

Immersive VR for Numerical Engagement

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ABSTRACT

In this article, we aim to offer audiences opportunities to have an immersive experience with the statistical figures in the news contents. We go beyond the current numerical information representation method to develop a new automatic generation system for improving the numerical experience. We implemented three different conditions for representing numerical information: 1) text, 2) infographic, 3) VR. We will observe user responses to these methods by measuring engagement, immersion and flow status to detect narrative experience. It is assumed that the VR narrative will provide a more immersive user experience. Since the number is the core element of the statistics, our research will propose the new method to achieve the purpose of the VR journalism by transforming numbers into life-sized materials.

CCS CONCEPTS

• **Applied computing** → **Sociology**; *Computer-assisted instruction*; • **Social and professional topics** → *Informal education*; • **Human-centered computing** → Usability testing;

KEYWORDS

Numeracy, numerical information, engagement strategies

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1 INTRODUCTION

We are exposed to numbers and statistics through news in our daily lives. News coverage uses the numerical data sets in order to enhance its legibility, reliability, and accuracy. Since statistical data sets are abstract and complex, audiences have difficulties in estimating numerical data. Especially, if the audience with a lack of numerical knowledge might not be able to fully understand the content of news.

Enhancing numeric literacy among the general public has been a challenge for many years [Blastland and Dilnot 2009; Paulos 1988]. There have been many attempts to make people to comprehend numerical measurements. Several researches have found that people remember better if a textual information is followed by illustrations [Mayer 2002]. However, existing methods have limitations to provide the well described form of contents for people who have difficulties in understanding numerical figures. Due to space-time constraints of traditional media, the news delivers numerical information only via inanimate graphs and figures rather than interactive, animate, and three-dimensional ones.

In this article we aim to offer audiences opportunities to have an immersive experience with the statistical figures. The issue of using VR for storytelling has received considerable critical attention [Ryan 2001]. We go beyond the current numerical information representation method to develop a new system for improving numerical experience. We demonstrate abstract statistical figures intuitively by transforming them into life-sized materials. Audiences could perceive the statistical figures not in a textual or infographic form, but as a real size and volume by using VR technology.



Figure 1: Conditions used in the experiment: (A) Text, (B) Infographic, and (C) VR narrative.

2 SYSTEM CONFIGURATION

We implemented three different conditions for numerical representation, as depicted in Figure 1.

2.1 Text

In the text condition, Statistical information was presented in text form only. In order to manipulate the case, sentences containing numerical information were extracted from news articles.

2.2 Infographic

Infographics are visual representations of information designated to indicate information immediately and precisely [Smiciklas 2012]. The graphic illustration is followed by textual information.

2.3 VR Narrative

We developed the VR system to represent numeric data into virtual reality format. We demonstrate abstract statistical figures intuitively by transforming them into real materials using VR technology. Audiences perceive the statistical figures not in a textual or infographic form, but as a real perceptible substance. For instance, in case of the unemployment rates, we show the visualization that among 100 people who prepare for the job interview, some cheer and others are discouraged. VR is the 3D space that we can explore in the degree of 360. Therefore, it is possible to express real size and volume that are impossible to express in other dimensional spaces.

3 RESEARCH DESIGN AND EVALUATION

Our objective is to testify whether VR narrative help users engage in and comprehend quantitative information. Therefore, we present the same statistical information in three methods. We will observe user responses to these methods by measuring immersion, engagement, and flow status to detect narrative experience.

1) Immersion is the state that user is caught up in the world of the story and it is discovered that people could become immersed in a VR environment [McMahan 2003] and an immersion measure which is proposed by Jennett et al. [Jennett et al. 2008] will be applied in our experiment. 2) Engagement is a state of mind in which users would enter into stories or games at most irrationally [Bentham 1887] and the concept of 'deep play' is applied as a measure of a user's level of engagement [McMahan 2003]. Engagement in the VR will be assessed using the scale developed by Charlton and Danforth [Charlton and Danforth 2007]. 3) Flow is an absorption in an activity that is intrinsically entertaining [Csikszentmihalyi

1997] and the measure was developed with short scale [Jackson et al. 2008]. The scale will be used as a measure of how much users are focused on the story.

4 CONCLUSION AND FURTHER WORK

Statistical data is one of the essential elements to comprehend the information about themselves, the community, and society. Since number is the core element of the statistics, we propose the new method to achieve the purpose of the journalism by transforming numbers into life-sized materials using VR technology. The key aspect of proposed system is that it provides realistic VR narrative of numerical data as well as contextual information. Our research could be used for the development of broadcasting news contents generation system with numerical data. In the future study we aim to further investigate the effects of VR narrative system, by comparing three different narrative methods and how they impact the immersive experience in key aspects such as user engagement and comprehension.

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