.

3. Submit reports through Blackboard.