

## “Troy is ours – How on earth could Clytaemnestra know so fast?”

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### Abstract

This paper introduces a web application developed to highlight Aeschylus’ perception on the transmission of a message from Troy to Mycenae through a series of beacons; a case study that investigates the veracity of an ancient spatial description to facilitate message transmission over a distance of approximately 500 km. This research demonstrates the use of modern web and geospatial tools to recreate and animate a series of events of the ancient world through geo-visualization. The outcome of this work serves as an educational resource to supplement mythological text and stories passed down by oral poetry and storytelling.

*Keywords:* geospatial web, animated maps, 3D visualizations.

### 1 Introduction

This paper presents an application developed using geospatial web tools to visualize the transmission of a very important message in the ancient world. The message travelled a distance of approximately 500 km in just a few hours. Agamemnon, king of Mycenae, along with other Greek kings led an expedition of Achaean troops to Troy and besieged the city for ten years, until the night the city fell to the ruse of the Trojan Horse. The following morning, Agamemnon’s wife, Clytaemnestra, in Mycenae was already aware of the glory (Figure 1).

Figure 1: Troy and Mycenae.



Source: Google Earth.

Historical event of 12th century BC or just another story of the Greek Mythology, the Trojan War has been narrated through many works of Greek literature, most notably through Homer’s Iliad and the Odyssey. The events and details of the Trojan War were passed on orally in poetry, non-poetic storytelling, and vase painting through the centuries. The great tragic playwrights of Athens, Aeschylus, Sophocles, and

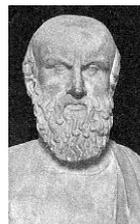
Euripides, were infused by those myths and wrote a series of relevant ancient dramas.

Their tragedies are extremely valuable resources of the ancient world as they help us better understand the social structure, political system, faith, beliefs, and even the scientific knowledge and technological achievements of their era.

This work was inspired by an act from Agamemnon tragedy. The main objective of this case study is to investigate the likelihood of intervisibility between beacons from Troy to Mycenae. To answer the question in the title of this paper, additional questions were posed: how can intervisibility between beacons be visualized in two and three dimensions; and how this possibility can be tested using modern web and geospatial tools?

A web map application has been developed to highlight the transmission of the message “Troy is ours” from the city of Hector and Paris to the kingdom of Mycenae, using a series of synchronized beacons. This is how Aeschylus (Figure 2a) describes in 25 lines the tele-communication means of the 12th century BC. It is stunning how accurate the geography of the Aegean is unfolded through those lines. After attending the play of the tragedy in the ancient theatre of Epidaurus (Figure 2b) in summer 2013 (Agamemnon, 2013), we examined closely those lines (Fagles, 1977), and thought that this transmission should be visualized on maps!

Figure 2: Aeschylus 525-456 BC (a), and the Ancient Theatre of Epidaurus (b).



(a)



(b)

Source: Wikipedia.

Figure 3: The transmission of victory message in yellow line. KML/Z file is available at: <http://gaia.gge.unb.ca/troyisours/KML>



Source: Google Earth.

The following Sections present a case study that clearly demonstrates the potential of geospatial web tools in the study of the ancient world through efficient educational tools. Section 2 provides a short description of the act and a map of beacons and places mentioned by Aeschylus. Section 3 presents the tools and functionality of the web application. Section 4 highlights the outcomes of this project.

## 2 Transmission of the Message

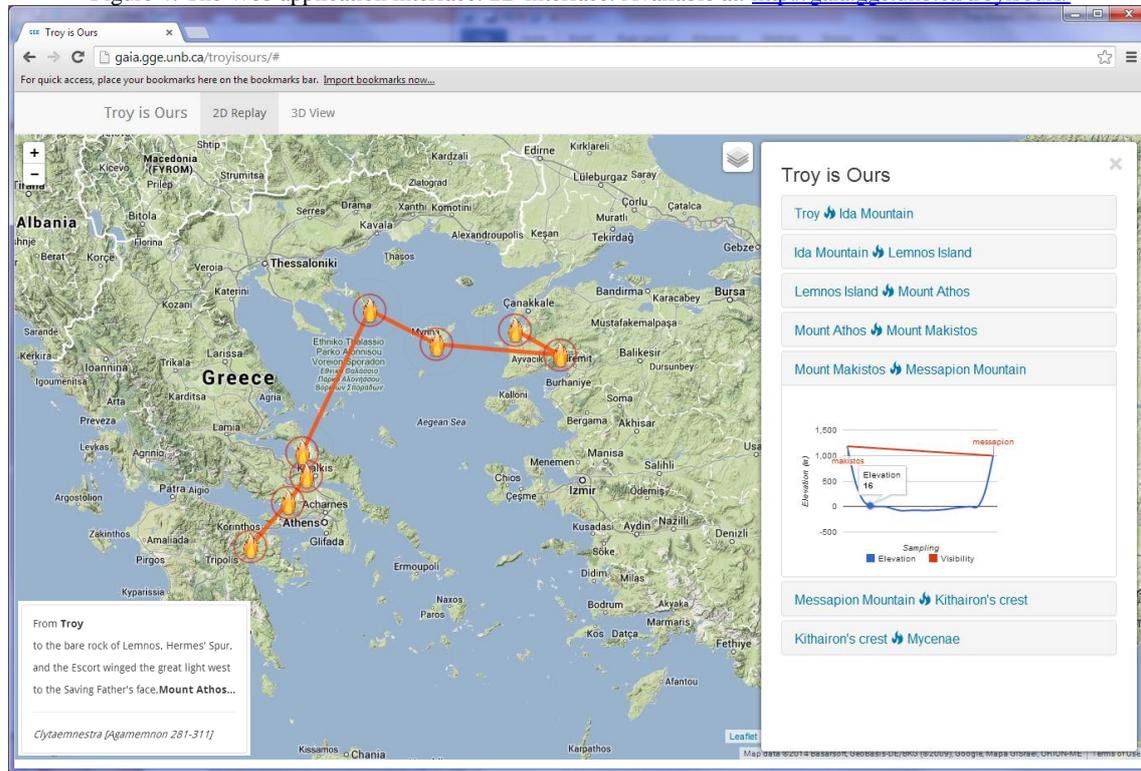
Agamemnon is the first play of the only complete trilogy that has come down from antiquity, entitled the Oresteia (Fagles, 1977) and written by Aeschylus in 458 BC. In this play, Aeschylus describes the return of king Agamemnon from his victory in the Trojan War, from the perspective of both the town's people (the Chorus) and his wife, Clytaemnestra. The story unfolds to the death of the king at the hands of his wife. Clytaemnestra was angry at his sacrifice of their daughter Iphigenia, killed so the gods would stop a storm hindering the Greek fleet in the war. She was also unhappy at his keeping of the Trojan prophetess Cassandra as a concubine. The ending of the play includes a prediction of the return of Orestes, son of Agamemnon, who will seek to avenge his father.

In the beginning of the play (lines 264-312), Clytaemnestra and the Chorus are on the scene. Clytaemnestra proudly

announces that “the Greeks have taken Troy!” As “...the joy is beyond [the Chorus] hopes...”, the Leader of the Chorus keeps asking the Queen “...and you have proof?” and “...when did they [Achaean] storm the city [Troy]?” Then, Clytaemnestra replies: “Last night, I say, the mother of this morning.” It is when the Chorus’ Leader raises his voice to doubt the news. He says: “And who on earth could run the news so fast?”

“Hephaestus, the god of fire... and beacon to beacon rushed it [the message] on to me”, Clytaemnestra will respond. In the next 30 lines, Aeschylus, through the voice of Clytaemnestra, will take the audience and fly with them across the Aegean Sea from Troy to the “bare rock of Lemnos” and the Mount Athos. From there, over Euboea and the Saronic Gulf to Argolis, where the Mycenae Palace is located. Aeschylus’ description is so poetic and fruitful, including details about the geomorphology, history, fauna, and flora of the Achaean land.

Figure 3 provides a visualization of the beacon locations in Google Earth. The yellow line represents the visual passing of the message from Troy to Mycenae through the beacons. The images around the map are perspective views generated in Google Earth. The terrain (elevations) was exaggerated by a factor of 3 to highlight the Earth’s relief. By examining the perspective images, it is clear that the visibility between the beacons described Aeschylus is valid. Hence, Aeschylus’ description makes sense. The total distance from Troy to

Figure 4: The Web application interface: 2D interface. Available at: <http://gaia.gge.unb.ca/troyisours/>

Mycenae through the beacons equals to 540 km. The longest segment is the one connecting Mount Athos to Mount Makistos which is equal to 180 km.

Obviously, Aeschylus had a very clear understanding of the Earth's relief. In addition, these 30 lines convey lots of details about the geography of the area. In this study, not much attention is spent on those details; we are planning to investigate them closely in collaboration with archaeologists in the future.

The next Section introduces a web application that was designed and implemented as part of this project. The application makes use of modern geospatial web tools. Both the tools and functionality are described. The main scope of the application is to serve as an educational tool to both school students and the general public.

### 3 Web Application

The geospatial web application uses multiple modern web technologies: HyperText Markup Language (HTML 5), Cascading Style Sheets (CSS 3), Scalable Vector Graphics (SVG) and JavaScript. To achieve responsiveness across multiple devices (e.g. mobile, desktop and tablet browsers), the application uses Bootstrap 3 (2014) as a front-end framework. Two dimensional interactive maps are created using Leaflet (2014) JavaScript library. Through Leaflet, SVG graphics and animation are overlaid on top of two tile layers: Google Maps (Terrain) and Open Street Map (OSM). SVG graphics and animation are enabled through the use of Data Driven Documents (D3, 2014) JavaScript library.

Google Earth application programming interface (GE API, 2014) is used for 3D visualization and tour animation. Other dependant JavaScript libraries include jQuery (2014) and Lo-Dash (2014).

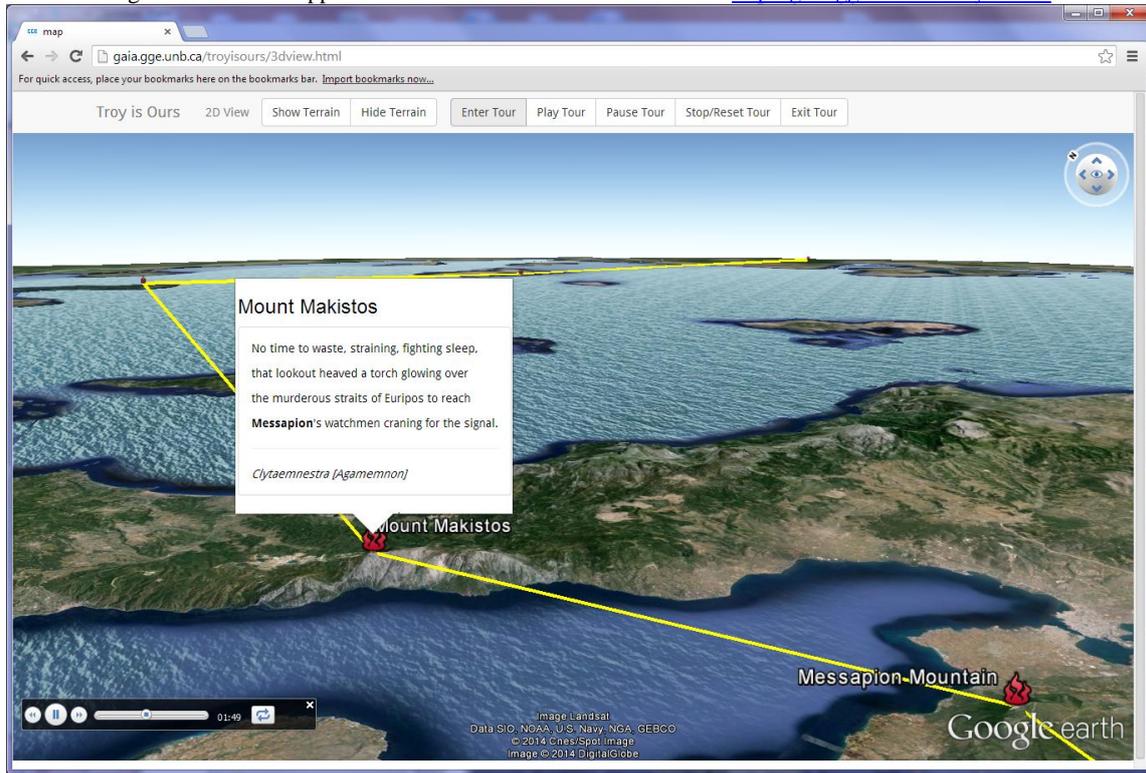
The application has two functional interfaces: 2D visualization and animation and 3D visualization and touring. The 2D interface (Figure 4) uses map tiles as base layers (e.g., Google Maps – Terrain) with SVG and vector animations to describe transmission of the message “Troy is ours”. At each chain of the transmission (from one beacon to the next) Google Elevation Service (2014) is queried for terrain elevations along the chain. Using Google Visualization API (2014), a profile is visualized as line chart. Since each signal is transmitted using fire, a straight line plot from the origin to destination is used to represent light communication. If the 2D profile does not intersect the light transmission between the origin and destination, then invisibility occurs between these two beacons.

The 3D view uses Google Earth browser plugin (Figure 5). The application uses a pre-recorded tour stored in KML to visit each station (from Troy to Mycenae) with terrain visualization and annotated text from Aeschylus. A user can enter the tour and navigate from beacon to beacon following Aeschylus description.

### 4 Discussion

Examining 2D profiles and perspective 3D views, it is clear that the visibility between the beacons described by Aeschylus is valid. Although there are lots of room for interpretation of

Figure 5: The Web application interface: 3D view. Available at: <http://gaia.gge.unb.ca/troyisours/>



Aeschylus play by experts (such as archaeologists, historians, and educators), we aspire that this case study and the web application can serve as a research and educational tool to test and explore various scenarios. Our future plans include a close collaboration with two main objectives: (a) to enrich the application by including their perspective (e.g., alternative opinions and related stories); and (b) build and test an educational program for school students.

A similar approach and collaboration with the Educational Programs Department in the Archaeological Museum of Athens has led in the past to the development of a web application (Stefanakis, 2012, 2013) for the origin of the Antikythera mechanism (2013), the world's oldest known analogue computer, which is exhibited at the Museum. The application was approved and included in the educational program of the Museum. Since then, it has been introduced to hundreds of school students and visitors, and has received very positive comments.

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