

MIGHTY MAPS

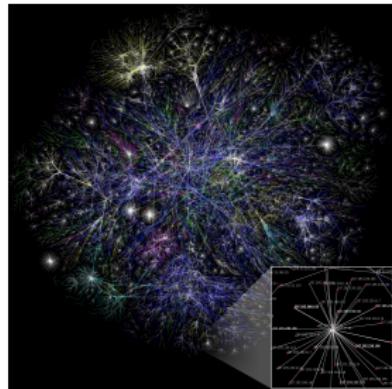
GEOSPATIAL VISUALIZATION WITH GOOGLE EARTH AND KML

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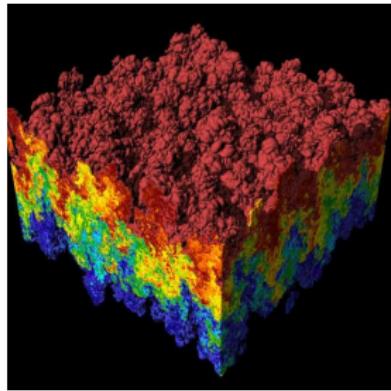
COOL KIDS DO DATA VISUALIZATION



The Opte Project

Everyone seems to have data, and lots of it. Everyone seems to want pictures of their data. Since most data geeks recommend drawing pictures as the first step of any analysis, this is probably a good thing.

COOL KIDS DO DATA VISUALIZATION

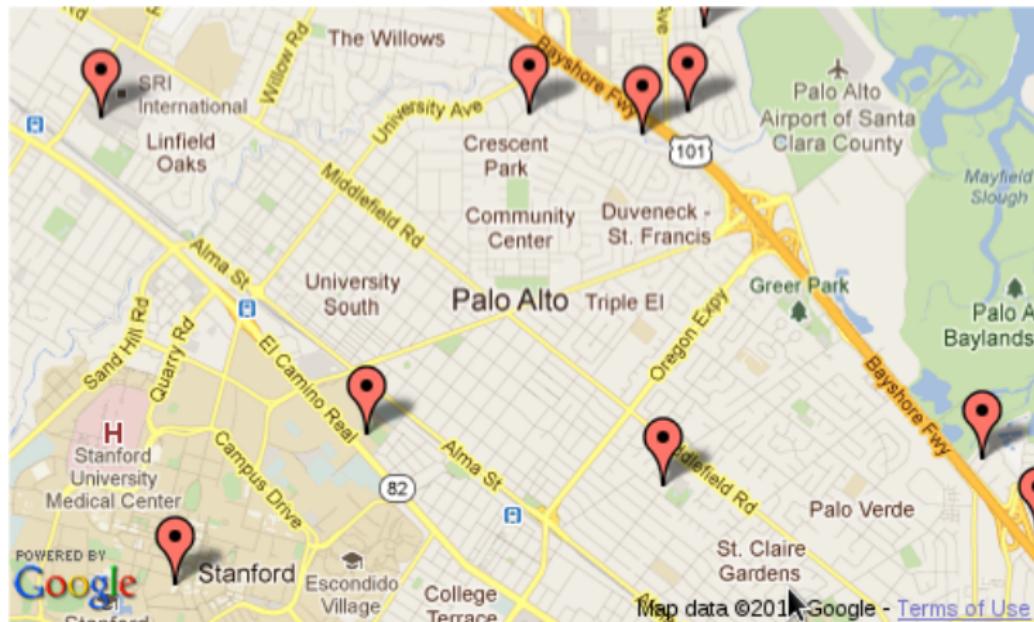


Visualization has become a vibrant field of study. People blog about visualizations.

Lawrence Livermore
National Laboratory

COOL KIDS DO DATA VISUALIZATION

In particular, people love geospatial visualization. Perhaps because everyone has geographic data, and Google's Maps API is easy.



COOL KIDS DO DATA VISUALIZATION

...or other APIs, if you prefer...



GEOSPATIAL VISUALIZATION

Geospatial visualization is ...

- It's easy to understand, compared to dots and lines. Everyone understands maps
- The selection of APIs makes it easy to do
- Everyone has geographic data
 - Who browsed my website, from where? (GeoIP)
 - Where do I ship most of my orders
 - What, in fact, are the migration patterns of African and European swallows?

COOL KIDS DO DATA VISUALIZATION

The process is pretty simple:

- ➊ Convert data to latitude and longitude (this is often the most difficult part)
- ➋ Create styles for data, if desired
- ➌ Plug data into some JavaScript API
- ➍ Remove some data after determining you've overwhelmed the API
- ➎ Celebrate

EVERYONE HAS GEOGRAPHIC DATA

NOTE

Although everyone has geographic data, it's not necessarily important data.

EVERYONE HAS GEOGRAPHIC DATA

NOTE

The fact that particular data are unimportant or even meaningless rarely prevents people from trying to make a picture out of them.

There are some cool things happening in geovisualization...

GOOGLE EARTH

Google Earth is essentially Google Maps in 3D.



WHAT'S GOOGLE EARTH?

- Desktop application for Linux (and Mac and Windows, if you insist)
- Free, but not open source ;(
 - This has caused us some problems
- There exists a paid “professional” version
 - Allows rendering of video, more flexible editing of large data sets, and a few other things
- Also exists in browser plugin form with JavaScript control; right now this works only on Mac and Windows
- Began as a project by Keyhole software, which Google eventually bought

HOW TO USE GOOGLE EARTH

Google Earth accepts files written in Keyhole Markup Language

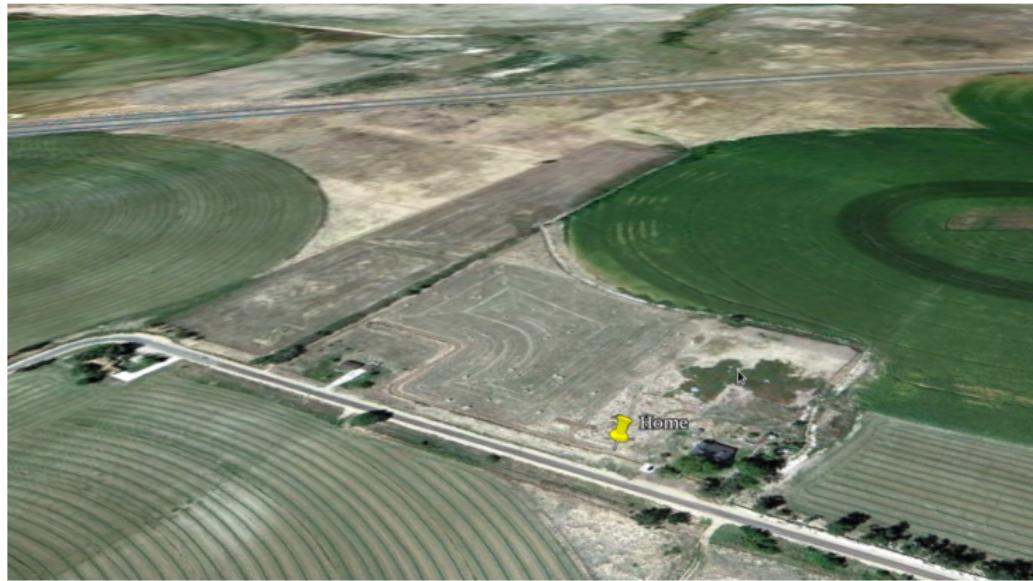
- XML-based
 - Mix between declarative XML, like XML Schema or XML config files, and procedural, like XSLT
- Can be created automatically through Google Earth. This is slow and inflexible
- Can be written by hand. This is like chewing glass
- Can be generated by various helper projects
 - Kamelopard: Ruby-based. I wrote most of it, and use it a lot.
 - PyKML: Python-based. More polished and consistent, but seemingly less capable than Kamelopard

ASIDE

This presentation won't show you much KML. Its point is to show some of what can be done, leaving the KML as an exercise for the reader.

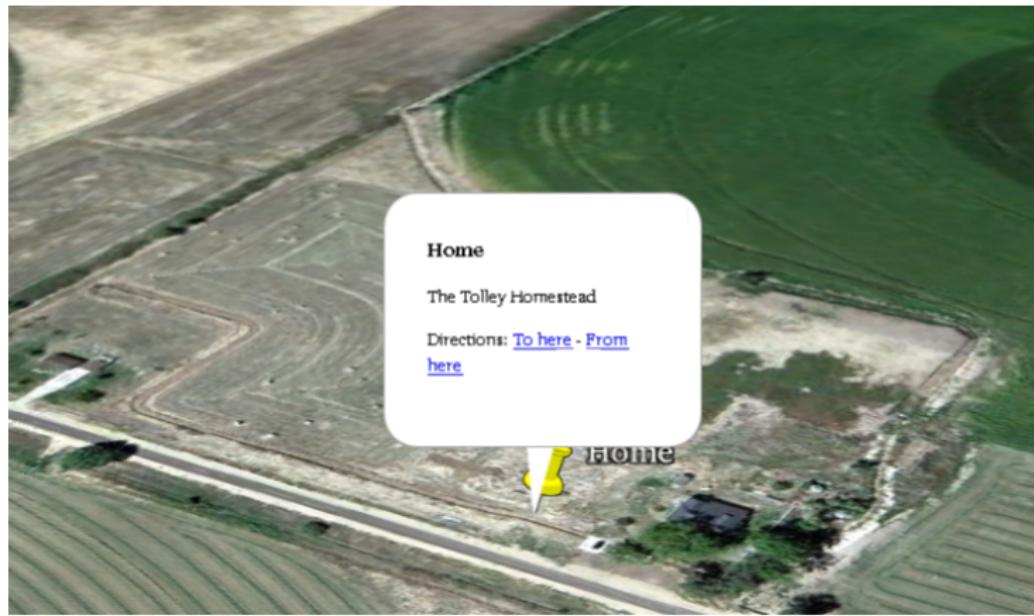
AN EXAMPLE

I live on a small farm, where we are growing 12 acres of wheat and raising various poultry. It's here. This is a KML Placemark.



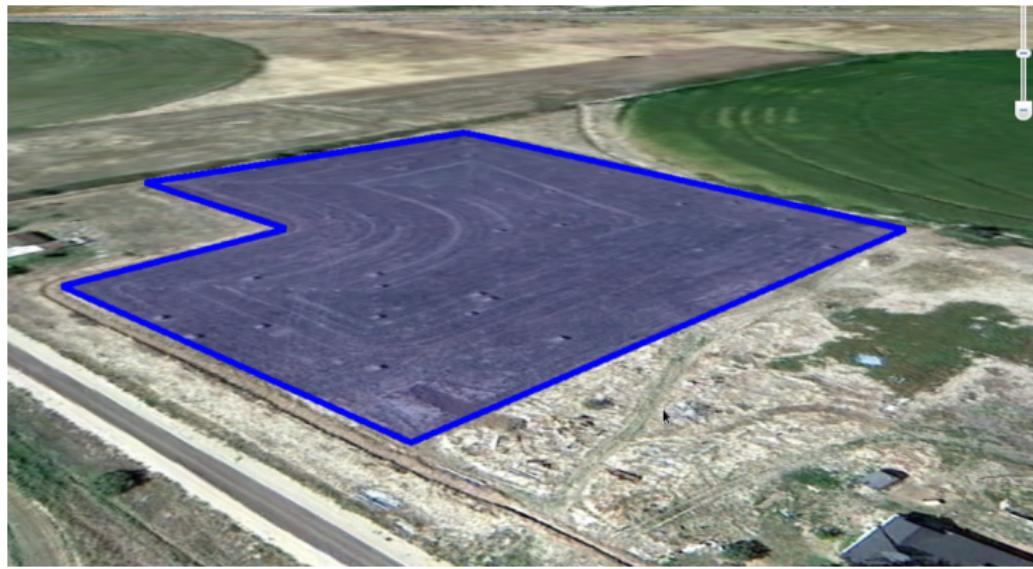
AN EXAMPLE

These placemarks have descriptions, which can pop up in balloons, like this one. This can include CSS, images, or even Flash video. Icons, text, and balloons can all be styled at will.



AN EXAMPLE

As I said, we're growing wheat this year. This shows the wheat field, outlined with a KML polygon. KML also allows other objects, like lines and 3D models, in various styles.



AN EXAMPLE

Some of these KML objects can include time data



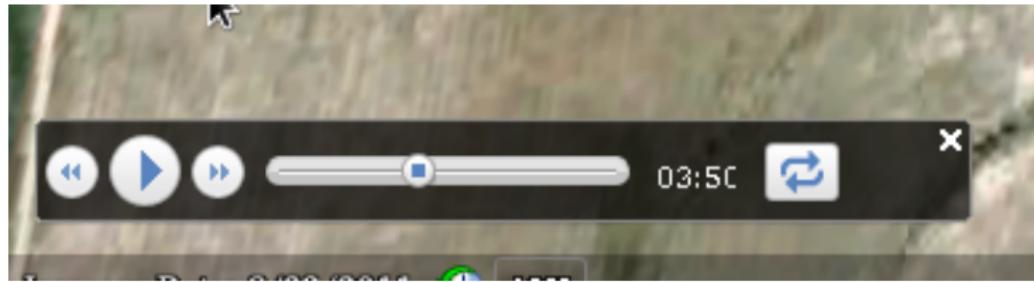
AN EXAMPLE

Google Earth allows a few different kinds of added images in a scene, called “Overlays”. This is a Screen Overlay.



AN EXAMPLE

Images, placemarks, overlays, etc. can be grouped and animated in a “Tour”



Tours navigate the viewer automatically, displaying and hiding objects at precise locations and for well-defined durations. They can include background audio.

MORE EXAMPLES

This is useful for more than just pretty pictures.

- Ocean currents
- Tsunami shock waves
- Wind patterns
- Historical events

LIQUID GALAXY

Google Earth can talk to itself, to broadcast its view of the world. It can also receive these packets, and show related views. So if you put multiple instances together, you get a panoramic view.

LIQUID GALAXY

This panoramic view is called a Liquid Galaxy.



...and if you wanna work on some, we're hiring ...

LIQUID GALAXY

End Point has done lots of work with Liquid Galaxies:

- They boot custom ISOs from a network
- Tours and content can be controlled via touch screen
- Techs can monitor and repair galaxies remotely, easily
- Tour content can integrate Google Earth with other applications, such as mplayer
- It's all open source

Come see our booth :)

UNIVERSAL TRUTH

Writing XML in significant quantities by hand sucks.
Debugging and modifying it later sucks worse.

MAKING TOURS



Enter “Kamelopard”:

- Writes KML for you
- Ruby-based, for buzzword appeal
- Open source, so you can fix what's broken
- Awkward name. It worked for PostgreSQL...

MAKING TOURS

```
require 'rubygems'  
require 'kamelopard'  
require 'yaml'  
  
f = Kamelopard::Folder.new 'Tour Resources'  
data = YAML::load_file 'some_data.yml'  
data.each do |d|  
  p = point d[:longitude], d[:latitude]  
  pl = Kamelopard::Placemark p, :desc => d[:desc]  
  f << pl  
end  
  
write_kml_to 'doc.kml'
```

KAMELOPARD

Kamelopard makes it easy (and succinct!) to generate KML for large data sets, using complicated algorithms.

- Tour of End Point employees, taken straight from employee database
- FamilySearch mashup; show ancestral migrations
- “Smart” power meters’ trouble messages vs. lightning strikes
- Fisheries’ catch records plotted historically, also straight from the database

LARGE DATASETS

KML can handle large datasets gracefully

- Regions: Data are loaded only when zoomed in close enough
- GroundOverlays: Data can be encoded into images that are mapped over the earth
- Combining the two, increasingly detailed images or sets of placemarks can appear as the user zooms in closer
- DataAppeal creates maps with various models in them, scaling and coloring them based on users' data

So...

- Google Earth is kinda neat
 - (though how might pictures of my backyard help the zombies advance their cause?)
- Liquid Galaxies are neat, too
 - They can make some pretty pictures
 - They can also show serious data

Questions?