

Visualization of the Spanish May 15th Movement Evolution on a Online Social Network

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ABSTRACT

Recent social unrest events cannot be understood if the role of social networking sites is not taken into account. Indeed, social media have helped protesters to self-organize and attain a critical mass of participants. Taking advantage of the amount of data generated on Twitter for one of such events, the 15th May Movement in Spain, we have extensively analyzed roughly 600.000 related messages that were exchanged by users. An important part of the work done was related with the deployment of a visualization tool, which helps to understand the spreading dynamics of online activity, including geographical effects. Here, we present such a tool.

Categories and Subject Descriptors

J4 [Social and Behavioral Sciences]; D.2.6.b [Software Engineering]; I.3.7 [Computer Graphics]

Keywords

Social Media, Social Dynamics, Complex networks, 15th May Spanish Movement, Animation, OGRE.

1. INTRODUCTION: AIMS AND BACKGROUND

The large amount of information that a person can receive in a day increases exponentially when looking to the Internet. Newspapers, forums, websites and social networks are the favorite in society and the truth is that scientific studies are not the ‘trending topic’ out of the scientific community. Social media could help spread their research but it will never be achieved without a simple, clear and shocking message.

At the same time, social online networks have revealed as a fundamental kind of communication, having enormous impact on opinions, cultural trends and information spreading. These platforms generate an enormous amount of time-stamped data, making it possible to study the fast dynamics associated to different spreading process at a system-wide scale. At the BIFI scientists have analyzed data from time-stamped, online activity in the Twitter network during the formation and stabilization of the 15th May Spanish social movement, a specific social

mobilization whose main objective is to protest, complain and change the current economical and political situation.

For these reasons, this project started with two main objectives:

1- Help scientist to check their results, compare them and visualize them in a simulated but identical geographic environment.

2- As a fast, efficient and direct way of spreading scientific results to the non-scientific community.

To achieve both objectives we have made a visualization tool, which integrates a graphic representation of the world and the exchanged messages between Twitter users around the 15th May movement (see Fig. 1).

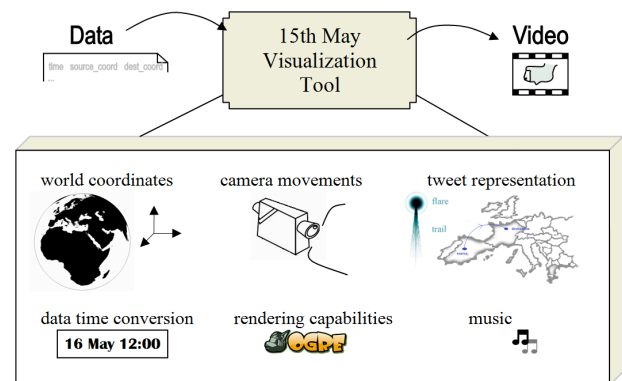


Figure 1. Main components of the 15th May visualization

2. DESCRIPTION

With the aforementioned objectives, we have created the visualization tool like an animated application. It is based on Ogre [2], an open source rendering engine written in C++, designed to make easier and intuitive to produce applications using 3D graphics. The result can be transformed in a video that you can find in the following website: <http://15m.bifi.es>. Figure 2 shows a few snapshots of the video.

To start with, we first obtained a representative set of tweets related to the 15th May movement, including the source, the destination and the date of each one. We take advantage of this

data to create the animation of a comet that follows a spline between this two nodes and that represents a communication link.

- The spline contains 50 points and has been calculated using a Bézier curve (De Casteljau's algorithm) [3].
- The comet is composed by a flare and a trail and each time we update its position we have the feeling that it is moving between the source node and destination node. It also has several customized parameters, like the color, the width, the length and the time to fade.

Basically, the steps followed by the created application are:

- Read and store the file containing the time and the coordinates of source and destination of each message.
- Create the Sun and the Earth.
- Start a time count.

The application executes a loop until we read all the data on the file and the main steps are:

- Update the Sun position and the date.
- If the timestamp of a message matches with the current time a comet is created at the source coordinates.
- If the comet is already created and hasn't arrived to the destination, then update its position following the Bézier spline between source and destination.
- If the comet arrives at destination is destroyed.

So, along time we are always creating and destroying comets recreating this way the same concept of a message, that first is created, then sent and finally arrived to the receiver. This tool is optimized to work at 30 frames per second giving this way the real feeling of animation.

Also, the Sun gives us the feeling of the night and day cycle and how the days move forward and the background contains the real positions of the stars. To achieve that, we made the sky look like a cube containing the scene and we generate 6 images corresponding to each cube side. A projection of the real star map on each image allows generating the background.

Other details about the platform are that we have used OpenStreetMaps and Mapnik [4] to get the texture of the Earth, and we have integrated several camera movements to fly and see different parts of Spain during simulation. The animation has been complemented with some music. It has been composed by us, using an audio file as a base and mapping different sounds with events occurred at the 15th May movement. The final composition is a soft melody that evolves with time like the number of messages.

3. APPLICATION AND RESULTS

The final video shows the real data obtained from Twitter, but the platform developed also allows changing the input file and, in this way, seeing other data with a timestamp-source-destination format. For instance, we are now using our visualization tool to monitor the results of a theoretical model aimed at mimicking the 15th May system's behavior.

The application has revealed not only as a way to spread information but a way to supervised geographically distributed complex systems with the ability to process up to 600 interchanged messages per second.

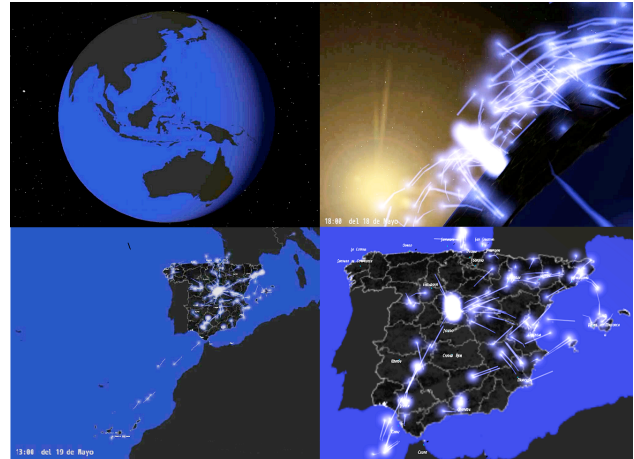


Figure 2. Some frames of the animation. The Earth textured and mapped to a sphere and three instants of the spreading dynamics.

4. CONCLUDING REMARKS

Visualization of the 15th May movement has helped to check some results and see at a glance the dynamics of information dissemination and communication patterns. Madrid is, as far, the city with more flow of information and, as in real life, it turned out to be the central node of the network. The massive mobilization and the camps in 'Puerta del Sol' have their effects on social media as we could see in the video having its height the 15th May at 8p.m. matching with the manifestation. Until this time, the animation shows us a continuous growth of the system but is at this point when the tweets talking about the movement take off. Later, the system suffers stabilization as we could also check in the animation.

Finally, through visualization, important results of the study can be easily conveyed to the general public, which had 32,000 visits on Youtube in the first 48 hours. Important enough, future work will be devoted to further develop this platform so as to make it a powerful tool for policy making.

5. REFERENCES

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http://15m.bifi.es/index_en.php

[2] Ogre, an open source rendering engine: www.ogre3d.com

[3] http://en.wikipedia.org/wiki/De_Casteljau%27s_algorithm

[4] OpenStreetMaps, MapNik: <http://www.mapnik.org>