Architectural Review 2

Aiden Carley-Clopton, Grace Montagnino, Ricky Rose

Our Direction

- Take a satellite image of a city and from that draw a map
  - This involves:
    - Processing the images in a way that makes them readable and easily analyzable
    - Detecting features, specifically roads, and being able to draw those roads on a blank slate
    - A User Interface that hopefully is not in the command window, that allows users to select a city, and then recieve a map of the city
      - The user would be able to use sliding scales to determine the threshold for feature detection, thus determining how specific their map would be

What we have done so far

- We switched from using Pillow to opencv when processing images (balancing histograms and merging channels). This allows computation to be done as matrix operations on NumPy arrays and greatly reduced run time.
- In Feature Detection, we are able to detect lines, and shapes on normal images, but the computer is struggling with the detail of satellite images
    - We are working on incrementing through the satellite images, or editing thresholds to improve this
        - We are also looking at different ways preprocessing could help this
    - Next Steps are to make this work for road specific detection
- Research into python GUI Modules (leaning towards Tkinter and OS for sliders file browsing)

Image Processing Explained

- Converts image to image to numpy array
- Balances pixel value histograms for each channel
- Combines multiple channels to create color Images

Feedback on Image Processing

- How important is it for an image to be “true color” (i.e, how it would look to someone in a plane)
- How about a mapping of lengths in pixels in the image to distance in the real world (using metadata from satellite image sources)
- Thoughts on additional steps to “enhance” images (i.e, make significant features more prominent)?

Feature Detection Explained

- Originally we started with Canny Edge detection, and Hough Lines, but most recently we have been using open CVs findContours library
    - We are unsure which of these we will end up using to detect roads, but are leaning towards CV2.findContours, however the thresholds are proving difficult to control
- With the findContours we are able to detect shapes, however this is only working on simpler images with little background interference, doing so on satellite images is proving inaccurate
- We are trying to play with thresholds to improve accuracy, but it is not working super well for us

Feedback on Feature Detection

- Opinions on which feature detection would work best for us?
- Ideas on how to make feature detection work on complicated satellite images?
- Do you think that we will be able to detect roads accurately enough with line detection, or will we need to detect color as well?
    - If so, anyone know how...?

UI Explained

Tkinter is an open source python library for creating an intuitive GUI. It has recently included functionality for graphical file browsing which is very useful for this project. The high level idea for this GUI is to present the user with a file browser to select the location of satellite data. It will then extract and display pertinent metadata from the file. Next it will prompt the user to provide parameters (eg: threshold for what is considered a shape, line thickness, etc) to be used in the image processing and shape recognition functions. Finally, it will display the original image and the new image with shapes representing streets overlaid on to it. Ideally, the user would be able to adjust parameters real time and see changes in the adjacent window.

UI Feedback Questions

- Are there any issues that stick out regarding this approach?
- Suggestions on real time user interfaces?
- Is there a better module to use?
- Which parameters should be user adjustable and which should be taken care of computationally?

Feedback/ Questions about overall project

- Remembering how unfocused our project was at the last AR, does our project now seem properly focused and scoped?
- Do you have any concerns for us?
- Any suggestions?