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IMPACT OF VISUAL EFFECTS AND CGI ON HUMAN MEMORY: A COMPUTER SCIENCE PERSPECTIVE FROM TAMIL CINEMA

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ABSTRACT

The primary purpose of the research is to investigate long-term memory and its relationship to computer graphics incorporated shots in commercial Tamil films. Also,this research focused on the use of visual effects shots for the effective memory and recalling factors of the Tamil film audience. Throughout the sequels of movies like Enthiran and Bahubali, many of CG incorporated symbols, signs, and shots are extensively used to create visual pleasure among the audience. So, the movie sequels like Enthiran, 2.0, Bahubali 1-The beginning, and Bahubali 2-The conclusion are selected to study the positive impact of CG incorporated shots. According to the psychologist's views, there are three classifications present in memory. They are sensory memory, short-term memory, and long-term memory. Sensory memory is a very basic type of memory, which present only as long as the visual /sound is present in front of the viewers. The short-term memory is present only up to 20 seconds. Long-term memory has the capability to store unlimited information and data for a few minutes to many years. To store the information in long-term memory the visual or auditory stimulus should be very strong. In this research, the qualitative analysis of interview data is used to study the relationships. Furthermore, the cued recall test is used to gather the information from the film audience. Computer graphics are used in the Enthiran and Bahubali movie series to create visual signs. These visual signs are present in the form of crowns, armours, swords, chariots, architectures, guns, costumes, tattoos, and property materials. This research shows that stories are effectively visualized with the use of computer graphics and visual effects. In addition, the interesting result of this research is the memory and recall ability of the film audience.This research concludes that the effective use of CG incorporated shots gives more effectiveness to the memory due to the individual's thought engagement with the story.

Keywords: Long-term memory, computer graphics, Story descriptive analysis, Cued call test, film analysis, Attention.

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1. Introduction

Visual perception is a psychological concept. Visual perception happens through the eyes which is a sensory organ. Visuals reach through the brain by the way of the retina. Vision is possible through rods and cones present in the eyes. The rods are responsible for the low light vision and the cones are responsible for the highlight vision and color identification. Moving images registers in the human brain through the visual perception process. Many research works conclude that visuals are more powerful than audio. There are two types of memory activity present in the human brain. The human brain contains one billion neurons. These neurons are responsible for the memory of the brain. More than one million gigabyte pieces of information can be stored in the human brain.

Isabelle's book named memory and moving image has underlined the links between the human memory and the moving image of cinema. It contains many clues and ideas related to preserving memory through cinema. Also, it confirms the rearrangement of existing memory. Generally, cinema has many recorded events. Even though it has real or imaginary moving images of events, it registers in the human brain as long-term memory storage. Isabelle's views support the concept of memory, replacement of memory, and also the interpretation of meaning through moving images.

Memory plays a very important role in the act of watching cinema. According to Lefebvre memory is very important to recognize faces, places, the narration of stories, segments, etc., Cicero mentions the significant relationships between mental imagery, imagination, and memory. There is a link that exists in the retention of visuals in the memory and the impression of the image. The story, characterization, places, settings, costumes, locations, properties, shots, scenes, sequences, kinds of music, visual effects, and animation clips present in a movie are constructed and filmed to impress the film audience. Those micro and macro elements of the films have different effects on memory. Gestalt psychology, discusses the whole perception. It introduces the concept of whole perception rather than part. The human mind has the possibilities to construct the parts and views the whole picture.

1.1 **Need and Importance of the Study:**

Digital revolution influences all the spheres of the business world. Particularly the impact of digital filmmaking technology changes every aspect of the film industry, which included all three phases of film production. Furthermore, it changes the way of film, advertising, screening, marketing, and distribution. This research is the need of the hour to understand the

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influences of new film trends and technologies. There are no research works that have been conducted in the interrelated fields of films and computer graphics for the past ten years in the Tamil film industry. This research work tries to bridge the gaps found in the Tamil film industry.

1.2 Statement of the problem:

Studying the impact of CG incorporated shots in the long-term memory of the young film audience belong to Tamil Nadu.

1.3 Objectives:

- To understand the long-term memory and its impacts in sequel movies released in Tamil Nadu.
- To conduct an experiment of the long term memory and CG incorporated shots
- To study the effectiveness of CG works in recent Tamil movies

2. Literature Review

Keene's research shows the importance of narration, language, and plots in the recollection and retention activities among the private as well as the public audience. According to Furman's research, there is a relationship present between long-term memory and cued recall based on the video clips. Furthermore, the long-term memory and the film's story narration have a link. It is measured by certain time duration (3 to 9 hours, weeks, and months). Timothy's research shows the massive capability of the brain in storing visual information related to pictures and movie clips. They have used the recall and recognition test to analyze the capacity of the human brain in terms of visual information storage. It shows the accuracy of the repeat-detection task to demonstrate the capability of the human brain's memory.

Candan Simsek's research work on memory due to motion in frames supports the concept of moving images and memory. Furthermore, it shows moving images enhances the retention capability of still pictures. This research has taken the movie clips as a visual stimulus. It shows the development of memory due to the presence of moving images. Furthermore, the visual extraction of information from the movie clips is possible based on societal exposure. CG helps to improve the quality of the visual effects. Furthermore, it helps to create high-quality outputs without the use of physically-based processes. Many research works support the positive impacts of CG works in the improvement of quality in shots.

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When producing a feature film, the use of CGI technology has become an emerging trend in film production. Using embedded CG visuals, cinematographic works can improve content. It offers more options to improve the creation of more engaging pictures. Research supports the development of emotion amongst younger age groups because of the presence of digital effects

3. Research Methodology

In this study, the experimental method of research was used to impact visual effects incorporated shots in the long-term memory of the young film audience. Two groups of young film audience of two different (film groups) areas were taken for this experimental study. One group of the film audience was considered an experimental group. Another group was considered as the control group. Pre-test and post-test (after 24 hours) were administered to understand the improvements in the long-term memory of the experimental group.

Cued recall test was used to study the impact of visual effect shots among the film audience. The story memory test (SRT-Story Recall Test) method was administered among the film audience. The visual cues were given to the film audience in the form of CG incorporated shots of the selected movies. The story elements were analyzed based on the recalling capability among the different groups. The variables are with CG incorporated shots and without CG incorporated shots of selected movies (Highly CG incorporated sequel movies recently released in Tamil film industry). The movies are Enthiran, 2.0, Bahubali-The beginning, and Bahubali-2 Conclusion. Pre-test and post-test were conducted to study the impact of CG incorporated shots among the film audience.

The movie sequels like Enthiran, 2.0, Bahubali 1-The beginning, and Bahubali 2-The conclusion are selected to study the positive impact of CG incorporated shots.

Sampling method:

A simple random sample method was used in this research to identify the protective film audience. This research had two groups of young film audience in two (Film groups in social media) separate areas. One group was considered experimental and another one was considered as the control group.

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Hypothesis:

1.There is a significant difference found between pre-test score and post-test means scores of the experimental groups and control group in long term memory of film events (quantified as correct answers)

2.There is a significant difference found between the post-test score of the experimental group and the control group in long-term memory due to the presence of CG incorporated shots and story narration.

Null hypothesis:

1.There is no significant difference found between the pre-test and post-test means scores of the control group and experimental group in the long-term memory of film events.

2.There is no significant difference found between the pre-test and post-test means scores of the control group and experimental group in long-term memory due to the presence of CG incorporated shots and story narration.

Variances applied in this study:

Independent variables:

1.Long term memory due to the presence of visual cues (Video clips with CG and visual effects)

Dependent variables:

1.The memory level score (In the form of descriptive and objective questions)

Tools used in this research:

Long-term memory was tested based on a memory test and the results were compared to understand the significant level of CG incorporated video clips in film events and story memory. (Unpaired) T-test was administered to study the relationships between the two variables.

The hypothesis was tested using the T-test based on the memory level (based on scores given).

Pre-test (Without CG incorporated video clips) (Movie clip duration-15 minutes)

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Group	NMean	memory
score	SD	
Control group	15	
	60	3.84
Experimental group	15	
	65	5.90

Posttest (With CG incorporated video clips) (Movie clip duration-15 minutes)

Group	NMean	memory
scores	SD	
The control group	15	
	57	2.58
Experimental group	15	
	80	6.34

From the above table (number 2), it is observed that there is a significant level of long-term memory in the control group. But after the experimentation with the visual effects incorporated shots the long-term memory related to events, and story narration showed an increased memory level score.

Standard deviation: Without CG incorporated clips: Control group

Standard Deviation, s: 3.84

Count, N:	14
Sum, Σx:	840.58
Mean, $\bar{x}$:	60.04
Variance, s2:	14.80

Steps

$$s = \sqrt{\frac{1}{N-1}\sum_{i=1}^{N}(x_i - \overline{x})^2},$$

$$s^2 = \frac{\Sigma(x_i - \bar{x})^2}{N - 1}$$

$$= \frac{(60 - 60.04)^2 + ... + (60 - 60.04)^2}{14 - 1}$$

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$$= \frac{192.51}{13}$$

$$= 14.80$$

$$s = \sqrt{14.80}$$

$$= 3.84$$

Confidence interval

The sampling mean follows a normal distribution. The SEM can be calculated using the following equation:

$$s_{\bar{x}} = \frac{s}{\sqrt{N}} = 1.02$$

Standard Deviation, s: 5.90

Count, N:	15
Sum, Σx:	988
Mean, $\bar{x}$:	65.86
Variance, s2:	34.83

Steps

$$s = \sqrt{\frac{1}{N-1}\sum_{i=1}^{N}(x_i - \overline{x})^2},$$

$$\frac{\Sigma(x_i - \bar{x})^2}{N - 1}$$

$$= \frac{(62 - 65.86)^2 + ... + (68 - 65.86)^2}{15 - 1}$$

$$= \frac{487.73}{14}$$

$$= 34.83$$

$$s = \sqrt{34.83}$$

$$= 5.90$$

Confidence Interval

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The sampling mean follows a normal distribution. The mean SEM can be calculated using the following equation:

$$s_{\bar{x}} = \frac{s}{\sqrt{N}} = 1.52$$

Post-test (With CG)

Count, N: 15

Sum, Σx: 864

Mean, $\bar{x}$: 57.6

Variance, s2: 6.68

SD=2.58

Experimental group

Count, N: 15

Sum, Σx: 1212

Mean, $\bar{x}$: 80.8

Variance, s2: 40.31

SD=6.34

Group one –Control group:

Unpaired t test results

P value and statistical significance:

The two-tailed P value equals 0.0181

By conventional criteria, this difference is considered to be statistically significant.

Confidence interval:

The mean of Group one minus Group two equals 3.0000

95% confidence interval of this difference: From 0.5532 to 5.4468

Intermediate values used in calculations:

t = 2.5115

df = 28

standard error of difference = 1.194

Intermediate values used in calculations:

t = 2.5115

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df = 28

standard error of difference = 1.194

Group-Experimental group:

Unpaired t test results

P value and statistical significance:

The two-tailed P value is less than 0.0001

By conventional criteria, this difference is considered to be extremely statistically significant.

Confidence interval:

The mean of Experimental one minus Experimental two equals -15.0000

95% confidence interval of this difference: From -19.5805 to -10.4195

Intermediate values used in calculations:

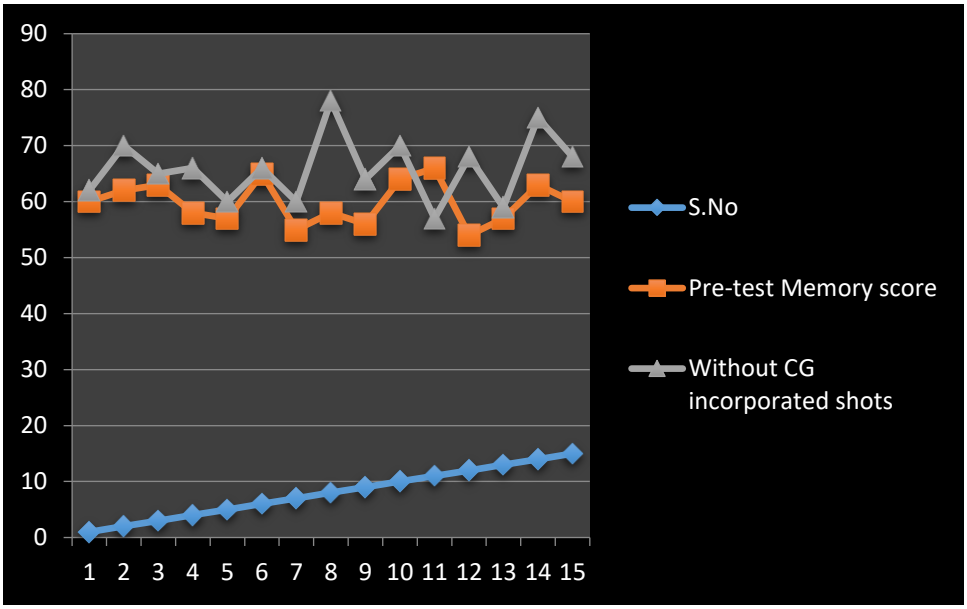
t = 6.7080

df = 28

standard error of difference = 2.236

Graph: 1

Graph 1 shows the pre-test memory score among the film audience



Graph:2

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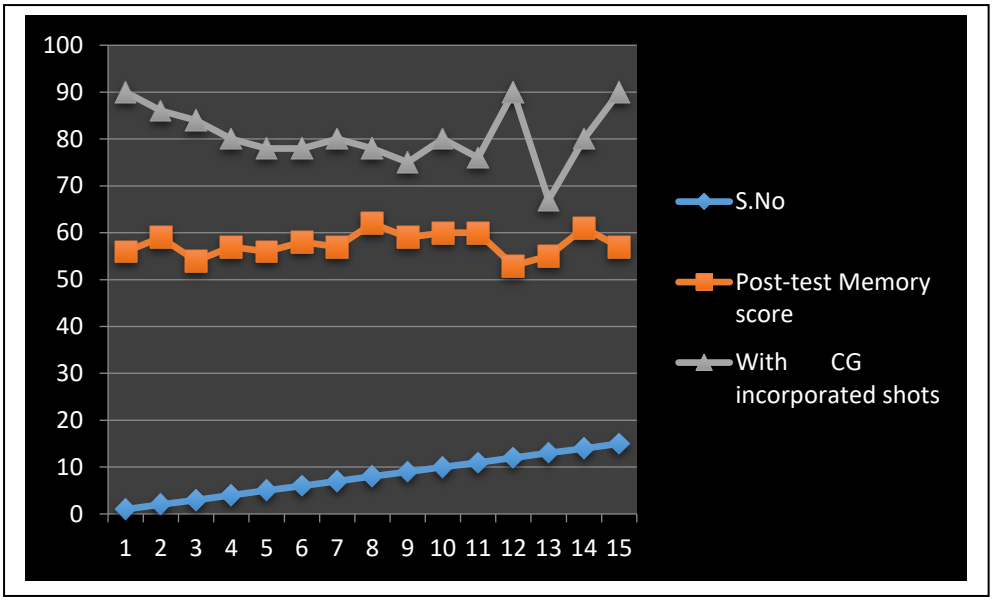

Graph two shows the difference between the memory test scores

Findings of the research:

The following outcomes are the findings of this experimental study.

- **The null hypothesis is rejected** based on the t-test values obtained from the pre-test and post test –Memory score values.
- There is a significant level of long-term memory score found between the control group and experimental group under the experimental settings (With CG and visual effects shots).
- There is no significant level of long-term memory score found between the control group and experimental group (without CG and visual effects shots).

The overall result shows the advantage of visual effects incorporated video clips (within the film) in developing the long-term memory in sequel movies.

Thus, the young film audience (19 to 24) has more long-term memory power due to the incorporation of CG shots in Tamil cinema.

The t-test value proves that there is a significant difference between the pre-test and post-test scores (Long term memory). The presence of CG incorporated shots increases the memory test score.

Thus, the null hypothesis is rejected based on the increase in long-term memory test score and the presence of the CG incorporated shots.

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Suggestions:

The new digital technologies such as CG and Visual effects should be used to enhance the long-term memory of the story, scenes, songs, and events in movies. It would help to attain the success of the sequels of movies. CG incorporated shots can be used to develop the interest and engagement level among the young film audience. Directors can use the new digital tools to attain and retain the film audience. Particularly, the sequel of movies needs more attention in order to understand the connection between the two stories.

Limitations of the study:

1. This experiment was conducted to study the impact of visual effect incorporated shots and memory among the young film audience between the age group 19 to 24.
2. Those who had basic film knowledge were considered in this experiment.
3. A few video clips (CG and Visual effects incorporated) were shown to the selected members to understand the effects of CG in long term memory

6. Conclusion

This study clearly shows the difference between the long-term memory of the story, events, and narration This difference happens because of the presence of CG incorporated shots in Tamil movies. Apart from the experimental results, the opinion of the young film audience favors the concept of computer graphics and visual effects in movies. Furthermore, this research shows the advantages of visual cues in memory of the films events and story. This research clearly shows the favorable opinions of the young Tamil film audience.Furthermore, CG works help to simplify the perception and attention process to believe the story, space and the transformation of the period of the movie.

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