

USER REQUIREMENTS FOR COLLABORATIVE WORK WITH SPATIO-TEMPORAL DATA IN A WEB-BASED VIRTUAL GLOBE ENVIRONMENT



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3rd Workshop on
Usability of GI
Ordnance Survey
10.11.2010

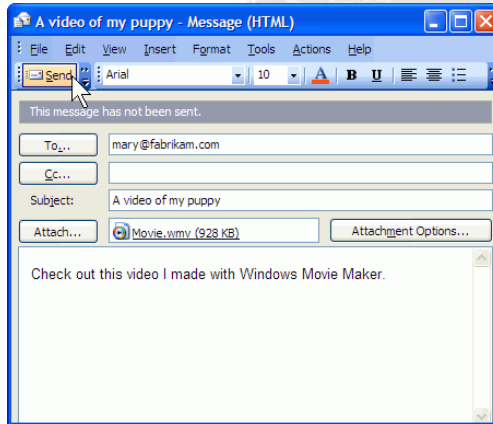


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COMMUNICATING SPATIO-TEMPORAL INFORMATION

Groupware: E-mail for asynchronous group work



Domain expert user

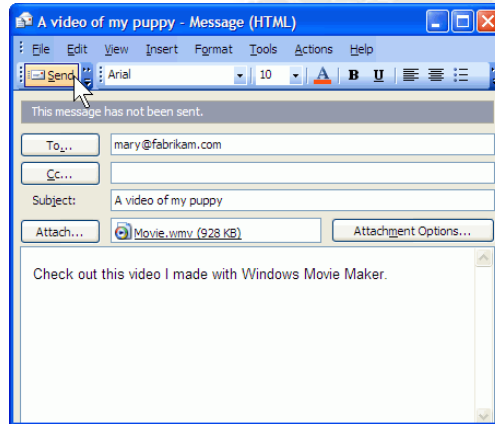


Domain expert user

The map: A perfect mediator for group work with geo-data

COMMUNICATING SPATIO-TEMPORAL INFORMATION

Groupware: E-mail for asynchronous group work

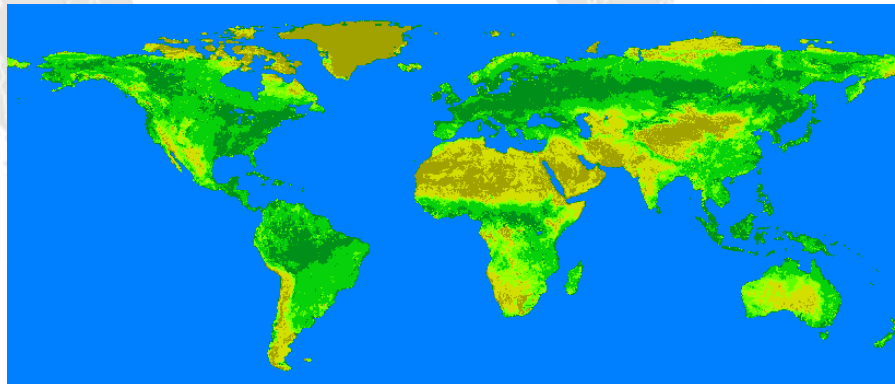


Domain expert user



Domain expert user

The map: A perfect mediator for group work with geo-data



COMMUNICATING SPATIO-TEMPORAL INFORMATION

Google Earth:
Immersive and
interactive env.



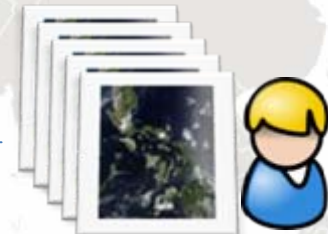
KML update: Animated
maps



Google Earth API:
Collaborative work



Domain expert user



Domain expert user

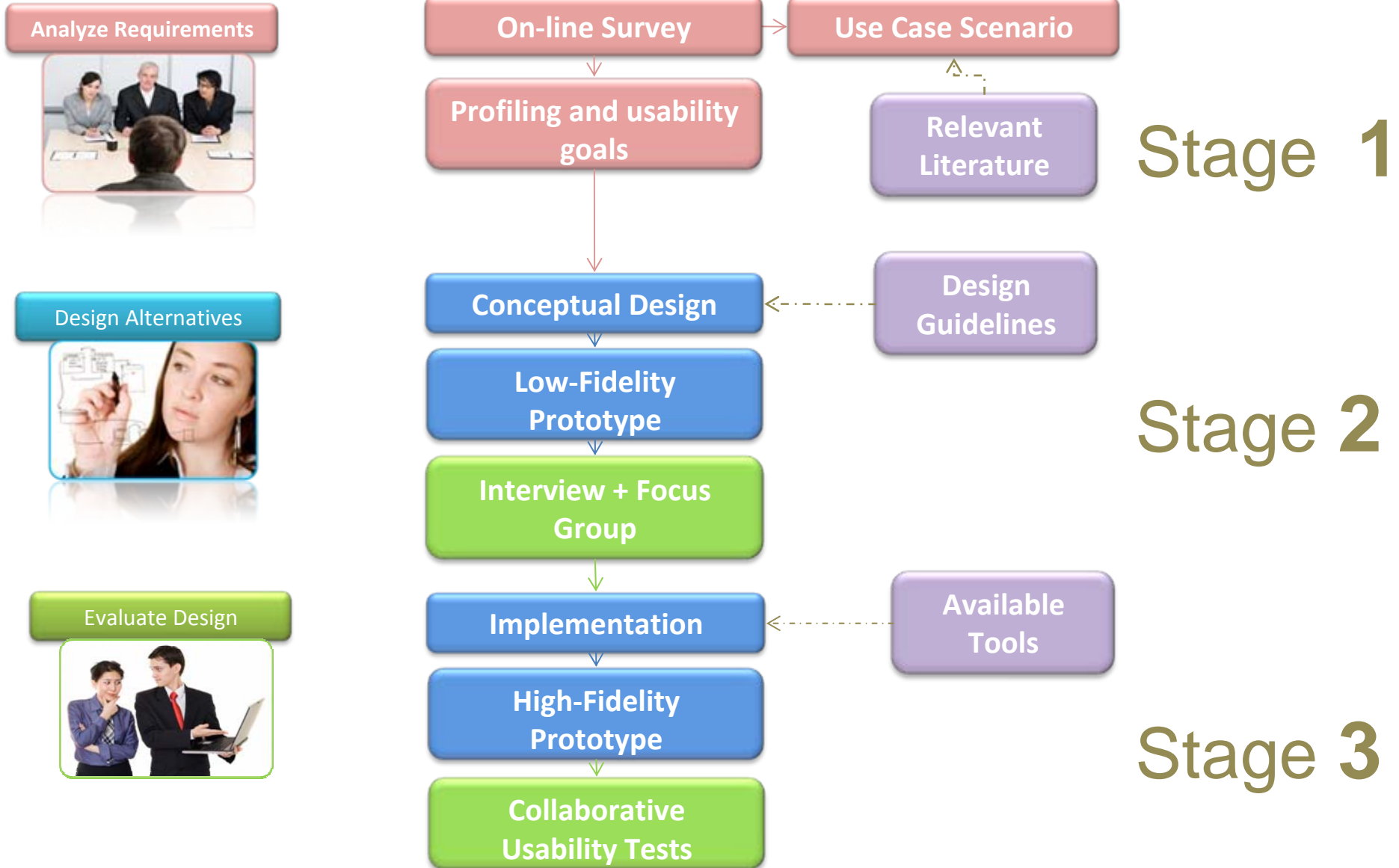
RESEARCH AIM



To outline key **user requirements and needs** of environmental researchers, working on **distributed research projects**, for collaborative dissemination and exchange of spatio-temporal data.

Result: a prototype of a collaborative web-based virtual globe application.

METHODS



KEY RESEARCH METHODS



On-line survey

- ✓ Exploratory in nature
- ✓ Guide for **further contact**



Low-fidelity prototype

- ✓ To make **assumptions clear**
- ✓ To stimulate **discussion**




Focus group

- ✓ Collaborative in nature
- ✓ Stimulates exploring further user requirements

OTHER RESEARCH METHODS

"The pursuit of knowledge with the tools of science is a cooperative enterprise."

Each independent effort only adds one piece to the puzzle."



Join the pieces together!

Username:

Password:

You will need the Google Earth plug-in to make use of this web-site.

Don't have an account yet?

What does this platform do?




Home | Tutorial (You are in: [Projects](#) / [Future Land cover](#) / TEST 3) simon | Logout

Find a place:

Chat | **Maps and Places** | **Users**

Chat [Hide System Messages](#)

- simone says: hello 15:43
- simonec has taken the control 15:43
- simonec has changed the camera 15:43
- simonec has changed the camera 15:43
- simonec has changed the camera 15:43



You have the control



ON-LINE SURVEY – RESULTS (1)



Criteria

- Have application domain within environmental sciences
- Work with spatio-temporal data
- Participate and/or have participated in distributed research projects

43 participants / 31 analyzed



Basic characteristics

- **Similar** in basic characteristics
 - Frequency of use of **computers**
 - Purpose and frequency of using the **Web**
 - Purpose and frequency of using **Google Earth**

ON-LINE SURVEY – RESULTS (2)



Data during analysis

- Most of the time two or more RS images and/or maps, **but...**
- In 87% of the cases these are **supported by other data**.
- **Three** main groups:
 - Use only RS images and/or maps
 - Use RS images and/or maps, together with statistical, vector or ground measurements data
 - Use only statistical, vector or ground measurements data



Data as a product

- A lot of **variety**
- In 35% of the cases the result is **two or more maps**.
- In 35% of the cases, the result is **spatial averages**.
- The rest specify **other output**: “graphs”, “3D data”, “subsurface models”, “statistical data”, “mix of qualitative and quantitative spatio-temporal data”

ON-LINE SURVEY – RESULTS (3)



Collaboration

- Frequent (**daily**) communication when work is dependent on someone else
 - The means for communication range from personal meetings to **dedicated software**
- Irregular (**no more than once a month**) communication when work is independent
 - The means for communication are mainly **e-mail** and personal meetings



User preferences

- Driven by outlined **user problems**
- **Users prefer:** fast access and a lot of space, tools to comment and add text, security

USABILITY GOALS



On-line **conversion** of different types of data to KML



Visualization of **location-specific** non-spatial temporal data (e.g. graphs)



Support of **synchronous** and **asynchronous** collaborative work with map content



Security

LOW-FIDELITY PROTOTYPE - DESIGN

Geo Puzzle

Home | Tutorial | You are in: [Projects](#) / [Project 1](#) / [Temporary room](#) [Sign out](#)

Find a place:

Chat / Maps and places / Users

14.10.2009 (Wednesday)

Simon logged in 15:11
Simon uploaded a new file 15:20
Simon last changed the display 15:21

Simon says: Hello Bert, I uploaded the maps showing precipitation patterns in the study area for several months in the period 10/09/2007 – 01/02/2008. Check them out and tell me what you think. May be we can discuss on Friday, but if you have to note something down before that, write here...

Greetings from Enschede... 15:25

15.10.2009 (Thursday)

Bert logged in 10:00
Bert last changed the display 10:05
Bert uploaded a new file 11:13
Bert last changed the display 11:15

Bert says: Hello Simon, I had a look. The precipitation maps are a bit odd for this time of the year. May be you can also prepare and send me the graphs we talked about...see you on Friday here to discuss...

Enter message here

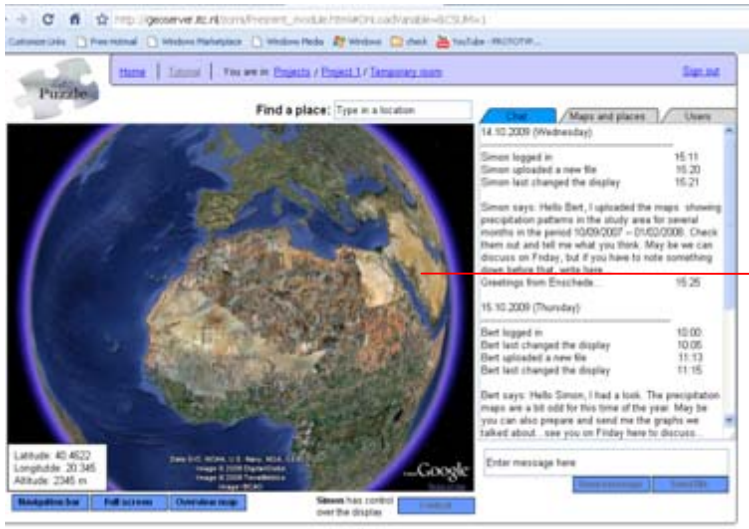
Latitude: 40.4622
Longitude: 20.345
Altitude: 2345 m

Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image © 2009 DigitalGlobe
Image © 2009 TerraMetrics
Image IBCAO

Google
Terms of Use

Navigation bar | Full screen | Overview map | Simon has control over the display | Control

FOCUS GROUPS - RESULTS



Loss of **accuracy** during conversion to KML

Inappropriate **scale** when working on a small study area

Limited **analysis** operations

Limited **access** to map content and virtual rooms

Critical need for effective **management** of data

Virtual space to **exchange** different data

Unlimited access to datasets

KEY CONCLUSIONS

Analyze

Requirements



- Requirements depend on **specific individual characteristics and preferences**

- The **variety of data** is essential

Design Alternatives



- Key user requirements include **conversion** of different types of spatio-temporal data, **management** of information, setting different **access levels** to map content, as well as optimal **scale and accuracy**

- Further work needs to address:

- **Optimization** of on-line spatio-temporal data conversion to KML

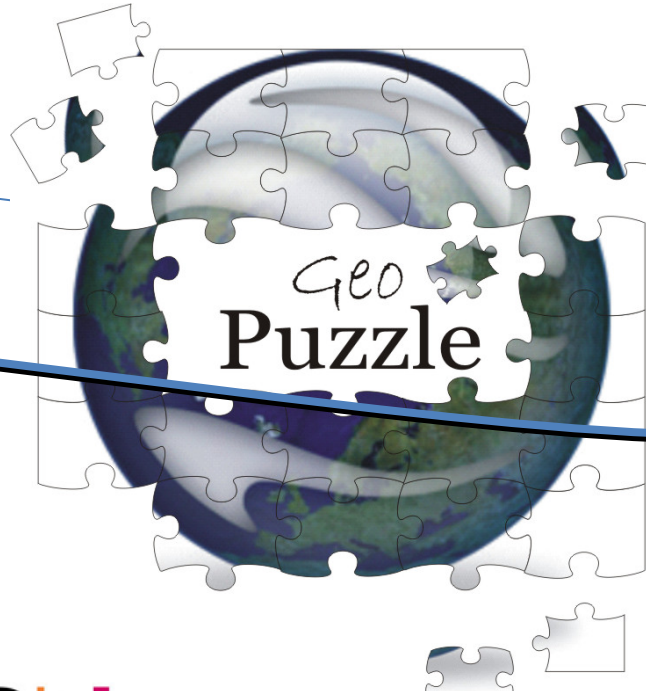
- **Effective organization** of user-generated data (maps, comments, non-spatial data)

Evaluate Design



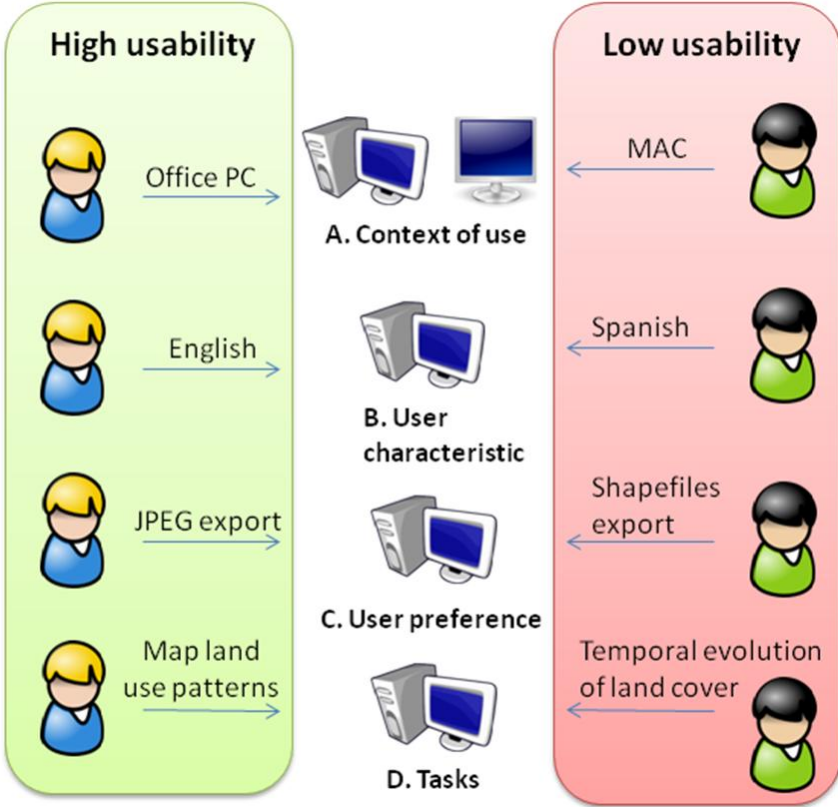
- Enabling users to **set different access level to map content.**

THANK YOU !



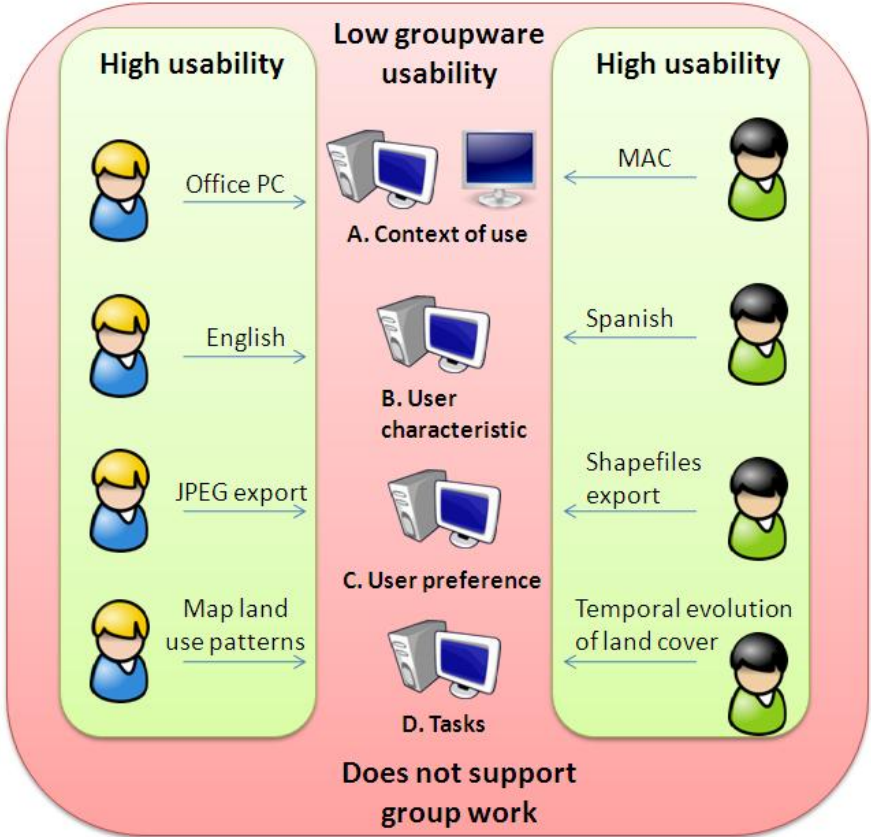
USER REQUIREMENTS FOR GROUPWARE

Software



The focus is mainly on **individual** characteristics, preferences, tasks and context

Groupware



The focus is on processes and tools that support **collaborative** activities (show, share)

IMPLEMENTATION



Google Earth API

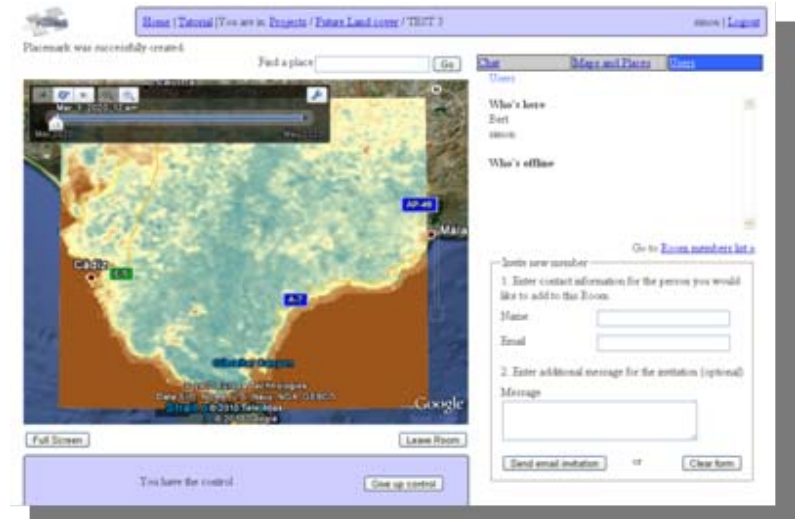
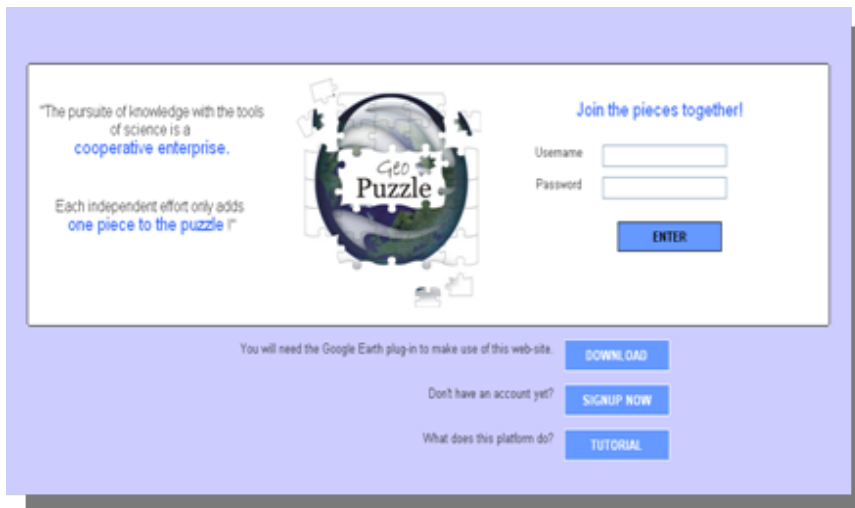
- Examples from the GE API gallery



Ruby on Rails

- Open source
- Gems and libraries

High-fidelity prototype



HIGH-FIDELITY PROTOTYPE (2)

Chat **Maps and Places** **Users**

Maps [Add new map](#)

vegetation greenness [Details](#) [Download](#)

Places [Add placemark](#)

Photos from the study area [Download](#) [Edit](#) [Remove](#)

Chat **Maps and Places** **Users**

Users

Who's here

Bert
simon

Who's offline

[Go to Room members list »](#)

Invite new member

1. Enter contact information for the person you would like to add to this Room

Name

Email

2. Enter additional message for the invitation (optional)

Message

or

HIGH-FIDELITY PROTOTYPE - EVALUATION



Usability tests

- ✓ Observe how users **work** with the product
- ✓ Think-aloud to **reveal** opinion, misconception and confusion
- ✓ A/V recordings **facilitate** analysis



12 users: 6 groups with 2 users

Scenario-driven simulation of a **real collaborative situation**

Special equipment in **two separate rooms**

HIGH-FIDELITY PROTOTYPE - RESULTS



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simon | [Logout](#)

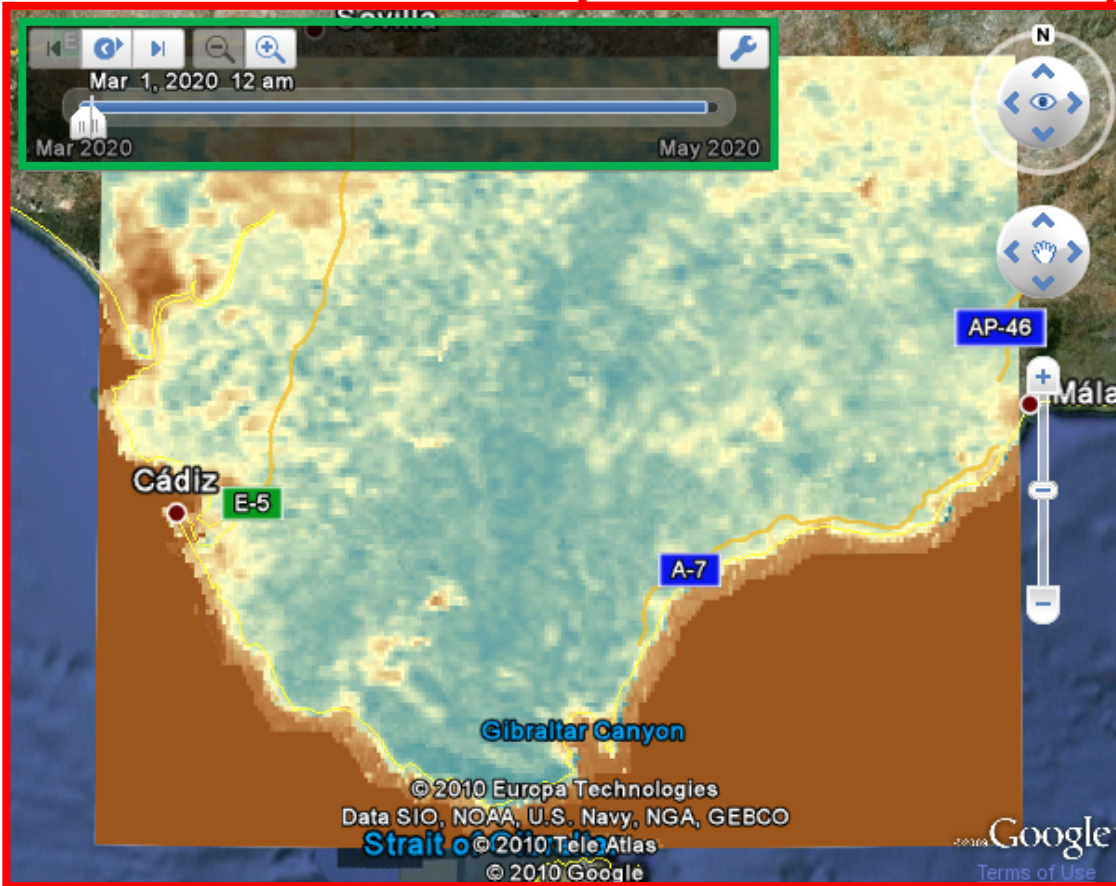
Placemark was successfully created.

Find a place

[Chat](#) [Maps and Places](#) [Users](#)

Maps

[Add new map](#)



vegetation greenness [Details](#) [Download](#)

Places

[Add placemark](#)

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You have the control