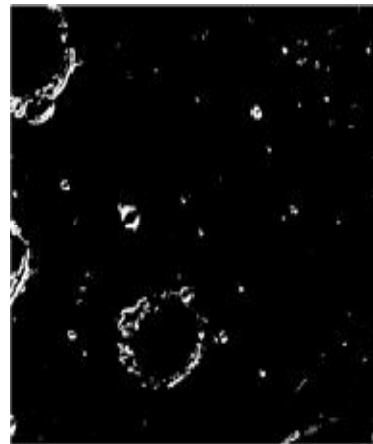


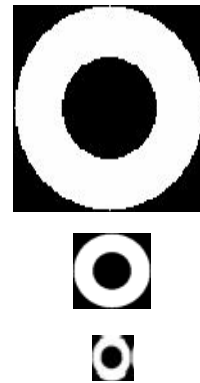
# Impact Crater detection in Remote Sensed Planetary images



Image



Edge detected



templates



Analysis

Proposed three-phased sequence to recognize impact craters. The original image is E1900566 ([NASA/JPL/MSSS](#)), with a spatial resolution of 245 meters/pixel.

**Ref:** J. Saraiva, L. P. C. Bandeira and P. Pina, "[A STRUCTURED APPROACH TO AUTOMATED CRATER DETECTION](#)", Lunar and Planetary Science XXXVII (2006).



# Automatic Crator Detection: Algorithm

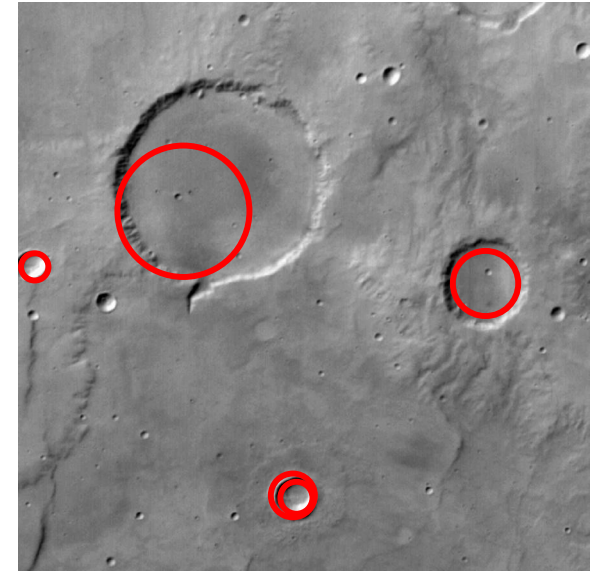
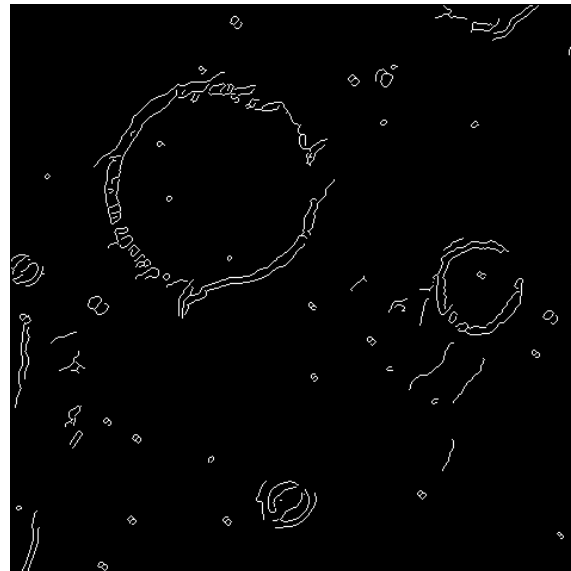
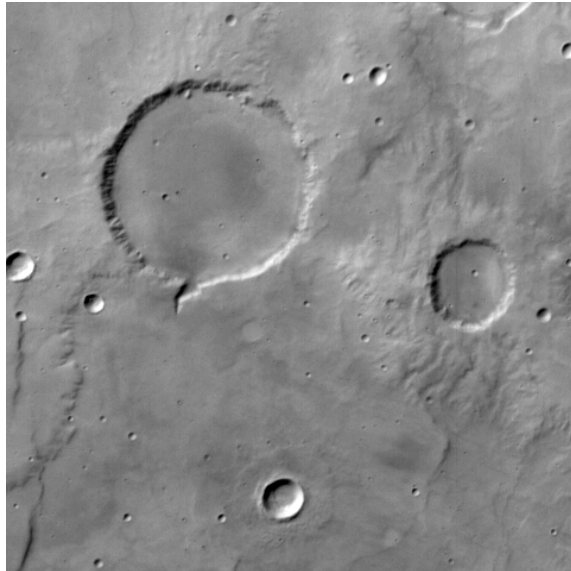
- Apply Canny Edge Detector to the image
- Apply Template matching algorithm
- Automatically scale the template to match smaller and larger craters
- Matching algorithm: Convolve the template over the image to find points of highest correlation.

# Some Results

>cratordetect

Enter image filename: R0200837.gif

Enter Edge threshold: 0.2



Courtesy: [NASA-Mars Global Surveyor - Mars Orbiter Camera](#)

# Template matching on Complex Objects

- Here we apply the same algorithm to aircrafts on a an airbase. We will try to identify a particular aircraft using its 'outline' or edge signature. (B-52 and B1-B Lancers)

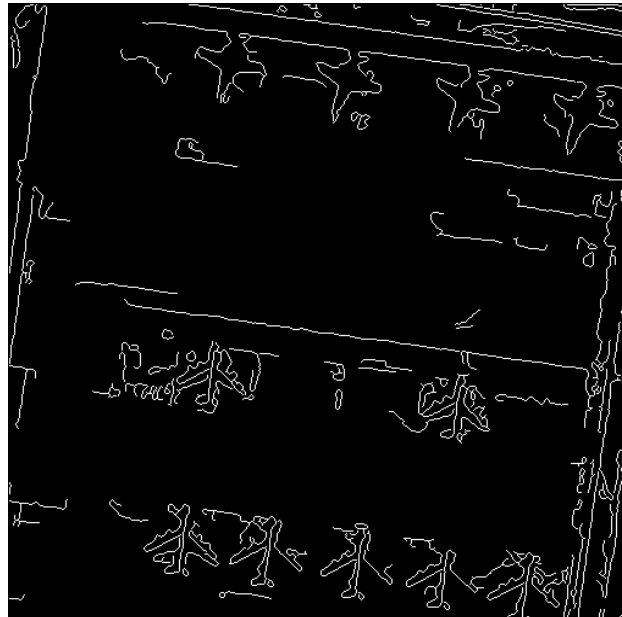
> b52detect

Enter image filename: dohabase1.bmp

Enter Edge threshold: 0.4

Enter template file: b52temp1.gif

Enter Tuning Param [0-1]: 0.66



*Courtesy: Google Earth*



# Why Template Matching in the EDGE DETECTED image?

- The images would usually contain vast swathes of empty regions, which means efficient processing.
- The template and the reference images are both binary images. This results in a remarkable improvement in processing.
- If the color/texture of the object is not a concern. Hence the chances of errors due to shading or lighting effects are decreased.

# Further improvements

- The proposed Template matching algorithm does not account for rotated objects. The template has to be rotated 360°s and has to be matched at each sample rotation  $\Delta\theta$ .
- We can investigate efficient algorithms that need lesser number of template rotations. e.g. using morphological transformations or a translation and rotation aware image comparison algorithms.