Recognition tool of craters and linear features on Digital Terrain Model derived from LISM/TC, Kaguya.

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We show a tool for automatic recognition of craters and linear features on Digital Terrain Model. This core technique is an application of generalized Hough transform. The EHT (Ellipsoid-modeled Hough Transform) is adopted for circular features [1]. We've also optimized preprocessings and postprocessings (refitting) and added a function of extracting linear features such as wrinkle ridges, grabens, and rills. We've prepared this for LISM [2-4] / TC (Terrain Camera [5]), Kaguya (SELENE) [6]. We show verification of this tool with MOLA DTM and preliminary results for Kaguya DTM. This EHT has shown a strong tolerance for noises and modifications; overlaid by other craters, partly eroded from them, large collapse of crater rims.

Craters (circular features) recognition is a hot field for planetary science and computer science. Various approaches have been proposed, and they can be classified by input data; images and DTMs. The former researches are Hough Transform [7], Fuzzy Hough Transform [8], Template matching [9], or Learning algorithm [10]. On the other hand, the number of the latter is small, we found only that of Hough Transform [11,12]. Typical rates of crater recognition by them range from 60 percents to 80 percents. Our tool show the similar one and verification with the size-frequency of craters from a viewpoint of handling craters in planetary science.

Figure 1 shows comparison of size-frequency of craters between our results and manual one. Although systematic decreasing is found, the shape of plots is reliable.

References: [1] Matsumoto, N. et al. (2005) *LPSC XXXVI*, #1995. [2] Haruyama, J. et al. (2008) *Earth Planets and Space*, in press. [3] Ohtake, M. et al.(2008) *Advances in Space Research*, in press. [4] Matsunaga, T. et al. (2001) *Proc. SPIE*, 4151, 32-39. [5] Haruyama, J. et al. (2006) *LPSC XXXVII*, #1132. [6] Kato, M. et al. (2007) *AGU Fall Meeting 2007*, #P44A-01. [7] Michael, G. G. et al. (2003), *PSS 51*, 563. [8] Sawabe, Y. et al. (2006), *Advances in Space Research 37*, 21. [9] Bandeira, L. P. C. et al. (2006) *1st Intl. Conf. on Impact Cratering in the Solar System*, 17. [10] Honda, R. et al. (2002) *Progress of Discovery Science*, Springer Verlag, 395. [11] Bruzzone, L. et al. (2004), *Proc. ESA-EUSC 2004*, 13. [12] Alves, E. I. (2003), *EGS-AGU-EUG*, #8974

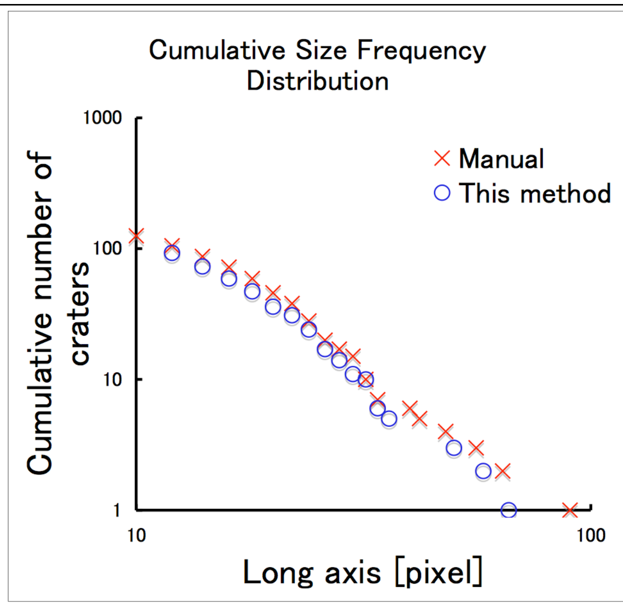

Figure 2. A cumulative size frequency distribution plot CSFD. The X-axis is crater diameter in Log, and Y-axis is cumulative number of craters in Log. Red points are manual counting, and blue points are this algorithm.