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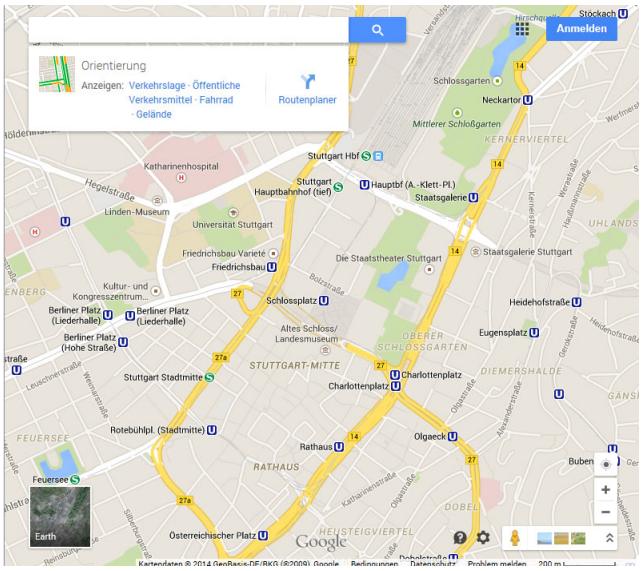
Google Maps

- Google Maps started on February 2005
- Google Maps and Google Earth are based largely on identical data sets



Google APIs

- Google Maps Javascript API
  - Embed Google Maps in a web site
- Google Static Maps API
  - REST-Interface for the viewing of maps
- Google Street View API
  - REST-Interface for the viewing of Street View Data
- Customizing Maps
  - Maps with user-defined styles

- More …

Google Maps API Licensing

- The **Google Maps APIs** let you embed Google Maps in your web pages or mobile apps. Your service must be freely and publicly accessible to end users.
- **Google Maps API for Work** provides enhanced features and added support to organizations who are adding maps to their fee-based websites or mobile apps, or to their internal websites.

Features	Maps API	Google Maps API for Work
Street View	✓	✓
Geocoding Web Service	2500 requests per 24 hour period	100 000 requests per 24 hour period
Directions Web Service	2500 requests per 24 hour period with 10 waypoints per request	100 000 requests per 24 hour period with 23 waypoints per request
Distance Matrix Web Service	100 elements per query 100 elements per 10 seconds 2500 elements per 24 hour period	625 elements per query 1000 elements per 10 seconds 100 000 elements per 24 hour period
Elevation Web Service	2500 requests per 24 hour period with 25 000 samples per 24 hour period	100 000 requests per 24 hour period with 1 000 000 samples per 24 hour period
Static Maps API maximum resolution	640 x 640	2048 x 2048
Static Maps API maximum scale	2X	4X
Street View Image API maximum resolution	640 x 640	2048 x 2048
Analytics		✓

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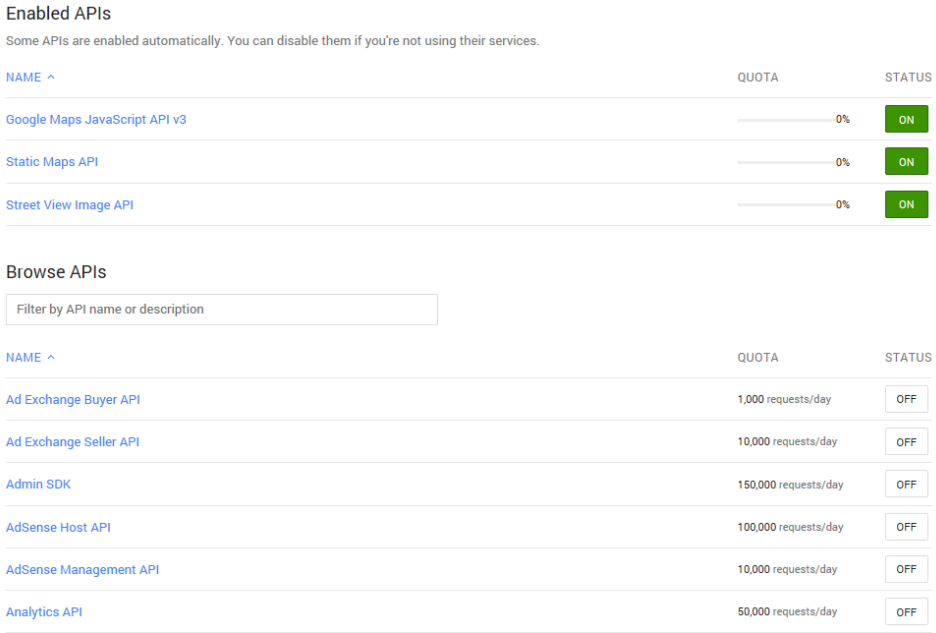
Get a Google license key

- Sign in to a Google account at https://code.google.com/apis/console
- Follow instructions



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Google Maps Javascript API

```
<html>
  <head>
    <script type="text/javascript"
      src="http://maps.googleapis.com/maps/api/js?key=AI...Z0">
    </script>
    <script type="text/javascript">
      function initialize()
      {
        var mapOptions = {center: new google.maps.LatLng(48.78317,9.17518),
                          zoom: 18,
                          mapTypeId: google.maps.MapTypeId.ROADMAP};
        var map = new google.maps.Map(document.getElementById("map_canvas"),
                                      mapOptions);
      }
    </script>
  </head>
  <body onload="initialize()">
    <div id="map_canvas" style="width:500px; height:300px"></div>
  </body>
</html>
```

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Map with Marker

```
function initialize()
    {
      var mapOptions = {center: new google.maps.LatLng(48.78317,9.17518),
                        zoom: 18,
                        mapTypeId: google.maps.MapTypeId.ROADMAP};
      var map = new google.maps.Map(document.getElementById("map_canvas"), mapOptions);

      var myLatLng = new google.maps.LatLng(48.78317,9.17518);
      var myMarker = new google.maps.Marker({position: myLatLng, map: map});
    }
```

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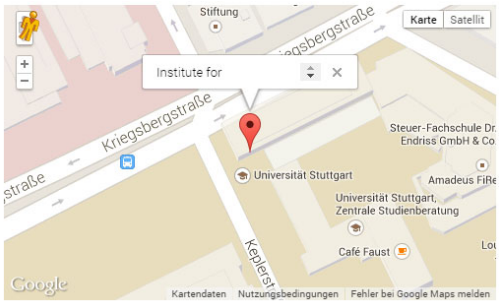
Marker with Info-Window

```
function initialize()
    {
      var mapOptions = {center: new google.maps.LatLng(48.78317,9.17518),
                        zoom: 18,
                        mapTypeId: google.maps.MapTypeId.ROADMAP};
      var map = new google.maps.Map(document.getElementById("map_canvas"), mapOptions);

      var myLatLng = new google.maps.LatLng(48.78317,9.17518);
      var myMarker = new google.maps.Marker({position: myLatLng,
                                             map: map,
                                             title: "ifp"});
      var myWindow = new google.maps.InfoWindow({content: "Institute for Photogrammetry"});
      myWindow.open(map, myMarker);
    }
```



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Polygons

```
function initialize()
    {
     var myLatLng = new google.maps.LatLng(24.886436490787712, -70.2685546875);
     var mapOptions = {zoom: 3, center: myLatLng, mapTypeId: google.maps.MapTypeId.TERRAIN};
     var map = new google.maps.Map(document.getElementById("map_canvas"), mapOptions);
     var triangleCoords = [new google.maps.LatLng(25.774252, -80.190262),
                           new google.maps.LatLng(18.466465, -66.118292),
                           new google.maps.LatLng(32.321384, -64.75737),
                           new google.maps.LatLng(25.774252, -80.190262)];
     var bermudaTriangle = new google.maps.Polygon({paths: triangleCoords,
                                 strokeColor: "#FF0000",
                                 strokeOpacity: 0.8,
                                 strokeWeight: 2,
                                 fillColor: "#FF0000",
                                 fillOpacity: 0.35});
     bermudaTriangle.setMap(map);
    }
```

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Control Elements

- Control elements can be added or removed with the following parameters of the mapOption element
  true = visible, false = invisible
  - panControl: boolean
  - zoomControl: boolean,
  - mapTypeControl: boolean
  - scaleControl: boolean
  - streetViewControl: boolean
  - overviewMapControl: boolean

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Control Elements

```
function initialize()
    {
      var mapOptions = {center: new google.maps.LatLng(48.78317,9.17518),
                        zoom: 18,
                        mapTypeId: google.maps.MapTypeId.ROADMAP,
                        panControl: true,
                        zoomControl: false,
                        mapTypeControl: false,
                        scaleControl: false,
                        streetViewControl: false,
                        overviewMapControl: false};
      var map = new google.maps.Map(document.getElementById("map_canvas"),
      mapOptions);
    }
```

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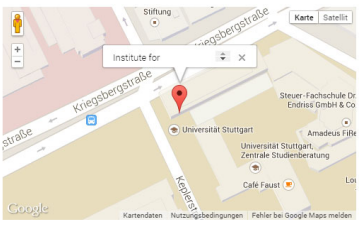
Events

```
function initialize()
    {
      var mapOptions = {center: new google.maps.LatLng(48.78317,9.17518),
                        zoom: 18,
                        mapTypeId: google.maps.MapTypeId.ROADMAP};
      var map = new google.maps.Map(document.getElementById("map_canvas"), mapOptions);

      var myLatLng = new google.maps.LatLng(48.78317,9.17518);
      var myMarker = new google.maps.Marker({position: myLatLng,
                                             map: map,
                                             title: "ifp"});
      var myWindow = new google.maps.InfoWindow({content: "Institute for Photogrammetry"});
      google.maps.event.addListener(myMarker, 'click', function() {myWindow.open(map, myMarker); });
    }
```



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Google Static Maps API

- With Google Static Maps API it is possible to embed a (static) Google Map into a web-site without JavaScript
- http://maps.googleapis.com/maps/api/staticmap?center=Stuttgart,Keplerstrasse&zoom=17&size=400x400&key=AI...Z0

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Google Static Maps API

- http://maps.googleapis.com/maps/api/staticmap?center=Stuttgart,Keplerstrasse&zoom=17&size=400x400&maptype=satellite&key=AI...Z0

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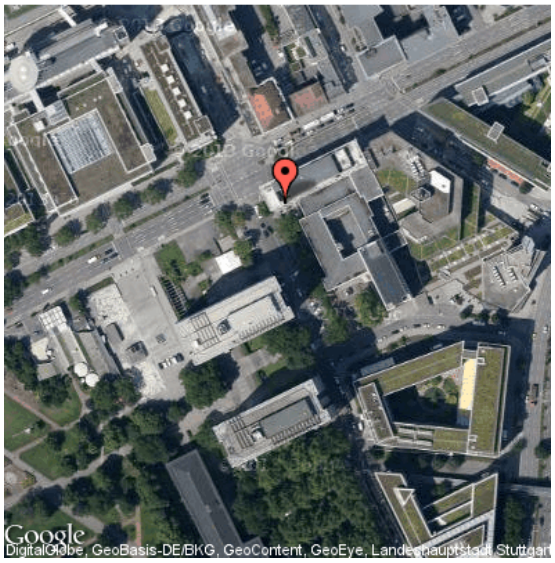
Google Static Maps API

- http://maps.googleapis.com/maps/api/staticmap?center=Stuttgart,Keplerstrasse&zoom=17&size=400x400&maptype=satellite&markers=48.78317,9.17518&key=AI...Z0



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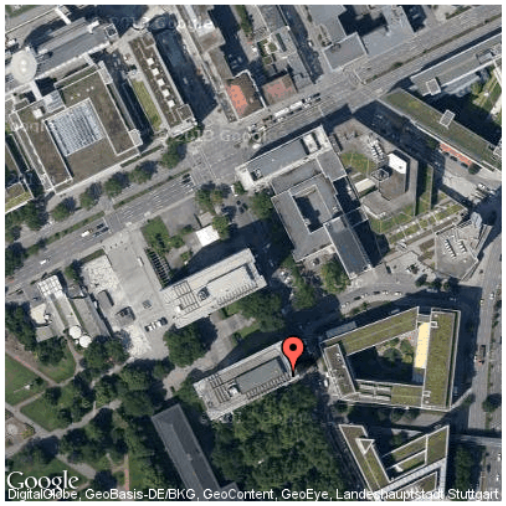
Google Static Maps API

- http://maps.googleapis.com/maps/api/staticmap?center=Stuttgart,Keplerstrasse&zoom=17&size=400x400&maptype=satellite&markers=Stuttgart,Keplerstrasse17&key=AI...Z0



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Google Street View Image API

- The Google Street View Image API lets you embed a static (non-interactive) Street View panorama into your web page, without the use of JavaScript. The viewport is defined with URL parameters sent through a standard HTTP request, and is returned as a static image.
- Parameters:
  - *size* defines the size of the image in pixel
  - *location* either a text (e.g. Chagrin Falls, OH) or lat/lon (e.g. 40.457375,-80.009353)
  - *sensor* defines if the device has a location sensor (GPS) which should be used for determine the location

Google Street View Image API

- Optional Parameter:
  - *heading* indicates the compass heading of the camera. Accepted values are from 0 to 360 (both values indicating North, with 90 indicating East, and 180 South).
  - *fov* (*default* = 90) determines the horizontal field of view of the image. The field of view is expressed in degrees, with a maximum allowed value of 120
  - *pitch* (*default* = 0) specifies the up or down angle of the camera relative to the Street View vehicle.
  - *key* identifies your application for quota purposes

Google Street View Image API

- http://maps.googleapis.com/maps/api/streetview?size=600x300&location=Stuttgart,Keplerstrasse11&heading=151.78&pitch=-0.76&sensor=false&key=AI...Z0

heading=0

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Styled Maps

- Styled maps allow you to customize the presentation of Google Maps, changing the visual display of such elements as roads, parks, and built-up areas.
- Example

```
var styles = [
  {
    featureType: "all“
     stylers: [{ saturation: -20 }]
  },
  {
    featureType: "road",
    elementType: "labels",
    stylers: [{ visibility: "off" }]
  }
];
```

Reduce Saturation of all objects

Do not show road labels

Styled Maps

```
function initialize()
    {
      var styles = [{featureType: "all",
                     stylers: [{ saturation: -50 }]},
                    {featureType: "road",
                     elementType: "labels",
                     stylers: [{ visibility: "off" }]}];

      var styledMap = new google.maps.StyledMapType(styles, {name: "Styled Map"});
      var mapOptions = {zoom: 18, center: new google.maps.LatLng(48.78317,9.17518),
                        mapTypeControlOptions: {mapTypeIds: [google.maps.MapTypeId.ROADMAP,
                                                             'map_style']}};
      var map = new google.maps.Map(document.getElementById('map_canvas'), mapOptions);
      map.mapTypes.set('map_style', styledMap);
      map.setMapTypeId('map_style');
    }
```

Style definition

Create Style with name „Styled Map“

Assign the style to the map

Map is displayed with the new style

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Styled Maps Wizard

- The manual definition of a style can be time intensive
- With the Styled Map Wizard you can select map elements and assign them individual styles.
- The style can be save in a JSON object and copied into your application
- http://gmaps-samples-v3.googlecode.com/svn/trunk/styledmaps/wizard/index.html

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Styles for Static Maps

- http://maps.googleapis.com/maps/api/staticmap?center=48.782724,9.175137&zoom=17&format=png&sensor=false&size=640x480&maptype=roadmap&style=feature:road|invert_lightness:true|hue:0x0044ff&style=invert_lightness:true

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Examination

- **Module 6 “Representation of Geodata”**
  - Geoinformatics, Thematic Cartography
  - Date: Tuesday, February 23, 2017
  - Time: 11:00 - 13:00, 120 min
  - Type: Written exam, Closed Book
  - Room: Seminar room M 24.01, Geschwister-Scholl-Str. 24D
- Questions:
  - Everything can be asked what was discussed in the lectures **and** in the exercises
  - Expect 15 +- questions
  - It is possible hat you have to calculate something or that you have to derive a structure with an algorithm

Examples

This is not a complete listing of all possible questions. It is possible that not one of these questions will be asked in the exam. This should be used only for an orientation

- What is a GIS?
- What is the IMAP model?
- What are the components of a GIS and how long is their life cycle?
- What is primary data acquisition?
- What is secondary data acquisition?
- What is an orthophoto? Why do we need that?
- What is laser scanning?
- What is the acquisition accuracy if you digitize manually from a 1:50,000 map?
- What is the acquisition speed if you digitize manually from a 1:50,000 map?
- Why do we need a transformation when we digitize from a map?
- What kind of transformation is typically used?
- What is semi-automatic digitizing?
- What is automatic digitizing?
- What is GDF?

Examples
This is not a complete listing of all possible questions. It is possible that not one of these questions will be asked in the exam. This should be used only for an orientation

- What is the difference between raster and vector data?
- What are the advantages and disadvantages of raster and vector data?
- What is thematic data?
- What is a TIN?
- For what do we use TIN's?
- What is geometric modelling?
- What is topologic modelling?
- What is thematic modelling?
- How does a GPS work?
- What is DGPS?
- How accurate can we collect spatial data?
- What is remote sensing?
- What is WGS 84

Examples
This is not a complete listing of all possible questions. It is possible that not one of these questions will be asked in the exam. This should be used only for an orientation

- What are the methods for modelling 3D-objects? How do they work?
- What is the "Königsberger Brückenproblem"?
- What is the travelling salesman problem?
- What is a minimal spanning tree?
- What different types of graphs do you know?
- What are the topologic basic primitives?
- Why is topology important?
- Explain a data structure for topologic structured data on an example
- What is the layer principle in thematic modelling?
- What is the object class principle in thematic modelling?
- What is a semantic network?
- …
- …

Examples
This is not a complete listing of all possible questions. It is possible that not one of these questions will be asked in the exam. This should be used only for an orientation

- Write a (simple) HTML file
- Write a (simple) HTML/CSS file
- Write a (simple) HTML/Javascript file
- Look at the following code… what will happen?

```
<html>
  <head>
    <script type="text/javascript" src="http://ecn.dev.virtualearth.net/mapcontrol/mapcontro
    <script type="text/javascript">
      var map = null;

      function GetMap()
      {
        map = new Microsoft.Maps.Map(document.getElementById("myMap"), {credentials:"Avt_Rb_
        var loc = new Microsoft.Maps.Location(48.78317,9.17518);
        var pin = new Microsoft.Maps.Pushpin(loc);
        map.entities.push(pin);
        map.setView({center: loc, zoom: 16});
      }
    </script>
  </head>
  <body onload="GetMap();">
      <div id='myMap' style="position:relative; width:600px; height:400px;"></div>
  </body>
</html>
```

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Examples
This is not a complete listing of all possible questions. It is possible that not one of these questions will be asked in the exam. This should be used only for an orientation

- Do not forget to look at the GISneyland exercises …
  - Examples:
    - Explain Data View / Layout View
    - Explain Table Join / Spatial Join
    - Explain Worldfile
    - …
    - …

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