

AUTOMATED SNR MEASUREMENT FOR HIGH-RESOLUTION SATELLITE IMAGERY

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Project Overview

Measuring SNR from a satellite image is difficult because there aren't many target source that supports uniform radiance. Therefore we measure SNR from a homogeneous target such as Dome-C. However taking additional image for calibration purpose is limited due to the satellite operation priority. Therefore, we studied a measurement method for SNR that is fully automated and takes input of a normal EO image.

SNR

SNR is the ratio of signal to noise. It is a key metric showing the relative strength of informational signal to noise signal. Measuring SNR of an image is usually done by calculating the mean intensity over standard deviation of uniform radiance area.

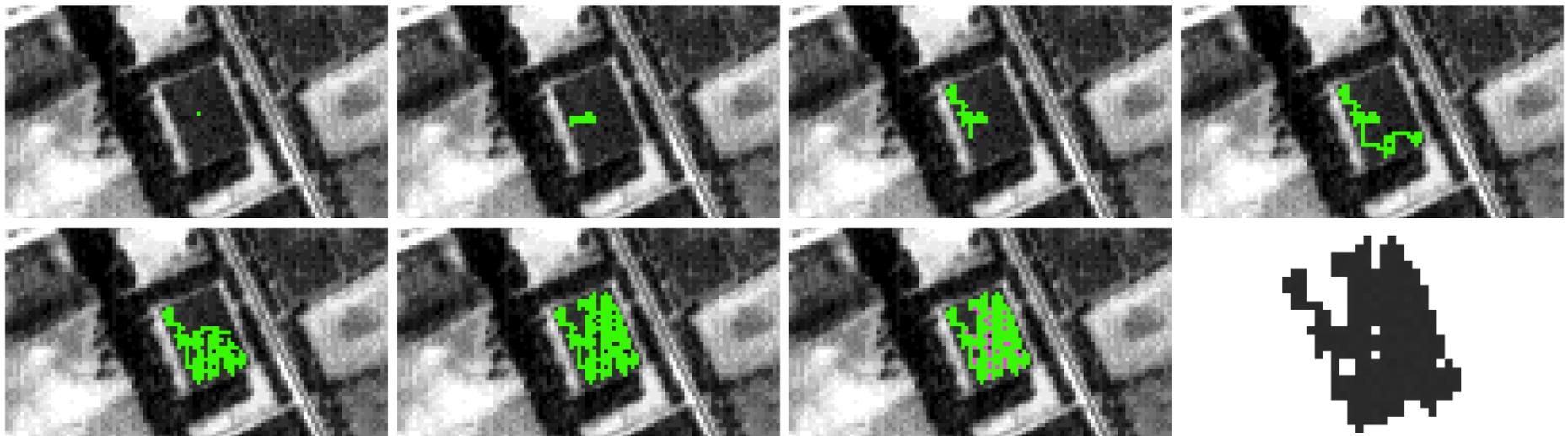
AutoSNR

AutoSNR measures SNR of a normal ground image. Based on two assumption for ground homogeneity, it finds homogeneous area in an image, and calculates SNR for each DN value. The resulting SNRs of each DN are fitted to a power function. ($y=ax^b$)

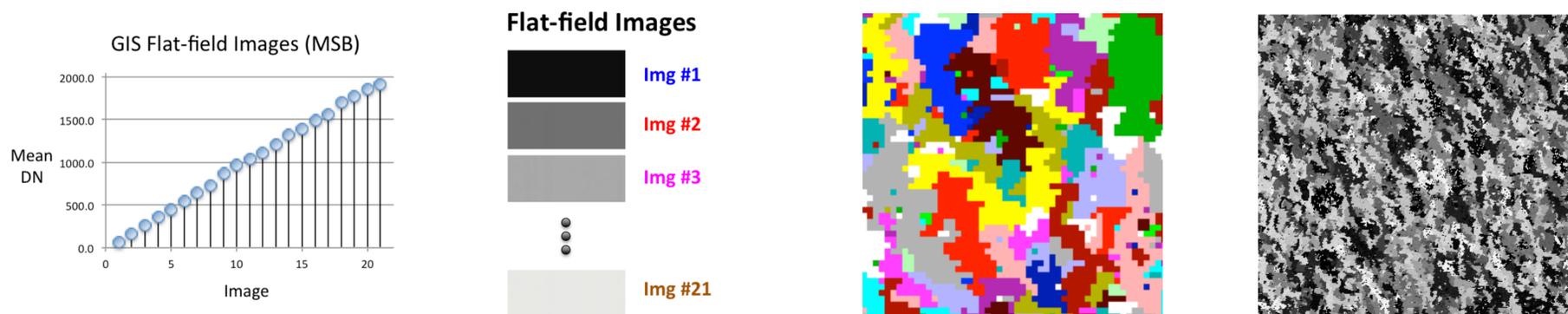
HOMOGENEOUS AREA DETECTION

Assumptions for homogeneous area detection

- 1 If a region is homogeneous, a pixel in it has at least one neighbor pixel which has the same DN value
- 2 A pixel surrounded by homogeneous pixels may also be homogeneous but has different DN due to noise

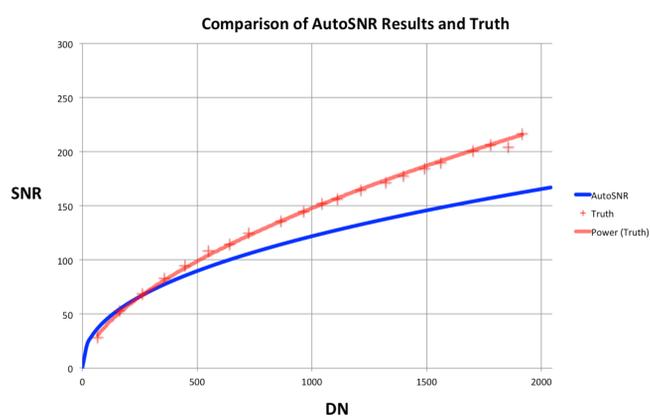


TEST INPUT IMAGE SYNTHESIS



RESULTS

AutoSNR on Synthesized Image



AutoSNR's measurement shows similar trend of SNR for each DN value. However there is a continuously growing error between the truth and AutoSNR. It would be because that our homogeneous detector assumes a pixel surrounded by homogeneous pixels is a noise pixel, but during the image synthesis, they can normally happen. And it results relatively lower measured SNR.