Introduction

- Lunar craters have attracted the attention of not only scientists but also citizens.
- Modern high-resolution cameras with zoom capabilities allow citizens to capture and share pictures of the Moon in Social Media platforms, such as Twitter.
- We cluster lunar pictures following a density-based approach to assist crater monitoring.

Problem statement and related work

- The automatic detection and classification of lunar craters have been one of the most important challenges among lunar experts.
- Several approaches have been proposed (Sawabe et al., 2006) to detect or count craters, in order to assist and accelerate the classification of space images.
- Crater shapes are changing in time and their transition to a more complex morphology has been investigated (Mahanti et al., 2016).
- Other approaches involve the extraction of visual descriptors that are based on the Hough transform for the detection and counting of craters (Galloway et al., 2014).
- Contrary to the use of lunar catalogues of optical images (Salamunićcar et al., 2014), we propose in this work the monitoring of crater activity through social media observations.

Methodology and Results

Data acquisition

- Keyword-based search: #crater
- Dates: From 01-01-2017 to 17-04-2017
- Twitter API search (https://dev.twitter.com/)
- 69 social media posts found relevant to lunar images with craters shown

Feature Extraction and Clustering

- Indexing using SIFT descriptors (Lowe et al. 2004)
- Extracted by http://pami.xmu.edu.cn/wzhao/lip-vireo.htm (Lip-vireo toolkit)
- Visual Vocabulary of 100 visual words (k-means)
- Term frequency inverse document frequency scores
- OPTICS reachability plot to determine the number of clusters
- DBSCAN with $\varepsilon=0.05$ and minPts=5

Summary and Conclusions

- Topic detection in Social Media collections which are relevant to lunar craters
- Two main clusters were identified with an additional (noise) group of images
  - Cluster 1 shows lunar images with a complete overview of the Moon and its craters
  - Cluster 2 has images that zoom in particular areas of the Moon and focuses on its craters
  - The “noise” cluster has other images, not classified into the two main clusters, containing images of not necessarily Moon.
- New topics can be detected on-the-fly, since the clustering stage is unsupervised
- Provided additional sources of planetary images (e.g. Twitter) using crowdsourcing information, associated with metadata such as time, text, location, links to users and other related posts.
- Fusion of planetary data with social media posts to enhance crater monitoring
- Future work: Automatic classification of lunar images and multimodal clustering using multiple modalities to exploit temporal and textual information in lunar image clustering

Contact: Ilias Gialampoukidis (heliasgi@iti.gr)

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