

Virtual Globe Games for Geographic Learning

(Article submitted for presentation only)

Ola Ahlqvist

Department of Geography, The Ohio State University
Columbus, OH 43210, U.S.A.

1. INTRODUCTION

Geographic literacy is alarmingly low in the U.S. as witnessed by a recent report suggesting that "...young people in the United States – the most recent graduates of our educational system – are unprepared for an increasingly global future" [1]. Geography is also the only 'core academic subject' identified within the No Child Left Behind act that lacks funding as well as any specified implementing programs. This is a major concern in an increasingly interconnected and information rich world, where spatial thinking is a crucial skill for science, workplace and everyday life activities. So it is both evidence and a paradox that the use of online virtual globes and maps is exploding and geography is emerging as a key means for organizing web data.

We see an opportunity to address the literacy problem through the strengths of emerging technologies and a recent but rich literature on game-based learning [2]. This paper reports on work to develop a user interface that combine the popularity of many computer based online games with rich information on the state of the world delivered through virtual globe browsers. The *Virtual Globe Games* (VGG) interface will then be explored as a learning tool, not only from a perspective of students as consumers of content, but also investigate the impact of having students as producers of content.

2. VIRTUAL GLOBES

Virtual globes are Internet-based applications that display a 3D model of the earth. On top of the globe model they can drape images taken from any vantage point, such as satellite images, air photos, and even images taken from the ground. In addition, any type of information that you can find on the Internet can be displayed as part of the globe model. A highly interactive interface allow users to select what to display, spin the globe around and zoom in

and out between a full overview of the globe down to detailed views of your own neighborhood.

The easy access, rich content, and a fascinating ability to 'fly' around to anywhere in world have made virtual globes enormously popular, and they are currently used for anything from professional applications through leisure activities. With the growing popularity of virtual globes, users have realized that most information has a spatial location; photographs, video clips, articles, weather, travel information. The Google Earth browser was quick to provide users with a possibility to add their own information in this rich geographic context, free for anyone to see. In this evolving and growing "wiki-cartography" there are now themed collections ranging from Americas favorite architecture, through the refugee crisis in Darfur, near real time tracking of California wildfires, to spatial annotations of books. The wiki approach implies a community effort that contributes to make virtual globes a tremendously rich environment for exploring information on human activities and the physical environment through a bottom-up and grass-roots geographic perspective. Some well known solutions are [Google Earth](#), Microsoft's [Virtual Earth](#), ESRI's [ArcGis Explorer](#), and NASA's [Worldwind](#).

3. THE VIRTUAL GLOBE GAMES INTERFACE

We take the above mentioned developments one step further and leverage the current use of virtual globes and geographical web resources from a simple "search, find, and display" tool to an educational quest that requires observation, inquiry, and analysis in order to promote geographical literacy and global awareness. The Virtual Globe Games interface transforms an existing online virtual globe into a "game board" and implements interactive web functionality and content as a source for challenges and answers on geographically related issues. More specifically, we have developed an interactive layer on top of the existing map adding support for multi-user

interaction and manipulation of scenario objects. The objects can be game pieces on the map, dice, playing cards, and even functionality such as user chats or searches for other information over the web. This allows for construction and execution of game-like scenarios, through which users can immerse in, explore, investigate and learn about our world.

To run the application users only need an Internet browser with a free Google Earth web plugin <http://earth.google.earth>. The interface is constructed and rendered using lightweight HTML, and user interaction is handled through asynchronous JavaScript and XML. In our current prototype we are developing a geographic board game, similar to the popular RISK game that we envision can be used as part of instruction and homework assignments in an introductory, undergraduate Geography class. In contrast to a standard board game, the information that feeds into the game mechanics are not set to pre-defined fact bases, but can be accessed from live information resources through the web. In our RISK-style example we use online information on e.g. country GDP and population to inform game mechanics such as

evaluation of player resources for movement and actions. Furthermore, leveraging Google search API, users are given the ability to search web information during the game play and when KML results are returned, they can be dynamically loaded onto/off from the globe interface as the user desires. In this fashion the developed platform, together with online geographic information resources can potentially support other application areas such as public policy scenarios and planning.

4. REFERENCES

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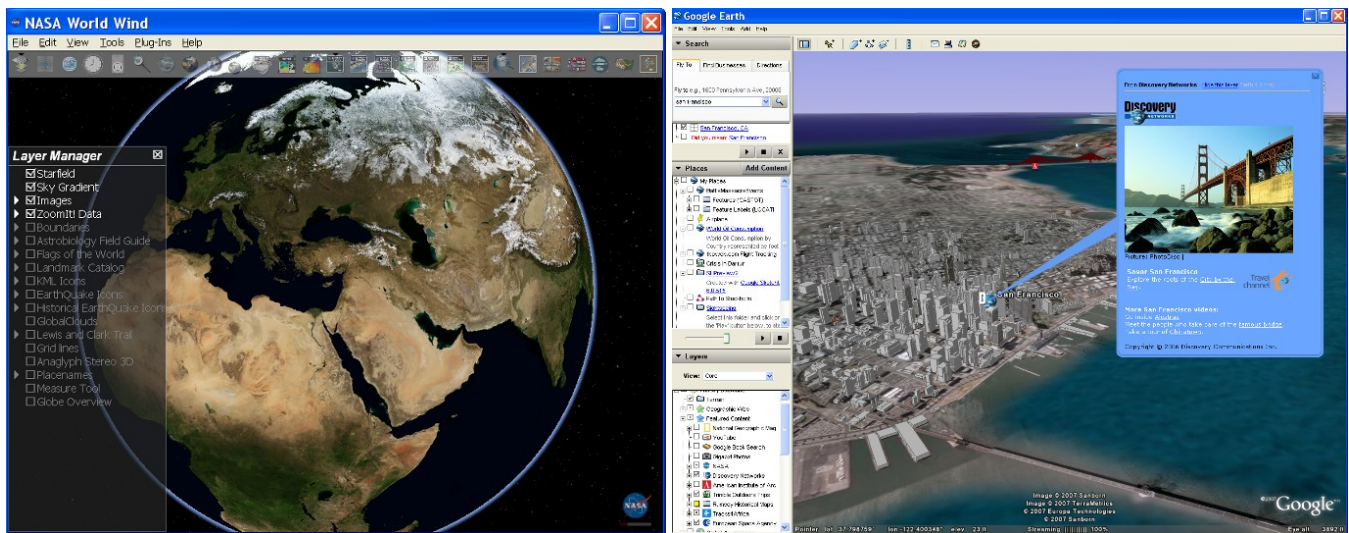


Figure 1. The NASA Worldwind (left) and Google Earth (right) applications.