Overview

CircleCraters is a new open source tool for crater counting that provides planetary scientists with an alternative to CraterTools [1] on the ArcGIS platform. CircleCraters is a Python plugin built for QGIS. QGIS is an Open Source Geographic Information System (GIS) licensed under the GNU General Public License [2]. QGIS is an official project of the Open Source Geospatial Foundation (OSGeo). It runs on Linux, Unix, Mac OS X, Windows and Android. In contrast, ArcGIS limits the user by requiring a Windows operating system. JMars (http://jmars.asu.edu/) is also open source and runs on Windows/Mac/Linux systems, however the open source code is not hosted in a manner that encourages community involvement and development. Hosting the CircleCraters code in a GitHub repository will promote long-term maintainability and transparency. Digitization of impact craters (Figure 1) is the first step in crater size frequency distribution analysis.

Open Source

The code and documentation for CircleCraters is on the GitHub website at github.com/sbraden/circle-craters. GitHub is a public source code repository for hosting, sharing, and collaboration using the version control system Git. GitHub also provides an easy-to-use platform for documentation and feedback. CircleCraters will be included in the QGIS plugin repository (plugins.qgis.org), which allows the plugin to be installed with one click from within the QGIS desktop application. CircleCraters will evolve together with new QGIS releases and improvements. The plugin is written in Python, a relatively easy-to-learn programming language. CircleCraters is made available under the BSD (Berkeley Software Distribution) 3-Clause (“BSD Simplified”) license [3]. Other scientists who want to write their own crater counting software tools may use the source code from this repository.

Features

- Projection independent.
- Uses three points on the crater rim input by the user to define a circle.
- Uses the center of a crater-circle to determine which craters are within which polygons in the area layer.
- Exports .diam files for ingestion into CraterStats2, a tool for plotting crater counts and determining surface ages using the techniques described in [4-9]. This export includes the crater diameter in kilometers, the center latitude and longitude of the crater in degrees, and the total crater counting area in kilometers squared.

Step By Step

1. Install QGIS 2.6 and then the plugin by downloading the files from the git repository (github.com/sbraden/circle-craters) and running the command “make deploy” on the command line.
2. Import a projected raster image into QGIS. The user is responsible for the correct definition of the projected image Coordinate Reference System (CRS) in QGIS. If the raster image is in GeoTIff or ISIS 3 cube format, the CRS will be imported automatically.
3. Create a vector layer for the count area and the crater count. Set the CRS for these layers to a geometric CRS (units of degrees).
4. For the QGIS GUI to display the layers in different CRSs correctly the Project CRS must be set to the geometric CRS and the “Enable on-the-fly CRS Transformation” function must be active.
5. Click on the “Select Crater Counting Layer” button and choose the vector layer for crater digitization. Now the three-click tool is activated and you can click on crater rims to create circle polygons. The values for each crater circle are stored in the vector layer’s Attribute Table.
6. There are many other tools in QGIS. If you use one of these, the tool for crater digitization will be deselected. Click on the “CircleCraters” button to activate the three-click tool.
7. To stop crater counting and deselect the crater digitization vector layer click on the “Stop Crater Counting” button.
8. Click the “Export Data” button get the crater counting data as a .diam file (used by CraterStats2 [4-9]). Choose the crater layer and an area layer (both vector layers). The crater polygons themselves can be saved to disk as a standard shapefile, which can be read by GIS applications.

How to Contribute

Contributions to the CircleCraters code and any comments, suggestions, or other input are welcome. A list of known issues, to-dos, and feature requests can be found on the Issues page of the GitHub repository (Figure 6). Installing the Git version control system (http://git-scm.com) and creating an account on GitHub (http://github.com) is recommended for collaboration. After that it is simple to clone the CircleCraters code repository, create a new branch, and start editing the code. When your changes to the code are complete, submit a pull request so that your code can be reviewed and merged into the main code branch.

Get CircleCraters

Git Repository: github.com/sbraden/circle-craters

Star the repository on Github if you support its development!

References


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Figure 1: Raster and vector layers for crater counting projected within QGIS. The LROC NAC image is M1126915118. The count area defined by the green line is 25 km² and contains just over 400 craters.

Figure 2: Current icons in the CircleCraters plugin. A) Select the crater digitization layer and start making circles. B) Deselect crater layer and stop crater counting. C) Resume crater digitization tool use after using a different QGIS tool. D) Export digitized craters as a .diam file.

Figure 3: Steps 2 and 3 part a.

Figure 4: Steps 3 part b and 4.

Figure 5: Steps 5 and 8.

Figure 6: The Issues page of the GitHub repository lists features requested, development to-dos, and bug reports from users. It is a key part of collaboration.

Figure 7: A picture of my dog in case you aren’t interested in crater counting.