Make your own GIS service

Summer School on Digital Humanities

Web site: https://bit.ly/dt4h-gis

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13 giugno 2025

Make your own GIS service

- We have seen how open services provide many functionalities to
  - produce a *live* map, with web links and multimedia contents
  - share it with others
  - export the data across tools and other services
- However, we may have requirements that do not exactly match an existing service
- In that case we need to create our own web service
- The task is simplified by the existence of powerful open source library, *leaflet*
- In this concluding tutorial we search the source of this tool to understand its potential

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How to proceed

- The tutorial consists in the step-by-step creation of a simple app that:
  - Displays a map
  - Allow the user to add markers to the map
  - Exports the markers as a GeoJSON string
  - Stores the data in the cloud (until September 2020)
- The tool we are going to use is Stackblitz (https://stackblitz.com), an online IDE for JavaScript
- The code for each step can be viewed, tested and modified as a Stackblitz project
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- Follow the project link for the first step
- In the right frame you see the preview of your service, showing a map
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  - The reference to the library is in the *package-lock* file
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  - The index.js file contains the JavaScript code of our App
  - The capital L stands for the Leaflet class
  - So we create a map with two parameters
  - Next we add a background raster, which is *OpenStreetMap*

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    - a `div` element for the map (its `id` is `mapid`)
  - The `index.js` file contains the JavaScript code of our App
  - The central instruction is `L.map('mapid')`
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  - The capital `L` stands for the *Leaflet* class
  - So we create a map with two parameters
    - the id of the DOM element containing the map (our `mapid`)
    - A JavaScript object with the options: position (lat/lon center and zoom level)
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Step 1: Lab activity

- Browse the web to find the coordinates of a place at your choice as the center of the raster
- Modify/remove the zoom factor

IMPORTANT:

- relax: you **cannot** damage my repo (you'd need my credentials)
- you may *Fork* (button on top-left corner) a branch in a repo of your own (recommended not strictly needed)
- you can undo unsaved updates with Ctrl-z
- after forking and signing up you can save your work

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- When the user clicks on the map an alert appears with the coordinates of the click
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    - we extract the lat and lon fields in a latlng field.

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Step 2: Lab activity

- create a named and write within the coordinates. Use

```
document.getElementById("myDiv").textContent = ...
```

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- Each click on the map adds a marker, and their coordinates are shown on the page
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  - The coordinates are appended to the list in a div element of the DOM

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Step 3: Lab activity

- Reverse the order of coordinates: longitude is shown first in the bottom list

Step 4: enumerated markers (project)

- A progressive index is assigned to each new point
- The index is shown in the list and added as a *title* field in the marker definition
    - the title field is automatically displayed when the mouse hovers on the marker
- How to:

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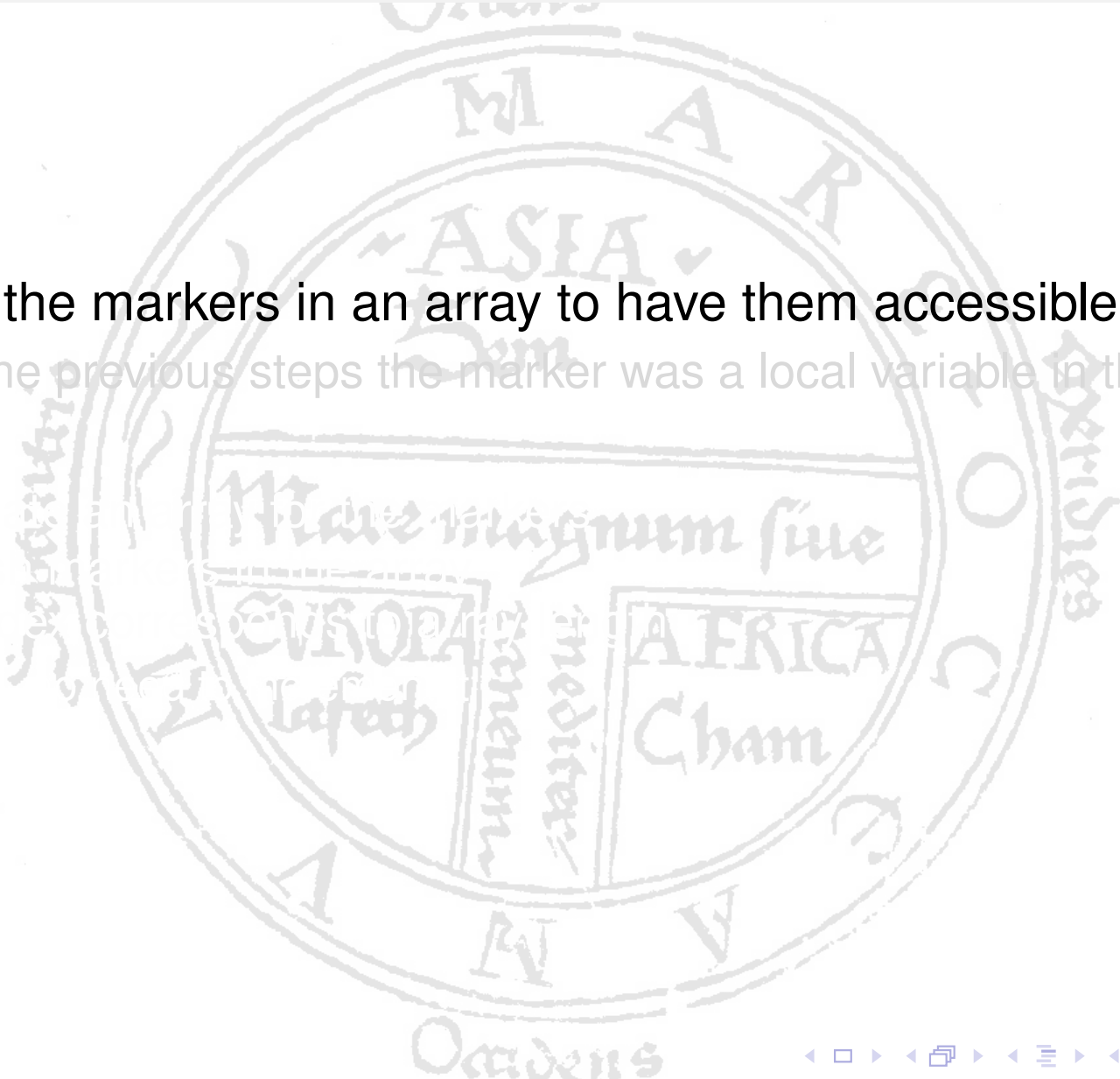
Step 4: Lab activity

- Configure the marker as draggable (ignore that the displayed coordinates become inconsistent)
  - hint: in the `marker` variable definition add a `draggable: true` property after the title, separated by a ","

Step 5: all markers in an array (project)

- Record the markers in an array to have them accessible
  - in the previous steps the marker was a local variable in the callback
- How to:



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Step 5: Lab activity

- Create a button that fades-out the markers
- Hint
  - loop through all items in the array with a for loop

```
for (let m in markers) {...}
```

  - use the `setOpacity(0.5)` on each marker

Step 6: all markers in a layer (project)

- Having all markers in a layer is more practical than in an array
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- Having all markers in a layer is more practical than in an array
- How to:
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  - Replace the array with a *layerGroup* object added to the map (`markers`)
  - Replace the *push* operation with an *addLayer* applied to the layerGroup
  - Add a layer control to the map to toggle layer visibility
  - The control creation takes two object arguments
  - See the effect on the layers button top right in the map

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Step 6: Lab activity

- move the `markers` *layerGroup* in the base layers. Any change?

Step 7: GeoJSON serialization (project)

- It is handy to have a standard string representation of a piece of data (serialization)
  - e.g. to store the data in a file
- The GeoJSON representation can be easely transformed into a JSON string, and viceversa
- We want to print in the console the JSON string for our markers
- The `toGeoJSON` method converts the markers layer into a JavaScript object with the GeoJSON format
  - alas, in this way we lose the styling
- The `stringify` method serializes the object as a String object
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Step 7: Lab activity

- Is there any way to record the *title* field in the JSON string?
- Study the geoJSON format in the console and find a solution
- If needed see :
  - https://geojson.org/ for geojson syntax
  - https://leafletjs.com/reference-1.7.1.html#marker for the toGeoJSON method

Step 8-10: a map in the cloud

- We want to store our markers in the cloud
- The simplest option is to use a Key-Value service
  - a basic one is the one I implemented on MongoDB Atlas (just demonstration, not for public use)
- A *New* button in the interface allows the user to acquire a reserved key (step 8)

(project)

- A *Save* button allows to update the cloud record (after filling the Key box) (step 9)

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Firebase deployment

- For this you need a Google account
- You need first to access the console of the service at `https://console.firebase.google.com/` and add a new project
  - in the following dialog, do not enable Google Analytics
  - observe the firebase logo in the upper left corner
- In the Stackblitz window click on the firebase logo in the left toolbar
- Click on the name of your project and next "Deploy"
- Finally click on the "Open Site", or visit `<YourProjectName>.firebaseapp.com`
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Stackblitz interface

- In the right frame we see the preview of our service
  - the URL on top of the screen is functional (try it...)
- In the center frame there is a code editor
  - try to change the title in the `app.component.html` file
- In the left frame there is the project content and github reference
- The left toolbar contains the general Angular commands
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One screen development environment

- The project code resides on the Stackblitz Webserver
- The user get access to the project following a web link
- The page displays an editable
- The user interacts with the browser clicking buttons, filling forms and such
- All this is synthesized in the Stackblitz screen

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