

Windows into the Real World from a Virtual Globe

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Abstract

Virtual globes such as Google Earth and World Wind are helping to achieve the vision of the Digital Earth. The key to virtual globes is the use of satellite imagery to provide a highly accurate view of the earth's surface. However, because the images are not updated regularly, variations in climate and vegetation over time can not be easily seen. In order to enhance the view of the earth and observe these changes by region and over time we are working to add near real time "windows" into the real world from a virtual globe.

For the past 3 years we have been installing web cameras in areas of the world that will provide long term monitoring of global changes. By archiving hourly images from arctic, temperate and tropical regions we are creating a visual data set that is already beginning to tell the story of climate variability. The cameras are installed in elementary schools in the different regions and show the student's view out the window. The *Windows Around the World* program (<http://www.WindowsAroundTheWorld.org>) uses the images from these cameras to help students gain a better understanding of earth processes and variability in climate and vegetation between different regions and over time. We have used standard web based technologies such as DHTML and AJAX to provide near real-time access to these images and also provide enhanced functionality such as dynamic time lapse movies that allow users to see changes over months, days or hours up to the current hour (http://jurban.es.umb.edu/elem_exchange/north_america.aspx).

One of the limitations of overlaying images on a static map is that features such as roads and rivers that are easily seen in the images are impossible to see on the map due to resolution constraints. This is where virtual globes are a tremendous asset and can help students get a much better understanding of what they are viewing in the images.

We are integrating the camera images from *Windows Around the World* into Google Earth. Through network links and models we are creating a way for students to "fly" to another school in the program and see what the current view is out the window. By using a model as a screen, the image can be viewed from the same direction as the students who are sitting in a classroom at the participating school. Once at the school, visiting students can move around the area in three dimensions and gain a better understanding of what they are seeing out the window.

Currently the images update automatically within Google Earth so that the view out the windows is always the most current image and is less than an hour old. Although this allows users to always see the current view from all cameras, it does not allow exploration of changes over time. As virtual globe applications evolve we hope to see enhanced scripting capabilities that will allow the creation of dynamic time lapse movies

to view changes not only at a single location but around the globe over hours, days, months and even years.