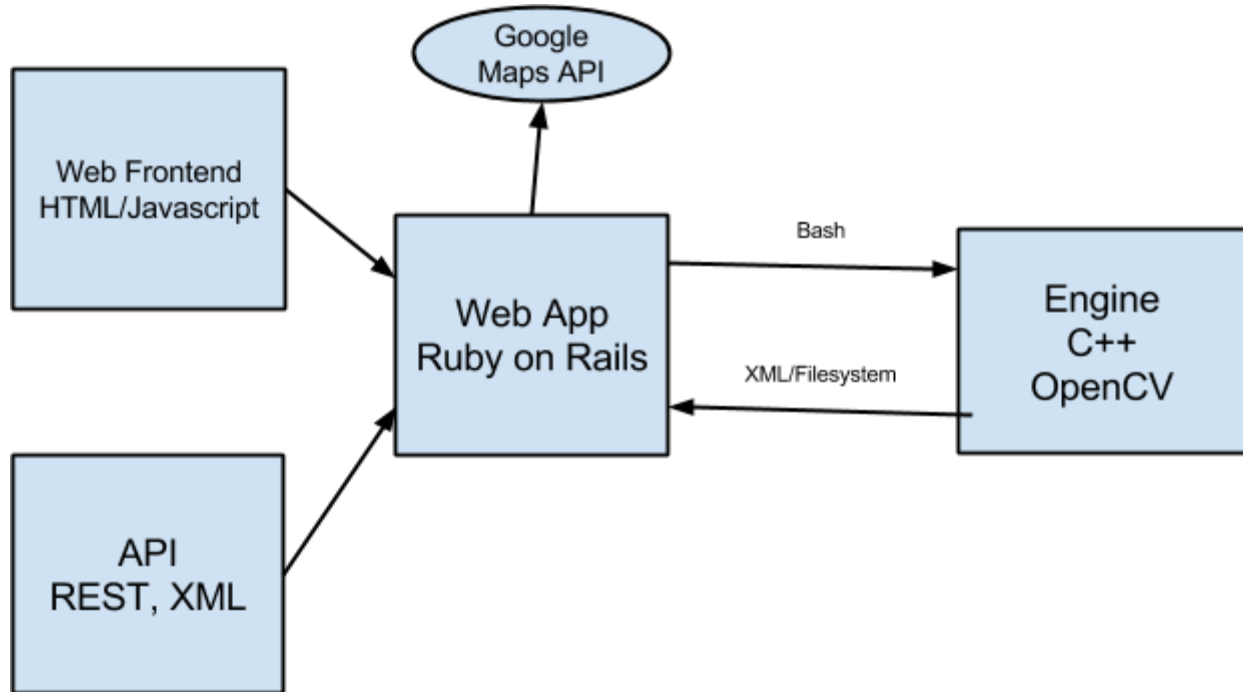Scraped Geometry Recognition
Jeff Csicsek
March 2012

Application Block Diagram

Lifecycle of a Typical Use Case

1. User enters address in web form, submits form
2. Request is handled by Ruby web app
   a. Map image for server-side processing is downloaded from the Google Maps Static API to the server filesystem
   b. Ruby invokes C++ image processing engine
   c. Engine writes map layer image with building footprints and area/height data to server filesystem and prints XML description of buildings to stdout
3. Map on web page re-centers on address, results (building footprints and area/height data) are shown as new layer on map. Algorithm run time is shown.

Algorithm

1. Identify Building Footprints
   a. Isolate building roof pixels by color
   b. Find contours
   c. Get polynomial description of contours
2. Calculate Building Heights
   a. Isolate building sidewall pixels by color
   b. Find contours of sidewalls
   c. Get polynomial description of sidewall contours
   d. Find vertical lines in these polynomials. These determine building height.
   e. Match sidewalls/height values to buildings
      i. For each sidewall, find the building which will maximize the ratio of the building area to the square of the distance between the centers of mass of both the sidewall and the building footprint

API

Get Building Data:

http://<server>/api/buildings?address=*address*
Returns an XML description of all buildings near the given address. Sample:

```
<buildings>
    <building address="bldg 1" area="1017" height="0"/>
    <building address="bldg 2" area="2660" height="0"/>
    <building address="bldg 3" area="2685" height="0"/>
    <building address="bldg 4" area="949" height="29"/>
</buildings>
```

Get Annotated Map Image:

http://<server>/api/mapimage?address=*address*
Returns a JPEG image of the map centered at the given address annotated with building footprints and data.

Build and Deploy

The c++ source code for the image processing engine is in mapscraper/engine. The included makefile was written for Mac OS X Lion with OpenCV installed with MacPorts. The Rails platform must be installed to run the web layer.