

EXPERIMENTS IN STEREOSCOPY

A Research Paper
DRS2019

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Spring 2018-19

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1. ABSTRACT

A study on stereoscopic comic book and its level of immersion for the reader in comparison to a normal comic consisting of 2D images. This study has been conducted as a part of DRS 2019, under the title of Experiments in Stereoscopy, with comic books in focus.

There are several factors involved for a person to approach a comic book like the visual storytelling, narrative, artwork, nostalgia, or just a mild interest. If the experience of reading a comic book can be enhanced even further, with stereoscopy, how does that effect immersion of the reader, is the focus of the topic.

The findings have been documented with help of a user testing, their responses analyzed and conclusions derived. A few other observations have also been made, which have been documented in this research paper.

2. INTRODUCTION

2.1 BACKGROUND:

Stereoscopy has widened the possibilities of storytelling vastly. An illusion of 3-Dimensional depth in the 2D images can be a major contributor for this phenomenon, possibly due to the immersive experience. In the current times with such an exposure to so many media of entertainment and varying experiences, it is an intriguing thought to see if stereoscopic imagery can engage people reading comic books on a greater level than a normal one.

2.2 HYPOTHESIS:

“3D comics are more immersive than regular 2D Comics.”

The above hypothesis will be tested through the help of a study. The study will consist of questionnaire which is to be filled after being presented with two versions of sets of 3D (Stereoscopic) and 2D (Normal), images and comics. Other observation by the users, in connection with Immersion, Stereoscopy and Comics, shall be also be documented.

2.3 AIM AND OBJECTIVE:

Aim: The aim of this study is to understand if there an increase in the level of perception understanding, or rather Immersion of a person, when presented with 3D comics, as compared to reading 2D comics.

Objective: The objective of this study is to check the concentration of the research participants and also to test their attention to tiny details, which shall help study and compare Immersion due to stereoscopy for comic books.

2.4 SCOPE AND LIMITATIONS:

Scope: Studying how stereoscopy works and a chance for experimenting with comics is a great scope for this topic. Increase of immersion in comics with stereoscopy, seems to have been overlooked before.

Limitations: Due to a time constraint, the study has been limited to only Anaglyphs and its use in comics. Equipment for the study is also limited to Anaglyph 3D glasses, excluding the other stereoscopic gimmick images and polarized stereoscopy. The study shall purely focus on the immersion aspect of the stereoscopic comics, based on anaglyphs.

2.5 METHODOLOGY:

An initial review of literary sources about stereoscopy, immersion and its applications in comic books. Types of stereoscopic image creation were also studied and its use in the current media and entertainment, for storytelling and information transfer.

Next, Experiments with stereoscopic images, shooting stereoscopic photographs and creating them digitally. Also, trying variations with the Intraocular distance for shooting the photographs to create anaglyphs.

Generating a narrative for making a 3D comic, with a complete narration for storytelling. Converting it to 3D comic. Conducting a User test with a sample of more than 10 participants to analyze immersion through stereoscopy for the comics. Studying the data and drawing out inferences from the same.

Analyzing the inference with respect to the initial hypothesis taken up at the initial stage of the study.

3. REVIEW OF PRIOR WORKS:

3.1 STEREOSCOPY AND IMMERSION:

Stereoscopy: A technology and science for creating or enhancing the illusion of depth or “3D” effect in an image by using stereopsis, binocular vision and 3D glasses.

Immersion: Deep mental involvement in something. (See Appendix A)

Areas of study with Immersion through Stereoscopy: All Media of entertainment, from Films, Art installations, Simulation, Games, Virtual Reality are dabbling in stereoscopy. A major chunk of studies have been conducted for Stereoscopic film viewing, with both anaglyph glasses and polarized glasses, further incorporating other sensory simulations (7D movies).

3.2 IMMERSION IN COMIC BOOKS THROUGH STEREOSCOPY

Applications of Binocular vision and Stereoscopy in “3D” Comics:

The stereoscopic technique has been largely used for the illusion of depth and also for telling a story with two visuals in the same panel, to be viewed through a single eye. The complete filtration of a particular colour gives a chance to create a gimmick-like story telling in comics.

Research about immersion, Stereoscopy and Comics: Largely it seems to have been implied due to all stereoscopic media studies, that they would hold the same result for still images in a comic book format.

4. DATA COLLECTION:

4.1 PRIMARY DATA COLLECTION:

There are various types of still image gimmicky applications of stereoscopy from Autostereogram to stereographs, and currently anaglyphs and latest polarized 3D. (See Appendix A).

4.2 SECONDARY DATA COLLECTION:

4.2.1 EXPERIMENTS WITH STEREOSCOPY:

As mentioned in limitations of the study, the Anaglyph 3D glasses were chosen. Anaglyphs were created using various techniques.

Photography: Shooting two pictures with Intraocular distance (See Appendix A) of 2.5 inches. The pictures are then omitted of the red in one and blue and green channels in other and superimposed to make an anaglyph. Varying distances were attempted for both close up and far off visuals.

Single Photograph edited digitally: A single image was edited using displacement map, which alters the image to make an anaglyph.



Fig. 4.2.1 (a) Anaglyph: Two photographs clicked with 2.5 inch distance



Fig. 4.2.1 (b) Anaglyph: Two photographs clicked with 2 feet distance

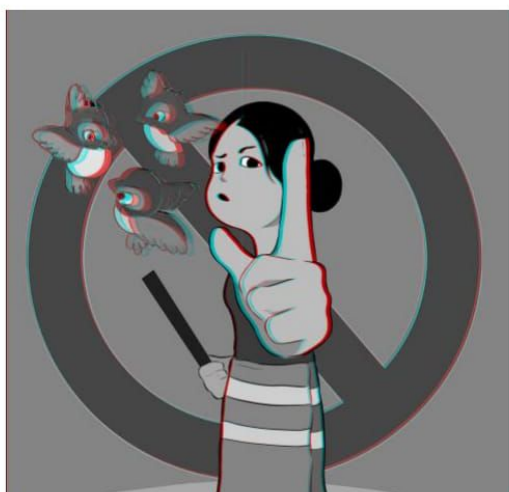


Fig. 4.2.1 (c) Hand drawn image converted to Anaglyph



Fig. 4.2.1 (d) 'The Kiss', Anaglyph: from a single image.

Hand drawn graphics: Drawn images were also similarly treated to create Anaglyphs using the same displacement method.

4.2.2 CREATION OF STEREOSCOPIC COMICS:

A three panel graphic narrative was developed initially, which lead to the two page comic later. The story consists of two men planning to reach the airport with one of them irresponsibly late. The story ends in a light vein when they do reach the airport but cant take the designated flight.

The conversation between the two characters keeps the narrative flowing, while the genre is chosen for its revisit value. Two types of visuals were designed, one with stereoscopic illusion of depth and others with 2 POVs shown in the same panel due to the property of the anaglyph glasses.

The panels were designed as a combination of a cluster of tiny panels and one full page panel for the 2 varying channels visuals. The story is told in two pages.



Fig. 4.2.2 (a) POV of Ch.01



Fig. 4.2.2 (b) POV of Ch.02

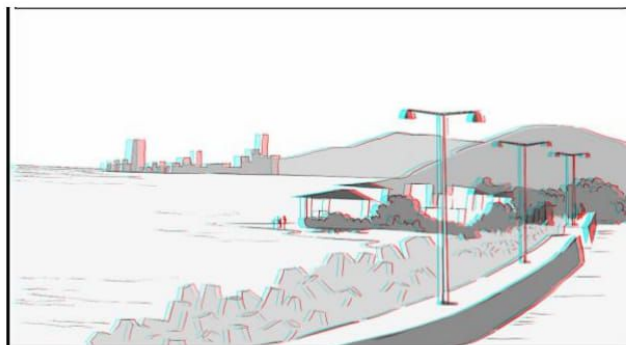


Fig. 4.2.2 (d)Anaglyph panel in the comic.



Fig. 4.2.2 (c) 2 POV s in the same panel

5. USER TESTING:

5.1 QUESTIONNAIRE DESIGN:

The questionnaire was designed in such a way so as to study immersion levels in comics considering various aspects such as photographic or drawn graphic images, Coloured and Black and White, and lastly with the help of a 2 Page stereoscopic comic.

5.2 SELECTION OF USERS, IMAGES AND EQUIPMENT:

For the Study, 12 participants were chosen randomly, ranging from 19 years to 31 years of age, with variables of some of them having eyesight correction glasses and others not.

The images chosen were clicked photographs converted to black and white and coloured anaglyphs. Images from the internet, which have been seen by the user prior to the testing were also chosen, for their recall value, and its possible effects on involvement of stereoscopy, effecting Immersion.

A pair of 3D Anaglyph glasses with Red and Cyan lenses were worn by the user during the testing and the images were displayed on a laptop screen. The choice of images from photographs to drawings was on purpose to ease the transition, since it was assumed the user is fairly familiar with concept of 3D glasses, with an exposure to 3D entertainment in the popular culture.



Fig. 5.2 (a) Anaglyph 3D Glasses
(Courtesy SnapDeal.com)

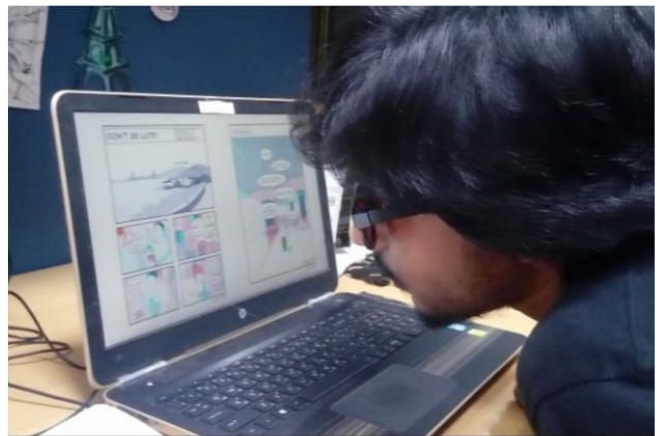


Fig. 5.2 (b) A participant in the study
testing the comic with 3D glasses.

5.3 TESTING PROCESS:

A google form was created to record the responses of the participants, while displaying the images/visuals on a laptop screen.

A pair of Anaglyphs shot and created with a 2-photograph were first shown to the User for studying the illusion of depth, the comparison of Black and White and Coloured image, and for any discomfort with the process.

Later, 2 sets of images were shown again, one with a popular internet “meme” image in combination of Black and White and Colour and later, “The Kiss” image (See Appendix A) was shown also with and without the stereoscopic effect applied to it. Both the times, figuring out which is favorable for the user to draw attention or level of Immersion in the latter set.

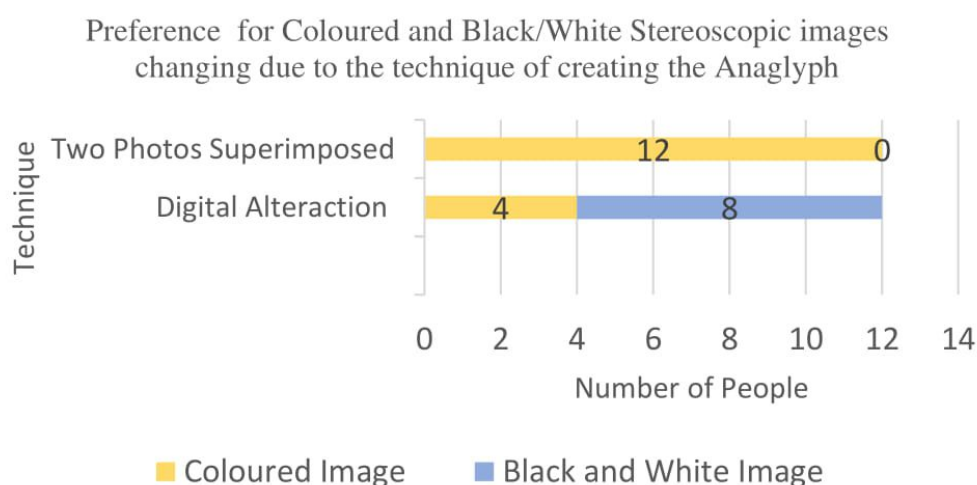
Then, the user was asked to explore the 2 Page Stereoscopic comic book, without any prior instruction for reading. All questions regarding the comic were asked only after the user had finished the 2 pages of the comic.

The final question asked to all the participants was about the effects of the Anaglyph glasses on their body- ranging from dizziness, strain to the eyes, blurriness of vision etc. Every participant took 15 minutes on an average to complete the testing.

6. COMPARATIVE STUDY AND ANALYSIS:

COMPARITIVE ANAYSIS OF DATA

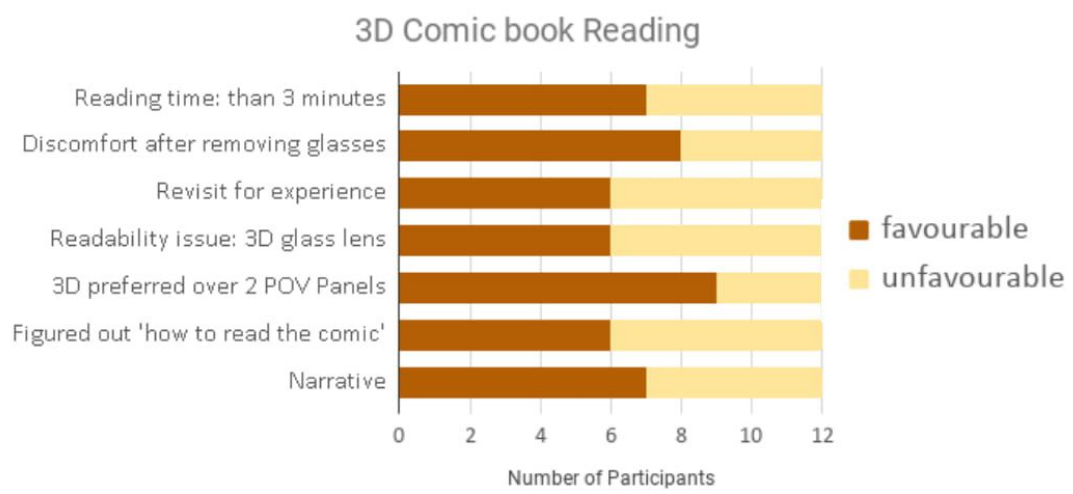
The anaglyphs created with two techniques were tested in both Black and white and Coloured versions.



While 3 of 12 people said they had read a 3D comic before, 8 out of the 12 people mentioned how they would pick up a 3D comic for the experience, prioritizing over the story.

8 out of 12 people when showed the picture of the ‘Kiss’, (See Appendix A) preferred to take a keener interest and found the picture engaging while it was stereoscopic.

The 2 page comic was left to the reader’s interpretation to explore. Later several aspects were clarified with the user and some of them noted from observation in the chart below.



7. INFERENCES

From the data collected from the user testing for the comics and Anaglyph images, these are some findings:

In case of Anaglyphs, when created with two photographs shot with a specific Intraocular Distance, the coloured anaglyph induces a better immersion than a black and white one.

When an anaglyph is created with a single image source, it works better in black and white than colour.

Testing for Immersion in 3D comics, and taking above inferences in consideration:

Comics with lesser pages or of short duration or as gimmicks work better, since the immersion of the reader is mainly due to the novelty of the stereoscopy but is negatively affected by the discomfort of the 3D glasses being worn.

A careful choice is necessary for choosing which genre of stories to be told via 3D comics, since the immersion continues longer with engaging content and a revisit value.

As observed in various studies before, the 3D glasses induce a state of unease in varying intensity ranging to dizziness and blurry vision if viewed for an extensive period. This also affects the immersion of the reader in the comic.

There has been a technical issue in the study too, with the red lens of the glasses not filtering out the necessary components.

Concluding the study,

3D comics are more immersive than 2D comics.

The novelty of seeing a 2D plane of a exhibiting 3D features is a novelty to the human brain and it definitely engages the viewer/reader than a case where the same visual is in 2D. The other aspects of the duration of immersion and the comfort of the reader/viewer in the whole process affects the immersion. The hypothesis stands true with the studies and test conducted.

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APPENDICES :

APPENDIX A:

TERMINOLOGY AND NOTES:

- **3D:** Stereoscopic, motion-picture process that gives a three-dimensional quality to film images.
- **Anaglyph 3D:** stereoscopic 3D effect encoding each eye's image using filters of different (usually chromatically opposite) colors, typically red and cyan. Anaglyph contain two differently filtered colored images, one for each eye. Each of the two images reaches the eye it's intended for, and visual cortex of the brain fuses this into 3 dimensions visual.
- **Autostereogram:** A single-image stereogram creating a visual illusion of a three-dimensional (3D) scene without any external viewing device.
- **Binocular Vision:** Type of vision in which an animal having two eyes is able to perceive a single three-dimensional image of its surroundings.
- **Immersion:** The action of immersing someone or something in a liquid.
Deep mental involvement in something.
- **Immersion (Virtual Reality):** Immersion into virtual reality is a perception of being physically present in a non-physical world
- **Polarization Stereoscapy:** A system which uses polarization glasses to create the illusion of three-dimensional images by restricting the light that reaches each eye (a type of stereoscopy). It has a better 3D perception with colours than Anaglyphs.
- **POV:** Point of view. In storytelling, the incidents are narrated from that character's perspective.
- **Stereopsis:** Refers to the perception of depth due to two eyes by individuals with normally developed binocular vision, like humans.
- **Stereogram:** A Stereoscopic image.
- **Stereoscopies/ Stereo Imaging:** Stereoscopy.

- **The Kiss by Alfred Eisenstaedt:** V-J Day in Times Square (also V-Day and The Kiss) is a photograph by Alfred Eisenstaedt that portrays a U.S. Navy sailor grabbing and kissing a stranger—a woman in a white dress—in New York City's Times Square on August 14, 1945.
- **Evil Girl meme.:** The meme image: An evil girl grinning with a house on fire in the background. A source for internet Humor.

APPENDIX B:

QUESTIONNAIRE FOR USER TESTING:

- Name of the participant:
- Which one from the two images gives a better 3D effect?/Which of the images has more depth?



- Which one from the two images gives a better 3D effect?



- Which image did you look at longer/ made you notice more details?



- Have you ever read a 3D comic?

Yes/no Answer

- Would you read a 3D comic for the story or the experience?

Story/Experience

- Explore the comic below and comment on: 1. The 2 types of Stereoscopic images. 2. the narrative and any issues with understanding. 3. other special mentions for the comic. 4. would you read this comic again? 5. how was the experience.? comments.



- Did you face any discomfort while viewing the images? (Headache/ Strain on the eyes: select "yes" if any of these)