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VISUAL DYNAMICS IN DIGITAL CATALOGUES: A COMPREHENSIVE ANALYSIS OF CINEMAGRAPH INTEGRATION THROUGH EYE-TRACKING TECHNOLOGY

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Abstract: *This paper investigates the transformative influence of cinemagraphs, a captivating hybrid of static images and subtle motion, on the overall quality and user experience of digital catalogues. As e-commerce and online browsing continue to shape consumer behaviour, the need for dynamic and visually appealing content is crucial. We delve into the aesthetic and functional enhancements brought about by cinemagraphs, analyzing their ability to capture attention, convey product features, and elevate the overall engagement levels within digital catalogues. Through a comprehensive analysis of user gaze patterns, fixations, and engagement metrics, we explore how cinemagraphs influence attention distribution, enhance product perception, and contribute to the overall quality of the digital shopping experience. Our findings not only underscore the significance of cinemagraphs but also provide valuable insights into designing visually compelling and user-centric digital catalogues.*

Key words: digital catalogues, cinemagraph, eye-tracking, user experience

1. INTRODUCTION

The theoretical framework for this study is based on the concept of visual communication and its role in influencing user behaviour. Visual communication is a powerful tool in digital marketing, as it enables brands to convey messages, evoke emotions, and establish connections with audiences through the use of imagery, colour, motion, and design elements (Lotman, 2016; O'Connor, 2024). In this context, cinemagraphs serve as an innovative form of visual storytelling that combines the best aspects of still photography and video. Unlike animated GIFs, which are often repetitive and low in quality, cinemagraphs employ high-quality visual elements that create a more immersive experience, blurring the line between static and dynamic content (Ramona, 2019; Winter, 2016). The concept of cinemagraphs was first introduced by New York-based photographer Jamie Beck and web designer Kevin Burg in 2011. They created cinemagraphs for New York Fashion Week and posted them on the Tumblr blog "From Me to You," where they received considerable attention (Susanto, 2019). Cinemagraphs are characterized by a subtle movement in one part of the image, while the rest remains static, effectively drawing the viewer's focus and creating a "living photo" effect that sets them apart from both static photography and video content (Ramona, 2019; Flock, 2011). Cinemagraphs are characterized by four main features: an infinite loop, continuity, animated frames, and a hypnotic effect. The infinite loop creates an impression of endless repetition, which is a shared component with forms such as animated GIFs, Vine, Boomerang, and Facebook Live Photo. The second component is pronounced continuity, which distinguishes cinemagraphs from other forms. This creates an illusion of time, making the beginning and end of the video imperceptible. In other formats, the repetition of a series of static frames is evident, whereas in cinemagraphs, individual elements are animated, creating dynamic parts in contrast to the rest that remains static. The visual effect created by the previous three components evokes a sense of hypnosis and emotion in viewers (Fang, 2024). An overview of the components is shown in Figure 1.

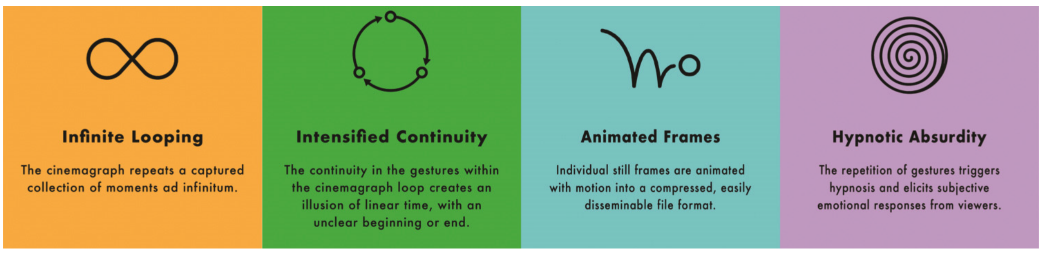

Figure 1: Four main features of cinemagraph

Due to their visually captivating properties, cinemagraphs are widely used in various fields, including fashion, travel, advertising, and online marketing (King, 2024). Their ability to attract and retain viewers' attention makes them a powerful tool for enhancing visual communication in digital catalogues, where engagement is crucial. Digital catalogues have become a key component in modern marketing, providing businesses with the ability to showcase products and services to consumers in an interactive and visually engaging way. Traditional catalogues, whether in print or basic digital formats, often struggle to capture and hold the attention of viewers in a highly competitive visual landscape. This challenge has led to the adoption of new visual elements such as cinemagraphs, which blend photography and video, to create a more dynamic and appealing viewer experience. Cinemagraphs are defined as a hybrid between a still image and a looping video element, creating an illusion of animation while maintaining the elegance and simplicity of a photograph (Ramona, 2019). Cinemagraphs have been shown to have several distinct advantages over both static images and traditional video in terms of engagement. Research conducted by Flixel, a tool used for creating cinemagraphs, found that dynamic content, such as cinemagraphs, achieved a click-through rate (CTR) 5-6 times higher than that of static images (Rose, 2024). This significant increase in engagement suggests that the subtle movement provided by cinemagraphs can be a highly effective method for capturing and retaining viewer attention in digital catalogues. Furthermore, the emotional response evoked by the motion in cinemagraphs plays a crucial role in influencing consumer behaviour, encouraging interaction, and driving conversions (Flicker, 2016).
The concept of visual hierarchy is central to understanding how viewers interact with digital catalogues. Visual hierarchy refers to the arrangement of elements in a way that guides the viewer's eye through the content in a particular order of importance (Fang, 2024). By integrating cinemagraphs strategically, designers can create focal points that direct attention to key products or messages, enhancing the overall effectiveness of the catalogue. The use of subtle motion in cinemagraphs naturally draws the viewer's gaze, making them an effective tool for establishing a visual hierarchy and improving the usability of digital catalogues (Fang, 2024). Eye-tracking technology provides a practical approach to studying visual hierarchy and understanding how different visual elements contribute to user engagement (Płużyczka, 2018). By tracking the movement of the viewer's eyes, it is possible to determine which elements capture attention first, how long the viewer remains engaged, and whether specific visual elements, such as cinemagraphs, have a greater impact on maintaining interest compared to static images (Eyeware, 2022). Metrics such as time to first fixation (TTFF), gaze duration, and heat maps are essential for evaluating the effectiveness of visual elements in capturing attention and facilitating navigation through the digital catalogue (Eyeware, 2022; Farnsworth, 2024).
This paper aims to provide a comprehensive analysis of the integration of cinemagraphs in digital catalogues through the use of eye-tracking technology. The focus is on understanding how cinemagraphs contribute to visual dynamics, enhance user experience, and drive engagement, compared to traditional static images and video content. By studying eye movement patterns, fixation times, and areas of interest, this research seeks to reveal the impact of visual dynamics on user behaviour and inform best practices for designing digital catalogues.

2. METHODS

Following the same principle, three cinemagraph examples were created in Adobe Photoshop (Figure 2). The videos used were sourced from the internet in the best possible resolution, and the cinemagraphs were saved in MP4 format. After creating the cinemagraphs, the next step is designing and creating the digital catalogue (Figure 3). The first version is a catalogue with all static elements, while the second version is an interactive catalogue featuring three dynamic elements, namely three cinemagraphs.
For the purposes of the research, a visual test was conducted. The experiment involved 30 participants, 20 women and 10 men, with an average age of 22.6 years. For conducting the experiment, a monitor was used to present both versions of the catalogue to the participants. Additionally, the Gazepoint GP3 eye-tracking device was used along with the software tools Gazepoint Control and Gazepoint Analysis. The Gazepoint GP3 is a research eye-tracking device that uses a 60 Hz machine vision camera at the core of its image capture and processing system. The device was calibrated before each participant.
For the analysis of the obtained data, the following research questions were formulated:

- Which element (Area of Interestes - AOI) did the participants notice first, and at which second?
- Does the cinemagraph attract participants' attention faster compared to a static image?
- Do participants spend more time on the cinemagraph compared to a static image?
- Do participants return to the cinemagraph?

To analyze the data, it is necessary to create AOIs in the Gazepoint Analysis software. Defining these areas facilitates and shortens the time required for data analysis. Twelve areas were defined: image/cinemagraph in the upper left corner (S1), image/cinemagraph in the centre (S2), image/cinemagraph in the upper right corner (S3), product prices (Price 1/2/3), device, as well as product names and descriptions. Figure 4 shows the AOIs on a sample.

Figure 2: Samples for the experiment

Figure 3: Catalogue used for the experiment

Figure 4: Areas of Interestes - AOIs

3. RESULTS AND DISCUSSION

Based on the analysis of the results for the elements (AOI) that participants first noticed on the static stimulus, seven elements were identified as being initially observed, with ten participants first noticing the element (AOI) "Coffee machine name." The average time to first fixation was 0.095 seconds, while the average duration of the first fixation was 0.99 seconds. The shortest first fixation duration was 0.02 seconds, and the longest was 2.27 seconds. Figure 5 graphically shows the number of participants who noticed each element during the first fixation on the static stimulus.

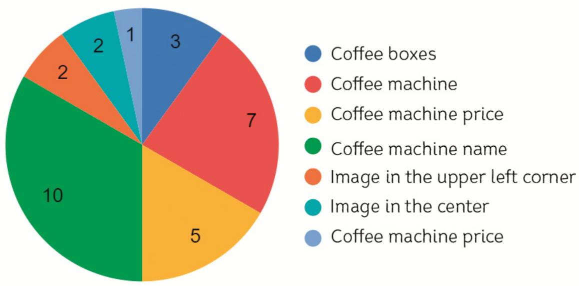

Figure 5: Graphical representation of the elements (AOI) that participants first noticed on the static stimulus

Based on the analysis of the results for the elements (AOI) that participants first noticed on the dynamic stimulus, eight elements were identified as being initially observed, with eight participants first noticing the element (AOI) "Coffee machine name" and one less (seven) noticing the cinemagraph in the upper left corner (S3). The average time to first fixation was 0.095 seconds, while the average duration of the first fixation was 1.25 seconds. The shortest first fixation duration was 0.16 seconds, and the longest was 3.47 seconds. Figure 6 graphically shows the number of participants who noticed each element during the first fixation on the dynamic stimulus.

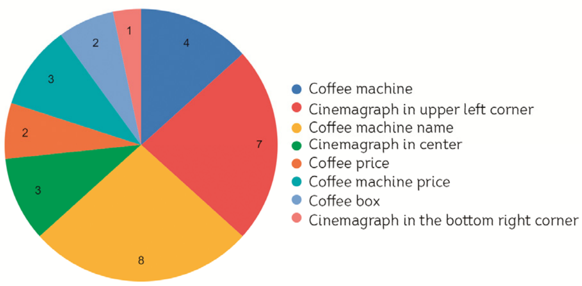

Figure 6: Graphical representation of the elements (AOI) that participants first noticed on the dynamic stimulus

Based on the analysis of how long it took participants to notice images on the static stimulus and cinemagraphs on the dynamic stimulus, which were identically positioned, the following observations can be made. All participants noticed the cinemagraph in the upper left corner, while one participant did not notice the image in the upper left corner. One participant did not notice the cinemagraph in the centre, while five participants did not notice the image in the centre. All participants noticed the cinemagraph in the upper right corner, whereas five participants did not notice the image in the upper right corner.

The average time to first fixation for the image in the upper left corner was 1.68 seconds, while for the cinemagraph in the upper left corner, the average time to first fixation was 2.67 seconds. The average time to first fixation for the image in the centre was 3.77 seconds, while for the cinemagraph in the centre, it was 3.15 seconds. The average time to first fixation for the image in the upper right corner was 3.37 seconds, while for the cinemagraph in the upper right corner, it was 2.4 seconds. Based on this, it can be concluded that participants took less time to look at the cinemagraph compared to the image in two out of three positions, as the movement attracted their attention.

An analysis was also conducted on how long participants kept their gaze fixed on images on the static stimulus and on cinemagraphs on the dynamic stimulus, which were identically positioned. The average duration of the first fixation for the image in the upper left corner was 0.7 seconds, while for the cinemagraph in the upper left corner, it was 1.5 seconds. The average duration of the first fixation for the image in the center was 0.59 seconds, while for the cinemagraph in the centre, it was 1.14 seconds. The average duration of the first fixation for the image in the upper right corner was 0.8 seconds, while for the cinemagraph in the upper right corner, it was 1.38 seconds. Based on this, it can be concluded that participants spent more time on the cinemagraphs compared to the images in all three positions. The time spent on the cinemagraph in the upper left corner was 2.1 times longer compared to the image, in the centre it was 1.93 times longer, while in the upper right corner it was 1.72 times longer.

An analysis was conducted on how many times participants returned their gaze to the image on the static stimulus and to the cinemagraph on the dynamic stimulus, which were identically positioned. For the image in the upper left corner, the total number of revisits was 12, while for the cinemagraph in the upper left corner, the total number of revisits was 32. For the image in the centre, the total number of revisits was 11, while for the cinemagraph in the centre, it was 26. For the image in the upper right corner, the total number of revisits was 14, while for the cinemagraph in the upper right corner, it was 26. The participant with the highest number of revisits was participant 10, with a total of ten revisits, while participant 13 had zero revisits. Based on this, it can be concluded that the movement resulted in more revisits to the element.

The best way to visualize the most frequently observed parts of the stimulus is through heat maps. Warm colours indicate the most visited parts of the stimulus, suggesting that participants primarily observed the dynamic elements-cinemagraphs-during testing on the dynamic version of the prototype. Figure 7 shows the heat map of one participant and all participants on the static stimulus, while Figure 8 shows the heat map of one participant and all participants on the dynamic stimulus.

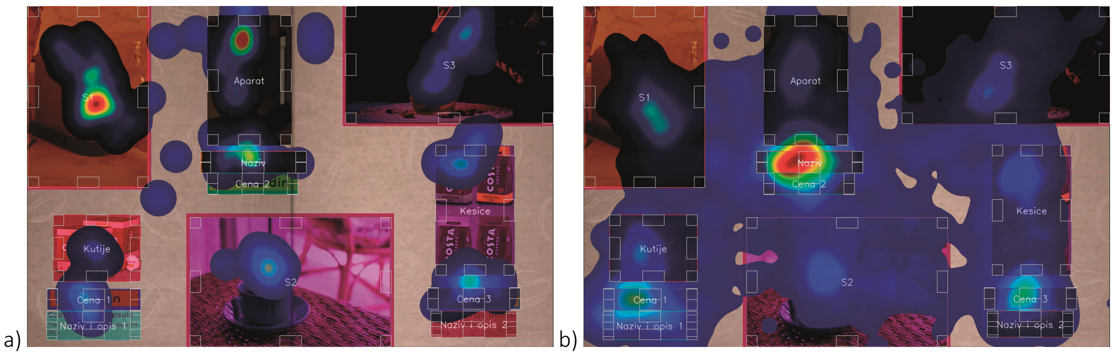

Figure 7 (part 1): Heatmap of a) single participant and b) all participants on the static stimulus

a) b)

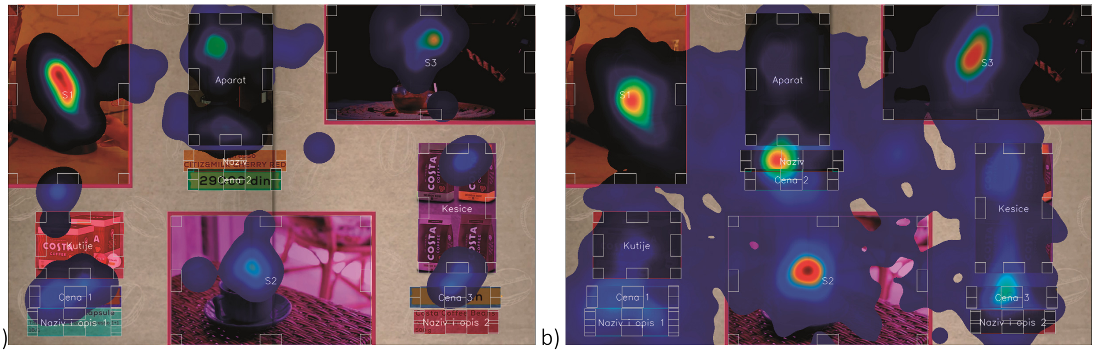

Figure 7 (part 2): Heatmap of a) single participant and b) all participants on the dynamic stimulus

4. CONCLUSIONS

The combination of dynamic and static elements creates an ideal form that captures attention, intrigues, astonishes, and ultimately leaves a lasting impression on users. A significant advantage of cinemagraphs is their versatility across various fields, as the subject matter can be anything. In today’s competitive market, the abundance of advertisements in various forms often leads to people forgetting what they have seen. Therefore, it is essential to capture attention and ensure that users remember their experiences. This can be achieved by incorporating interactive elements into catalogues.
The analysis of the obtained results leads to the following conclusions:

- Dynamic elements attract viewers' attention more quickly than static ones.
- Viewers tend to focus for longer durations on dynamic elements.
- Viewers return to dynamic elements more frequently.
- More attention is directed toward moving elements.
- Dynamic elements achieve greater appeal and interactivity.

Psychology and perception play crucial roles; for instance, individuals in this region tend to read from left to right, which is reflected in heat maps and gaze maps, as attention was observed to linger more on the left side compared to the right. The focus of the participants was predominantly on the centre of the display; this was evidenced by the fact that 24 out of 30 participants first looked at the central elements (product name, product price, appliance, image in the centre) in the static version, while 18 out of 30 did so in the dynamic version. Creating interactive dynamic content does not require significantly more time than developing static content. However, the differences in user engagement that dynamic content creates compared to static content are substantial. A potential drawback of using cinemagraphs in interactive catalogues is the choice of format. Nevertheless, formats such as high-quality GIFs or video formats (e.g., MP4) with autoplay and infinite looping are excellent options for digital catalogues.

5. ACKNOWLEDGMENTS

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