### Tags: Data Visualization, Model

*We give a method for localizing aurora in images taken from the ISS, to a location over the earth. First we use k-means image segmentation to extract the sky, aurora, and earth. We then create star trails from the brightest stars, and calculate their lengths. This gives us star velocities, from this we get the angle of the camera using least-squares over expected star velocities. With the angle of the camera and the segmented aurora, we can project the approximate aurora location onto a map.*

This project is solving the [**Aligning the Stars**](https://2013.spaceappschallenge.org/challenge/aligning-the-stars) challenge.

**Description**

**Method Steps**

Using images of the aurora taken from the ISS, we find location of the aurora over the Earth, by the following method:

· Segment (using k-means) to get the ground, sky, and aurora.

· Filter resulting images to only get the brightest stars, and generate star-trail images from these.

· Extract the length and direction of the star trails.

· Use the length of the star-trails to get star velocity, and find the direction the camera on the ISS is pointing by a least-squares search (see paper).

· Find where on the earth the aurora is above, by using inverse projections to find the approximate distance to the aurora from the ISS, and then projecting them back onto a map.

**More Information**

See our attached paper for more details on each step, and the video for a short overview with figures.

**Running the code**

See the README file on github for information on running the code (requires MATLAB and the MATLAB mapping and image processing tool boxes, and M\_MAP: <http://www.eos.ubc.ca/~rich/private/>).

**Project Information**

* License: [GNU General Public License](http://opensource.org/licenses/gpl-license)
* Source Code/Project URL: <https://github.com/laculp/SpaceApps2013>

**Resources**

* Direct link to the "North Dakota to Central Quebec\*" data set, used by example code: <http://eol.jsc.nasa.gov/Videos/CrewEarthObservationsVideos/dakotaquebec_iss_20120126/dakotaquebec_iss_20120126HighRes.zip>
* Short paper explaining the approach: <https://www.dropbox.com/sh/331ioong01s28ga/BDUIkNZ2qZ>