

# Describing Geographical Objects

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## Abstract (2)

The *Keyhole Markup Language (KML)* is a way of how placemarks and other geographical features can be described. It is not as powerful or sophisticated as the *Geographic Markup Language (GML)*, but it is easier to understand and use and is supported as a data format by a variety of Web-oriented services and applications. Flickr, Google Maps, Google Earth all support KML and can use KML for exchanging geographic datasets.

## Geodata on the Web (3)

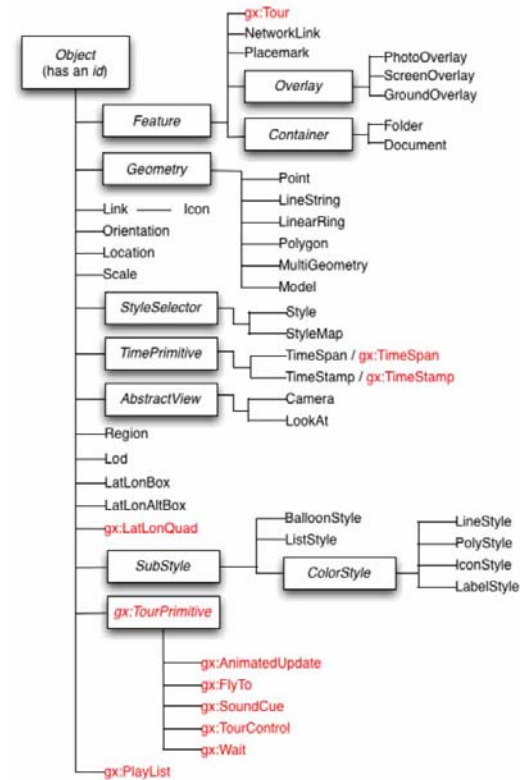
- [GeoRSS](#) [Location and Geocoding] is a simple way of tagging feed entries
  - each entry can be associated with a point on a map (GeoRSS-Simple in its simplest form)
  - the basic data structure is still a feed (probably sorted by date)
- [Keyhole](http://en.wikipedia.org/wiki/Keyhole,_Inc.) [http://en.wikipedia.org/wiki/Keyhole,\_Inc.] pioneered consumer-level geospatial imaging
  - founded in 2001 and acquired by Google in 2004
  - Google Maps and Google Earth are based on Keyhole technologies
- [Google Earth](http://earth.google.com/) [http://earth.google.com/] started as a standalone program
  - separate application instead of being an integral part of browsing
  - [Google Earth Plug-in](http://googlesystem.blogspot.com/2008/05/google-earth-browser-plugin.html) [http://googlesystem.blogspot.com/2008/05/google-earth-browser-plugin.html] and [Google Earth API](http://code.google.com/apis/earth/) [http://code.google.com/apis/earth/] allow browser integration
  - [Plug-Ins](#) [Web Browsers; Plug-Ins (1)] require separate installation (unless they are as popular as *Flash*)

# Keyhole Markup Language (KML)

## Map-Based Painting (5)

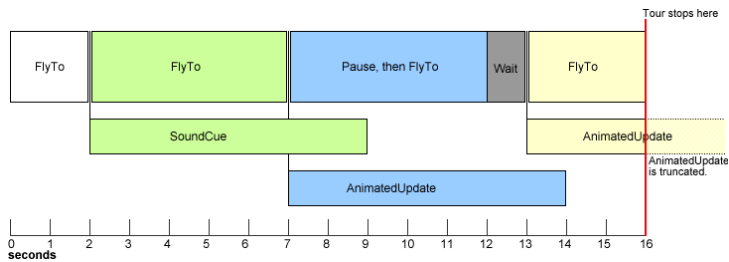
- KML represents annotations in mapping-oriented applications
- Features for representing annotations (not the map itself)
  - placemarks
  - images
  - polygons
  - textual descriptions
  - 3D models
- Google Earth extends KML with dynamic features
  - ability to associated time spans with features
  - ability to represent tours (dynamic presentations of features)

## KML Schema (6)



## KML Tours

(7)



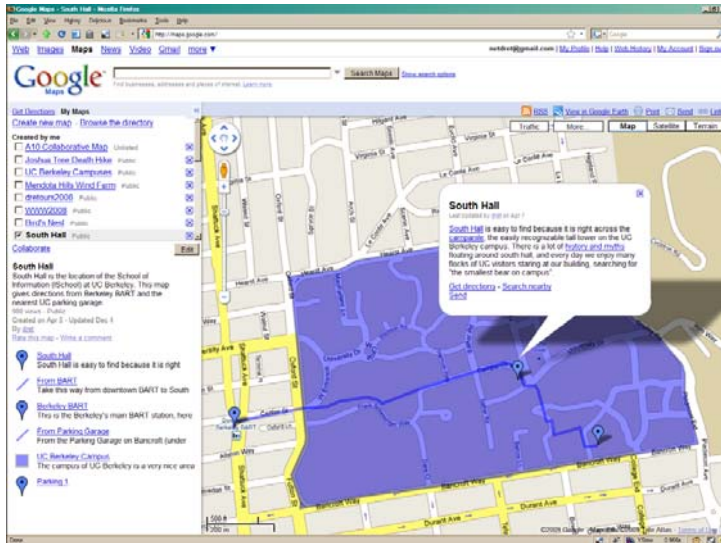
## Google My Maps

(8)

- Based on Google Maps and adds simple drawing features
  - maps are associated with a Google account
  - maps can be private, public, or collaborative
  - maps can be [linked to](http://maps.google.com/maps/ms?ie=UTF8&hl=en&msa=0&msid=116962062413210327627.00000111c424a5e1da07d&z=15) [http://maps.google.com/maps/ms?ie=UTF8&hl=en&msa=0&msid=116962062413210327627.00000111c424a5e1da07d&z=15] for publishing custom maps
- Extremely limited in its functionality
  - three feature drawing tools: placemarks, lines, polygons
  - allows import of GeoRSS or KML data (KMZ simply is gzipped KML)
  - inability to rearrange painted features

## Google My Maps

(9)



## South Hall KML (1<sup>st</sup> Attempt)

(10)

```
<?xml version="1.0" encoding="UTF-8"?>
<kml xmlns="http://earth.google.com/kml/2.2">
  <Document>
    <name>UC Berkeley Campuses</name>
    <description><![CDATA[]]></description>
    <NetworkLink>
      <name>UC Berkeley Campuses</name>
      <Link>
        <href>http://maps.google.com/maps/ms?ie=UTF8&hl=en&vps=1&
          amp;jsv=153e&oe=UTF8&msa=0&
          amp;msid=116962062413210327627.00043de7109aff5329452&output=kml</href>
      </Link>
    </NetworkLink>
  </Document>
</kml>
```

- Useful because the KML is just a pointer to the real data
- Only useful in online scenarios (access to URI required)

## Getting the KML Data (11)

- KML has a feature that allows dynamic access to KML files
- KML handling in offline/import scenarios requires KML content
- KML is XML and XML has special escaping rules
  - [markup languages](#) [Setup and Environment; Element Markup (1)] always need "magic characters" (in HTML/XML: < & " ' )
  - copy/paste of XML-encoded strings requires unescaping of these characters
- Unescaping is a mechanical task and can be done by hand
  - change each "&" into "&"
  - [Web-based services](#) [http://coderstoolbox.net/string/] can be used to automate this task (use "XML" "decode" to "US-ASCII" when using this service)

## South Hall KML (12)

```

<Placemark>
  <name>South Hall</name>
  <description><![CDATA[South Hall is the oldest building in the UC system
and is located in the middle of the UC Berkeley main campus.<br><img
alt=""><br>]]>
</description>
  <styleUrl>#style20</styleUrl>
  <Polygon>
    <outerBoundaryIs>
      <LinearRing>
        <tessellate>1</tessellate>
        <coordinates>
          -122.258682,37.871521,0.000000
          -122.258499,37.871559,0.000000
          -122.258339,37.871159,0.000000
          -122.258530,37.871109,0.000000
          -122.258682,37.871521,0.000000
        </coordinates>
      </LinearRing>
    </outerBoundaryIs>
  </Polygon>
</Placemark>

```

## **KML vs. GeoRSS**

**(13)**

- Different focus (based on the language origins)
  - GeoRSS is a feed of entries (with some geospatial annotations)
  - KML is a set of features intended as a map overlay
- Different application scenario
  - GeoRSS is published from a continually updated collection
  - KML often is a static set of features (or a "static" tour)

# **KML Applications**

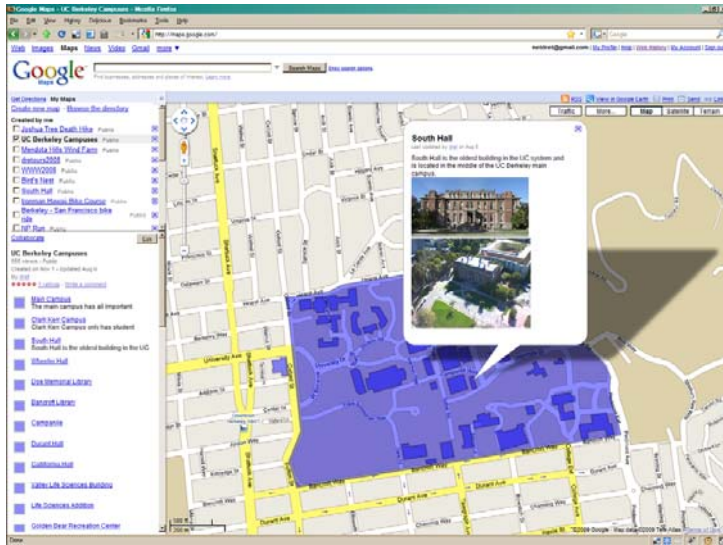
---

## **KML as "Poor Man's GIS"**

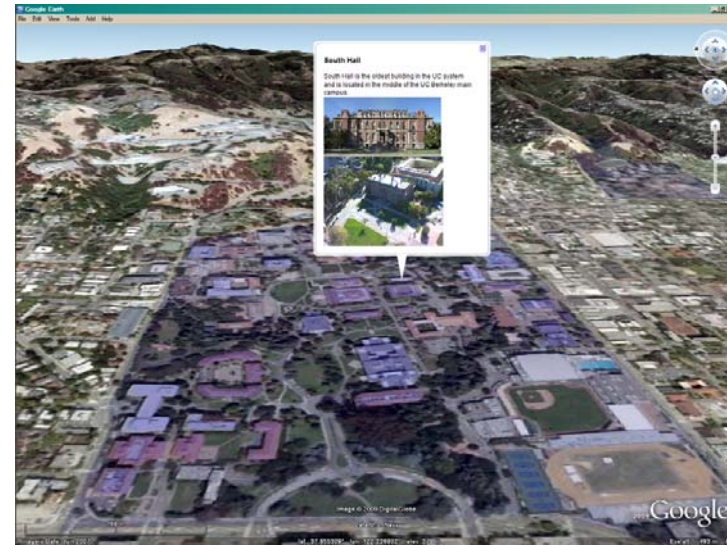
**(15)**

- KML can be easily exported from various geospatial data sources
  - sophisticated systems have richer data formats
  - KML is better used as an "export format", not as a "native format"
- Increased availability of mobile devices produces geospatial data streams
  - KML as the smallest common denominator among these

## UCB Campus KML in Google Maps (16)



## UCB Campus KML in Google Earth (17)





# GPS KML Export

(18)

```

<LineString>
  <coordinates>
-122.2677459,37.9042908,254.4060059 -122.2677476,37.9042933,254.4060059
-122.2677686,37.9042067,254.4060059 -122.267895,37.9041198,253.4447021
-122.2680509,37.9040338,252.4833984 -122.2682063,37.9039967,250.560791
-122.2683674,37.9039979,249.5994873 -122.268569,37.9040305,248.6381836
-122.2687854,37.9040907,246.2348633 -122.269004,37.9041813,246.2348633
-122.2690351,37.904202,246.2348633 -122.2691941,37.9042747,245.7541504
-122.2693706,37.9043745,246.7154541 -122.2693997,37.9043921,246.7154541
-122.2694605,37.9045424,245.7541504 -122.2694809,37.9046427,245.7541504
-122.2695116,37.9047445,245.7541504 -122.269538,37.9049206,246.2348633
-122.2695581,37.9050732,246.7154541 -122.2695746,37.9052039,248.1575928
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-122.2696726,37.9059762,245.2734375 -122.2696909,37.9061069,245.2734375
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-122.2697,37.906454,247.6767578 -122.269709,37.9065346,249.5994873
-122.2697494,37.9066337,251.0413818 -122.2698141,37.9067632,254.4060059
-122.269873,37.9068874,257.770752 -122.2699277,37.906991,260.6545410000001
-122.270014,37.9071211,263.0578613 -122.2700772,37.9072552,263.5385742000001
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-122.2703347,37.9077357,263.5385742000001 -122.2704255,37.9078669,264.4998779
-122.2705373,37.9080606,264.9805908 -122.2706086,37.9082023,264.0192871
-122.2706944,37.9083372,263.0578613 -122.270743,37.9084601,262.5771484
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-122.2716284,37.9096116,247.1960449 -122.2717288,37.9097312,245.7541504
-122.2717758,37.909839,244.7928467 -122.2718446,37.9099603,243.831543
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-122.272111,37.9102503,239.0249023 -122.2721364,37.9103776,240.467041
-122.2721965,37.9105403,239.5054932 -122.2722612,37.9106606,239.5054932
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-122.273005,37.9116161,243.831543 -122.2731705,37.9116638,243.3508301
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```

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```

-122.2737914,37.9123246,249.5994873 -122.2739617,37.9123719,249.1187744
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-122.2754346,37.9134314,235.6602783 -122.2755579,37.9135319,236.6217041
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-122.2763635,37.9138034,232.2957764 -122.2765191,37.9138292,231.3343506
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-122.2776646,37.9142634,222.2017822 -122.2778485,37.9143202,222.2017822
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```

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## Conclusions

**(19)**

- Geospatial data is important and gets more important
- GeoRSS and KML are two simple data formats for geospatial data
- GeoRSS build on a more solid foundations (dynamic collections)
- KML is mostly a static and standalone data format