
Complexity, Magic, and Augmented Reality: From Movies to Post Desktop Visualization Experiences

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Abstract

While we can look to Hollywood for inspiration about the future of visualization and interaction with data, we must be cautious to recognize some fundamental differences between movies and reality. We explore three areas: complexity; magic; and augmented reality and examine their uses both within movies and potential uses on post-desktop visualizations.

Keywords

Guides, instructions, author's kit, conference publications

ACM Classification Keywords

H5.m. Information interfaces and presentation (e.g.,

HCI): Miscellaneous. See [3] for help using the ACM Classification system.

Introduction

The use of rich visual interfaces in Hollywood abound and have been and continue to be an inspiration to researchers in the field. We should note, however, that the goals of Hollywood often come into opposition with the goals and abilities of information visualization researchers.

First, the goals of Hollywood are to tell a story, and visualizations are often used as short-hand to help convey overwhelmingly complex situations to the audience. Second, magic is used to astound viewers, but by its nature may defy the laws of physics. And finally, we often want to convey information visually that may not be inherent in the world of actors in the film. Augmented reality effects have been explored for decades both to convey viewpoints of characters and to superimpose information on the film itself.

We explore these three areas that present both challenges to or opportunities for researchers.

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Complexity

A common goal in story telling is to convey either the hopelessness or the overwhelming complexity of a situation. When faced with this, our protagonists can instantly evaluate the complexities and come to a conclusion. Thus the best thing to show the audience is an interface of enormous complexity that the hero can navigate effortlessly. A prime example of this is the interface shown in the pre-crime unit in *Minority Report*.



Figure 1: *Minority Report*, 2002.

Tom Cruise effortlessly uses gestures to sift through huge amounts of data to locate a moment in time and related information. We don't currently expect our users to be virtuoso performers on our interfaces (though that it is an interesting avenue of pursuit itself), but in fact, our goals in information visualization is often to REDUCE the complexity in facing the users as oppose to overwhelm them.

We see many other examples of complicated user interfaces whose goals are to convey a dauntingly complex situation to the audience, a few are shown in the following figures:

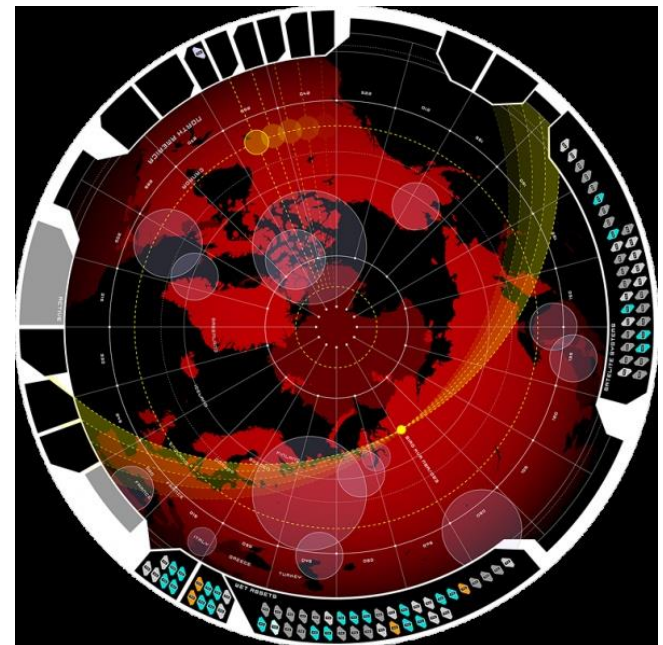


Figure 2,3: Complicated displays from *Star Trek*

Particularly intriguing though, is the view in the Matrix when NEO achieves mastery over the simulation and sees the motion of the constituent bytes that make up his environment. I believe that the visual designers have tapped into a deep-seated desire to see structure emerging from chaos. We are fascinated by individual particles moving in concert to create structure from chaos.

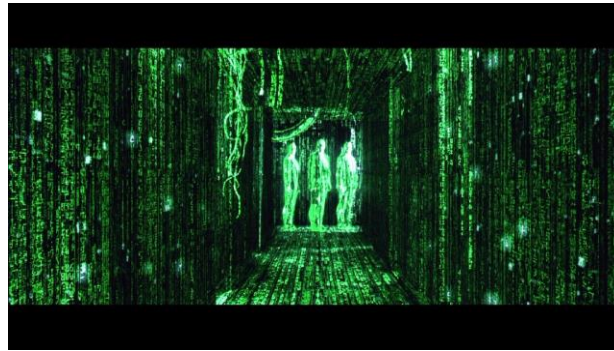
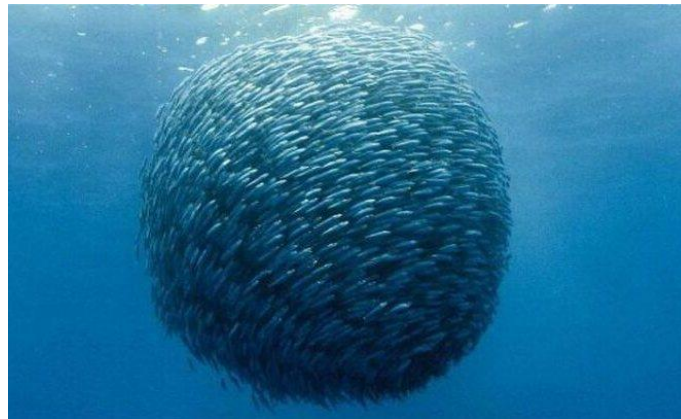


Figure 4: The Matrix, 1999

Other examples from nature include flocks of birds, or schools of fish :

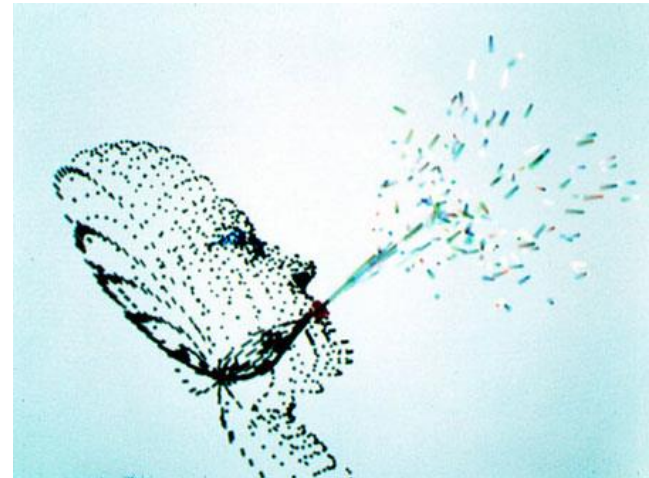


Figures 5,6: Flocks of Birds



Figures 7,8: Schools of Fish

Or examples from film– particles creating faces (early computer animation, and special effects for the movie The Mummy).



Figures 9,10: Particle systems in film: Particle Dreams, Karl Sims: 1988, The Mummy: 1999.

While not strictly 'post-desktop visualizations' this fascination with particles is reflected in systems such as Histomage, Scatter Dice, Visual Sedimentation, and SandDance. The natural, 'physicality' of these types of interfaces (like Dust and Magnets, Yi, Ponder, Jacko &

Stasko, 2005) often inspire more natural, 'post desktop' styles of interaction.

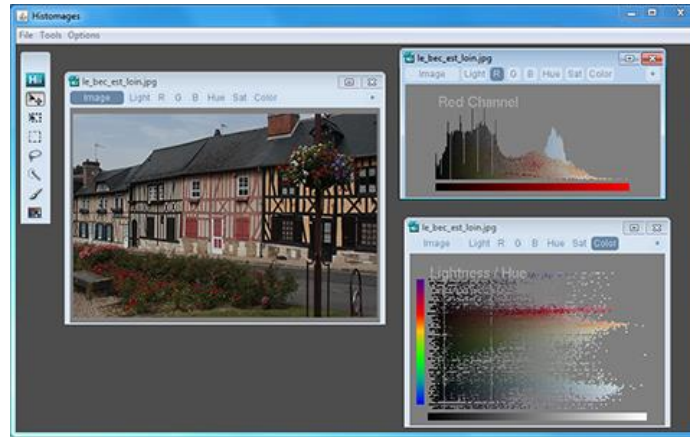


Figure 11: Histomages : Chevalier, Dragicevic, Hunter, UIST 2012.

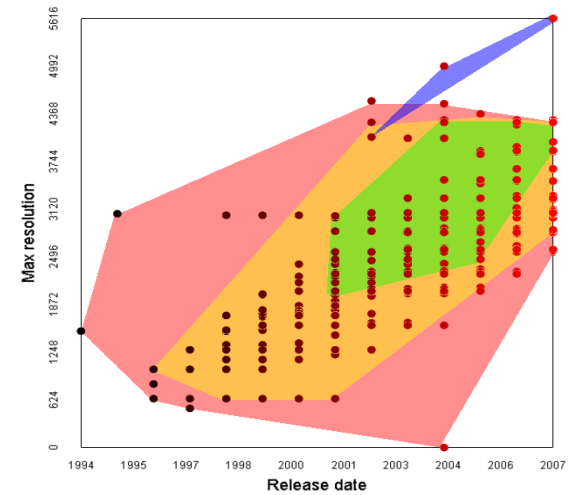


Figure 12: ScatterDice: Elmqvist, Dragicevic, Fekete, Infovis, 2008.

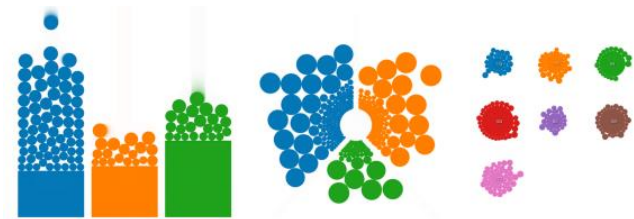


Figure 13: Visual Sedimentation: Huron, Vuillemot, Fekete, Infovis, 2013.



Figure 14: SandDance: Drucker, Fernandez, Microsoft Tech Report. 2012.

Magic in the User Interface

Another common goal/subject of movies is the demonstration of magical actions and effects. From the very earliest day of Méliès (making things disappear through editing) to the magic of Harry Potter, capturing the thrill of magic in the movie can also be an inspiration for researchers in Infovis.



Figure 15: George Méliès, 1896. Scene from the vanishing lady.



Figure 16: Swish and Flick: Harry Potter and the Sorcerer's Stone, 2001.

The gestural language from minority report is not dissimilar to the 'swish and flick' motion from Harry Potter. Getting the gesture just right causes amazing things to happen. The conjuring of something out of

nothing (like the flames from Dumbledore in the Half Blood Prince) shows magic at its most profound, and it is the wonder of action at a distance that often pulls attracts an audience, whether it is for film entertainment, or to inspire an audience at TED.



Figure 17: Harry Potter, Half Blood Prince, 2009.

As we know from Clarke's third Law – 'any sufficiently advanced technology is indistinguishable from magic.' (or perhaps Benford's correlary – Any technology distinguishable from magic is insufficiently advanced'), we see how action at a distance, or the creation of something out of nothing can be reflected in scientific work itself. Oblong industries, founded by the science advisor for Minority Report, realized its own version of Minority Report.



Figure 18: Underkoffler Ted Talk: 2010.

And displays from x-men that almost magically conform to the geography of a landscape, figure 19:

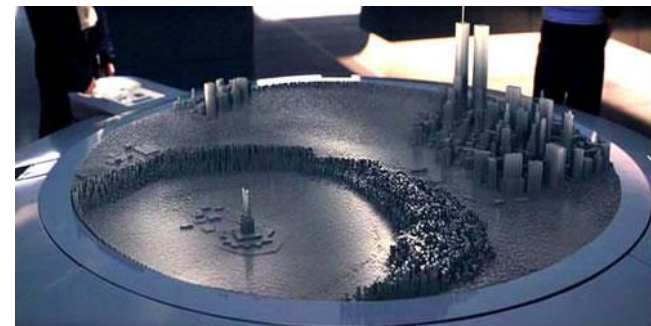


Figure 19: X-Men (2000)

can in turn inspire real world researchers at the Media Lab to create a haptic display which allows users to manipulate objects (and present data) at a distance.

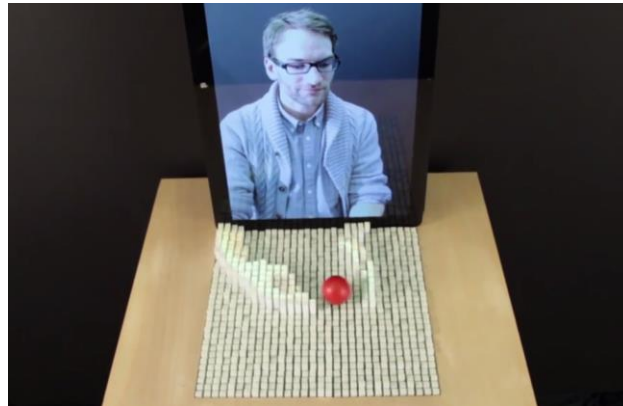


Figure 20: inform – Interacting with Dynamic Shaper Display, Tangible Media Group, MIT Media Lab, 2013

Augmented Reality

Finally, we have another common meme from cinema – augmenting reality with annotations and visualizations. Whether it is the viewpoint of a Terminator:



Figure 21: Terminator, 1984.

or the superimposed infographics in Stranger than Fiction.



Figure 22: Stranger than Fiction: 2006.

Being able to augment what we see, either through head mounted displays or projected graphics is as compelling in reality as it is in the movies.

Researchers have used head-mounted displays to augment the environment with extra information:



Figure 23: Augmented Reality Medical Heads up Display.

Or used smaller devices with views overlaid onto the real world.



Figure 24: Real time augmented reality concept based on Layar Technology, PSV Media. 2014.

Or they have used projectors to project extra information on the objects in the environment itself, thus freeing users to a more unencumbered view of the world while still augmenting it with visualization.



Figure 25: Volkswagen, x-ray projected view, Juergen Leohold, 2010.

Conclusion

We have briefly explored 3 themes from movies and found existing examples of visualization related interfaces that all move beyond the desktop. There are vastly more possibilities that can be explored. One important aspect, though, often neglected is that while an interface may LOOK compelling (whether in film or the real world), actually having it be effective in addressing real world problems is often the difference between a point example relegated to history



Figure 26: 1949 Aerocar.

or a technical idea that eventually turns into reality:



Figure 27: Picturephone, 1964.



Figure 28: Facetime.