Framework for more standardized evaluation of crater detection algorithms

G. Salamunićcar (1) and S. Lončarić (2)

(1) AVL-AST d.o.o., Av. Dubrovnik 10/II, HR-10020 Zagreb-Novi Zagreb, Croatia, (2) Faculty of Electrical Engineering and Computing, University of Zagreb, Unska 3, HR-10000 Zagreb, Croatia (gsc@ieee.org / sven.loncaric@fer.hr)

Crater detection algorithms' (CDAs) applications range from approximating the age of a planetary surface and autonomous landing to planets and asteroids to advanced statistical analyses [ASR, 33, 2281-2287]. The simplest evaluation of CDAs is visual comparison of detected craters with topography. More advanced evaluations include comparison with craters' catalogue(s) and cumulative size-frequency distribution(s), as well as use of Receiver Operating Characteristics (ROC). However, in order for evaluation results from different papers to be comparable, more standardized evaluation of CDAs is required. As a first step, the catalogue of 17582 craters was assembled which can be used as ground truth (GT) in future evaluations of CDAs [37^{th}LPS #1137]. Each crater from this catalogue is aligned with MOLA topography and confirmed by three independent sources: (1) catalogue from N. G. Barlow et al.; (2) catalogue from J. F. Rodionova et al.; and (3) revised version of catalogue used in previous work [34^{th}LPS #1403]. As a second step, a method for estimation of false detections for CDAs is proposed which, in combination with known GT and other available analyses, can improve evaluation of CDAs [37^{th}LPS #1138]. While those two steps are important, there are also some other requirements, as e.g. usability of framework and flexibility for possible improvements of used data and methodology. For CDAs that cannot use MOLA data as input, visual images were generated using different projections and shadowing. Tools are also provided for analysis and processing of craters' catalogues and drawing of (free-response) ROC curves. Additionally, it should be taken in consideration that possible improvements can influence evaluation results. One possibility is to specify the version of framework which is used, so that others can use the same version when comparing results. Another approach is to register catalogues of craters found with CDAs, in order to make them available with rest of the framework on DVD. After each minor change of framework (e.g. new GT), others can use their catalogues for re-evaluation. After each major change of framework (e.g. new MOLA data), authors can be notified to resubmit new catalogues. Of particular importance and benefit is also close cooperation between lunar/planetary and computer scientists. The first group can benefit from tools for analysis and processing of craters' catalogues as well as from craters found by CDAs that can be potential candidates for revised versions of their craters' catalogues. The other group can benefit from newer versions of GT and MOLA data, which can improve the framework.