

Mapping the Past: Determining the Best Method with which to Animate Historical Maps

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Introduction

In his paper, *It was the Mapmakers that Discovered America* (1992, *Cartographica* 29 (2): 31-36), Arthur Robinson displayed uniform projections of significant maps that were created before, during, and soon after Columbus's discovery. The result gives the viewer of today perspective on not only the process of exploration that the entire world went through during the Age of Discovery, but also perspective on practices and methods used by the cartographers featured in the article.

With Robinson's projections as a template, digital illustrations were created and then "morphed" into one another to create a graphic animation depicting the change in cartographic representation that occurred with every new map illustration. To do this, a process known as tweening was used where points are selected on each feature offering an anchor for which the animated map could move from and to, but does this tweening process work better to depict the change from shape to shape rather than the static presentation of the projections in series?

With no guidance to go from in the literature surrounding cartography or graphic animation, it was decided that experimentation was needed.

Background

Arguments for Tweening

Temporal interpolation as opposed to spatial interpolation

If we find it acceptable to use derived data to map the elevation of a hillside, estimate a hot or cold front's movement, why should it be unacceptable to use interpolated data to illustrate time?

Use of corresponding data

Any animation that uses tweening should have interactive tools so that the user may see and understand the information behind the movement. For the purposes of this evaluation; however, interaction was not allowed to the test subjects as it would have added an unintended variable.

Arguments against Tweening

Depiction is not based in reality

While tweening can be adjusted in an intuitive manner, the subsequent iterations of the image are all illustrations of change, not actual data. This can mislead the viewer into thinking that they are seeing something that has actually happened rather than a conceptual process.

Too much movement

Harrower (2007) (citing Wilson and Cole (1996)) writes that, "...(L)imited working memory makes it difficult to gather elements of information simultaneously (351)." A viewer cannot be expected to see more than five to seven instances that they will fully understand during the quick movements of a tweened animation.

Preliminary Results

Test Group 1: Tweened (N = 62)	% Correct
Africa	83.87
Asia	83.87
Europe	69.35
S. America	14.50

Test Group 2: Non-Tweened (N = 56)	% Correct
Africa	85.71
Asia	85.71
Europe	53.57
S. America	12.50

Method

To test which method, tweened or non-tweened, works best, experimentation was needed. Two study groups, one for each method, were given the multiple choice questions that follow. All questions are in regards to the size of the landmass of the four continents.

The continent of Africa:	The continent of Asia:	The continent of Europe:	The continent of South America:
a. Stays the same size	a. Grows continuously	a. Grows continuously	a. Grows continuously
b. Initially grows and then shrinks	b. Shrinks and then grows	b. Initially shrinks and then grows	b. Stays the same size
c. Initially shrinks and then grows	c. Grows and then shrinks	c. Initially grows and then shrinks	c. Initially grows and then shrinks
d. Shrinks continuously	d. Stays the same size	d. Stays the same size	d. Initially shrinks and then grows

Test group 1 was shown the tweened depiction of Robinson's maps. Test group 2 was shown single frames of the same content, without the tweening function. Presentation speed and coloring were the same for both test groups. The timeline was animated in a way to correspond to the type of animation being used (tweened timeline for the tweened test group and non-tweened timeline for the non-tweened test group).

Test subjects were comprised of anonymous students in the Geography 120: Human Geography and Geography 250: Introduction to GIS and Cartography classes at the University of Wisconsin - River Falls.

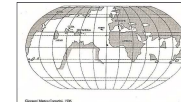
Discussion

Test group 2 (Non-Tweened) performed slightly better on the questions pertaining to Africa and Asia, the easiest of the four questions. Test group 1 (Tweened) performed moderately better on the question pertaining to Europe and slightly better on the question pertaining to South America, the harder questions.

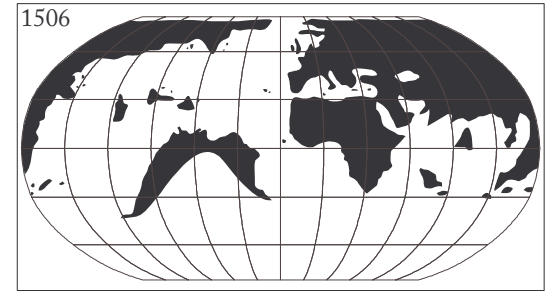
While no decisive answer as to which form of animation is more effective can be extracted from the outcome of this experiment, specific questions have come about due to the results:

1. Why would difficulty affect which test group performed better?
2. Is the ability to recognize the object in question significant?
3. Would the outcome be similar with basic shapes rather than with spatial data?

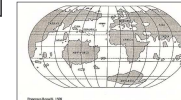
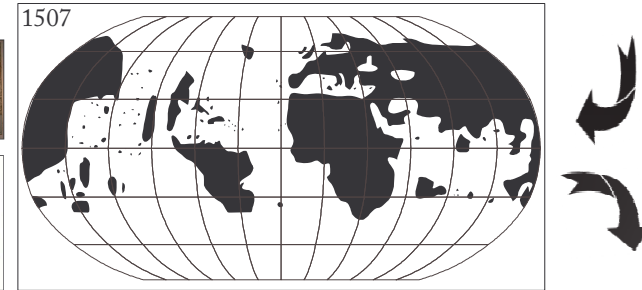
While the question of which method is more effective remains unsolved, the topic of whether tweening hinders the viewers ability to comprehend has been slightly resolved. It seems as though cognition was not significantly hindered by tweening. Though this cannot be seen as being applicable to all areas of graphic animation, it is significant to ongoing discussions in the ever-broadening field of animated cartography.



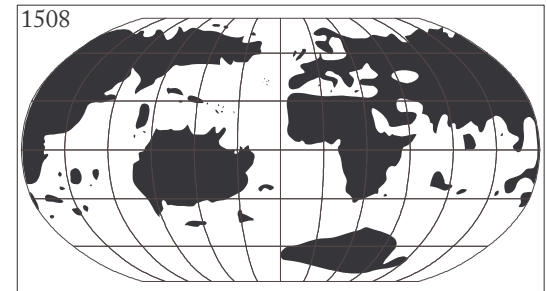
Robinson (1992), page 34



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