

FrameShift: Shift Your Attention, Shift the Story.

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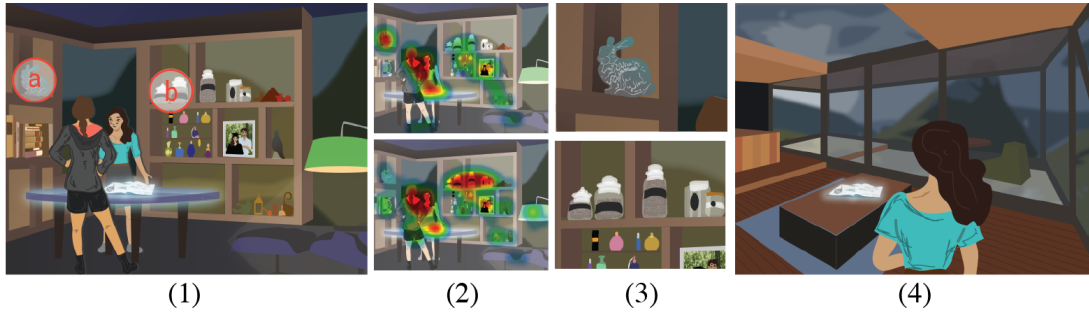


Figure 1: (1) type *A* frame with two attention elements. (2) Heat maps of user eye fixations. Top illustrates fixation on attention element *a*. Bottom illustrates fixation on attention element *b*. (3) *S* type frames depend on varying eye gaze. (4) *K* frame displays regardless of *S* frame

1 Introduction and Motivation

Keywords: attention, eye-tracking, gaze, interactive, graphic novel, alternative splicing, fixation, branching, belief states

Attention is a limited resource that intrinsically dictates our perceptions, memories, and behaviors. Further, visuospatial attention correlates highly with user engagement, heart rate, and arousal [El-Nasr et al. 2010]. Artists and interactive game designers strive to capture and direct attention, yet even in the most carefully crafted graphic narratives viewer eye paths – a proxy for attention – vary up to 20 percent [McCloud 1994; Jain et al. 2012]. Our aim is to use attentional measures to enrich graphic novel narratives. FrameShift uses eye tracking to measure reader attention and changes text and visual elements later on in the story accordingly. We have built an extensible framework for using attention to introduce perceptual changes in narratives. We use attention as an indirect method for interactions and introduce shiftable frame nodes that change readers’ belief states over time.

2 Our Approach

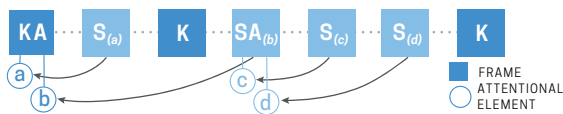


Figure 2: Dependency graph showing attentional elements and their dependent shiftable nodes.

Narrative Framework Representation The narrative framework is constructed from a series of graphic panels. Each panel is represented as a node in a dependency graph. Nodes can be of 3 types:

- *K* is a key frame and **must** appear in the narrative
- *S* is a shiftable frame and **may** appear in the narrative

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- A frame has attentional elements with dependent *S* nodes. *S* nodes appear based on the state of an attentional element in a previously appearing *A* node. We calculate probabilities for each path through the dependency graph based on user data for feedback.

Branching and Belief States Rather than constructing an extensive branching storyline, our approach modifies the user’s perception of key narrative structures. Readers may or may not be shown some *S* nodes (based on their attention), thus altering their belief state in regards to the plot. Say an *S* node contains an unsavory fact about a character which casts doubt on that character. The reader’s perception of that character changes based on the presence of that *S* node.

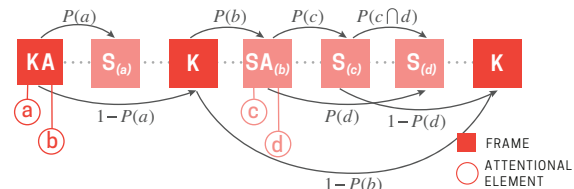


Figure 3: Example narrative paths with probabilities based on gaze data.

3 User Studies and Future Work

In our user studies, we investigate the minimum fixation time for an attentional element to be considered cognitively attended to. Additionally, we compare our implicit attentional narrative experience to choose-your-own-adventure and non-interactive controls. Lastly, we are working on authoring tools to assist in the creation of belief-state-aware content. All our artwork is original and designed specifically for FrameShift in Adobe Illustrator. The framework is written in C# and built in Unity.

References

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