Comprehension of Animated Public Information Graphics

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Abstract. Graphic information displays have the potential to communicate public information in situations where normal announcement types are ineffective. This pilot study explores comprehension of event-related information on railway traffic disruptions presented via different graphic formats. Ninety two participants were asked to understand and compare series of traffic disruption messages delivered via four purely visual formats. Animated displays were not only the preferred presentation type; they were also the most effective. Future research directions using eye tracking techniques are discussed.

Keywords: Comprehension of graphics; public messages; dynamic information; non-verbal presentations.

Introduction

Most previous research on the comprehension of animated graphics has concerned formal learning in scientific and technical domains (Bétrancourt, 2005; Bernay & Bétrancourt, 2009; Höffler & Leutner, 2007; Scheiter & al., in press). The typical goal of such research was to study how animations influenced the building of mental models of unfamiliar complex dynamic processes. This paper focuses on a rather different application of animations - providing public information messages about train traffic disruptions for people who cannot hear or understand normal spoken announcements. The target audience includes people with hearing impairments, the elderly, and travelers from other countries. Standard loudspeaker announcements are usually composed of a series of time events such as *"Your attention please, contrary to the information that has been displayed, the TGV number 1259 for Paris, will not start from platform A but will start from platform B".* Because these types of travel disruptions can be a part of the everyday context for people taking trains, it is important to provide alternative visual versions of these announcements that are effective for our target audience. The approach taken in the present research study is to recruit theoretical ideas from the Animation Processing Model (Lowe & Boucheix, 2008) for exploring the potential of dynamic visual displays to quickly and effectively trigger a task-appropriate script of the relevant events. Our interest is in which visual format (perceptual bottom-up level) will efficiently map to the internal script (representational top down aspect) of the series of train disruptions events. In this paper we present the results of a pilot study with directions for future research using eye tracking methods.

Method

Five graphic-only train disruptions messages were designed, each containing a series of pictures (figure 1) showing: switching of a railway track, train delay, cancellation of a train, passing of a nonstop high speed train on the railway near from passengers, and general disruption. Four message formats were produced for each design: static simultaneous (figure.1), static sequential, animated stepwise presentation, and 'comic strip' (similar to the sequential version). All versions were exposed for the same time period (21 sec.).

The 92 participants were from three different (equal number) groups: people deaf from birth (deaf 1), people with acquired deafness (deaf 2), elderly people with an auditory disability (old). Each group was divided in four sub-groups according to the four formats. Pre-tests assessed working memory, general IQ (WAIS Wechsler scale for adults) and transport usage.

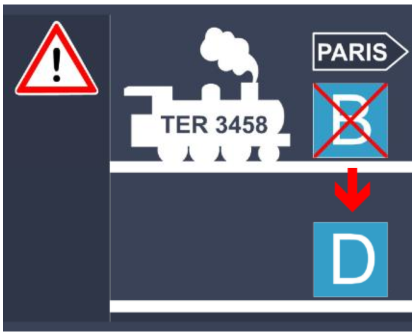

Figure 1- Visual display of the message "*"Your attention please, contrary to the information that has been displayed, the Regional Train (TER) number 3458 for Paris, will not start from platform B but will start from platform D"*

Next, each participant was presented with the disruption messages via their assigned format then was asked to give verbal and written explanations of the message's meaning (i.e., what does it say and what would you have to do in this situation). A sign language translator assisted when necessary. Responses were assigned a comprehension score. Finally, participants performed a judgment task in which they compared the four formats and ranked them in terms of preference.

Results

Figures 2 and 3 show comprehension scores (all messages) and preference scores respectively. For comprehension, an ANCOVA (group x format x messages with age as covariate) showed a main effect of format F (1, 79) = 4.86, $p < .004$, partial $\eta^2 = .16$, in favor of the animated version, a main effect of messages F (4, 316) = 4.60, $p < .002$ $\eta^2 = .06$ showing comprehension differences among the five messages and an effect of the covariate factor age, F (1, 79) = 19.79, $p < .001$, $\eta^2 = .20$; and an interesting interaction between type of message and group F (8, 316) = 3.10, $p < .003$.

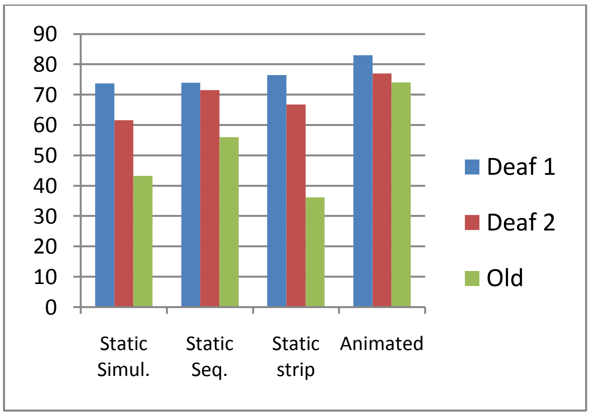

Figure 2- Comprehension score (%)

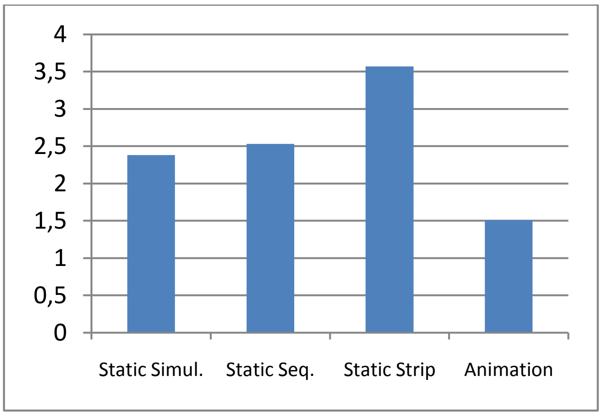

Figure 3- Mean preference rank out of four

Preference scores indicated that the animated format was highly favoured. A non-parametric testing (ANOVA of Friedman) showed a main effect of format on preferences: *Chi²* (N = 90, dl = 3) = 113,93 $p <= .001$.

Discussion and future research

Findings from the present pilot study suggest that dynamic graphic have the potential to facilitate public information comprehension and use. However these initial results are exploratory with a number of issues needing to be examined by further research. For example, we will be investigating the influence of the information's spatial integration and effect of different segmentations of the events. Further, other classes of participants will also be tested to explore the applicability of this approach. These groups include foreigners, those who are not regular train users, and various control groups who are not represented in the present research. In addition to outcome measures such as comprehension scores, we will be studying internal processes via eye tracking, reaction times and other dependent measures can help to reveal the underlying reasons for performance differences.

Eye tracking investigation

We are currently doing an eye tracking research.

Figure 4- Example gaze patterns (ex T120 Tobii) for a linear fixed simultaneous format (left) and for a linear animated format (right)

The example figure 4, dragged out of the sample of a new sample of 200 participants (students), showed that gaze patterns (fixation locations, fixation durations and scan path across time) could differ according to presentation formats.

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