

A Note on Carrying Captions Over a Shot Change

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Back in the mid 1970's when captioned television was being developed, some eye movement research was done at the Children's Television Workshop by Dr. Kenneth G. O'Bryan of the Ontario Educational Communications Authority. This research investigated how people moved their eyes when they watched captioned television programs. Apparently the results of this research were not formally published, but Jeff Hutchins and several other people who were involved in caption development at WGBH in Boston in the 1970s remember it.

In July 1999, Mardi Loeterman of WGBH searched the WGBH archives and found two unpublished manuscripts titled "Eye Movement Research Report on Captioning Television Programs for the Deaf" and "Report of Basic Findings on Captioned News." These manuscripts summarized eye movement studies by O'Bryan, one of which involved 40 profoundly deaf Canadian children who were shown episodes of the programs "ZOOM" and "Good Times," and another study involved 60 profoundly deaf subjects who were shown a captioned news program. Analysis of the eye movement from these studies allowed O'Bryan to recommend certain techniques for the creation of television captions. The work of O'Bryan greatly influenced the manner in which captions were prepared at WGBH, and many of the captioning techniques that were developed are used today throughout the captioning industry.

O'Bryan was an excellent researcher and his work was very important to the fledgling science of captioning television programs. However, his subjects were naive viewers in the sense that they had probably never seen captioned television before, and the captions on his video material were very different from those commonly seen today in terms of size, font, background, and presentation speed. It is suspected that some of O'Bryan's findings might be different today with experienced viewers and the currently used caption characteristics.

One of the techniques recommended by O'Bryan relates to carrying captions over a shot change. A "shot change" refers to a sudden change in the picture shown on the screen. The original eye movement studies suggested that when a caption remained on the screen when a shot change occurred, the viewer would go back and reread the caption. For example, O'Bryan's manuscript (Page 9, Item "e") states "Change of shot almost always disrupts an incompleting reading of a caption." As a result of this finding, WGBH and other caption companies have made it a general rule that a caption should not be carried over a shot change.

The problem with this rule is that it takes time to adjust captions so they do not carry over a shot change. Caption preparation would be faster (and less expensive) if such adjustments were not needed. It was decided to see if viewers really did reread captions when the captions were carried over a shot change.

With assistance from Mardi Loetermann and other staff at WGBH, several custom-captioned video segments were prepared with captions carried over a shot change. Two segments were selected and shown to five subjects. The eye movements of each subject were recorded. Figure 1 shows a plot of eye movements for a typical viewer

for a single caption held over a shot change. The caption appeared on the screen during a shot of two actors talking to each other. The shot changed to a different scene of the two actors talking, but the caption remained. The viewer was watching the face of the speaker in the first scene, dropped down to read the caption when it appeared, continued reading through the shot change, and then looked up at the speaker in the new scene after the caption was read. The top image in Figure 1 shows the eye movement over the whole sequence. The two bottom images in Figure 1 show eye movement before and after the shot change. This subject's reading of the caption is clearly not disrupted by the shot change. The subject simply continued reading and then looked up at the new scene.

To further examine how viewers responded to a shot change while reading a caption, the data for the five subjects on the two video segments were examined. The eye gaze position during the five frames immediately after a shot change were isolated and graphed, with lines and arrows added to show the direction of gaze movement. The results are shown in Figure 2. In four instances the subject's gaze moved right, in four instances it moved left, and in two instances it remained fixed.

The results also show that a viewer does not always react the same way to a shot change. Two of the viewers in this study moved their eyes in the same direction for both shot changes, but three subjects moved their eyes in a different way.

Clearly, the notions that shot changes disrupt caption reading and that viewers automatically reread a caption after a shot change are erroneous. Different people react in different ways. Caption companies can save caption preparation time by allowing captions to be carried over shot changes.

Figure 1
Eye Movement of a Typical Viewer Over a
Shot Change

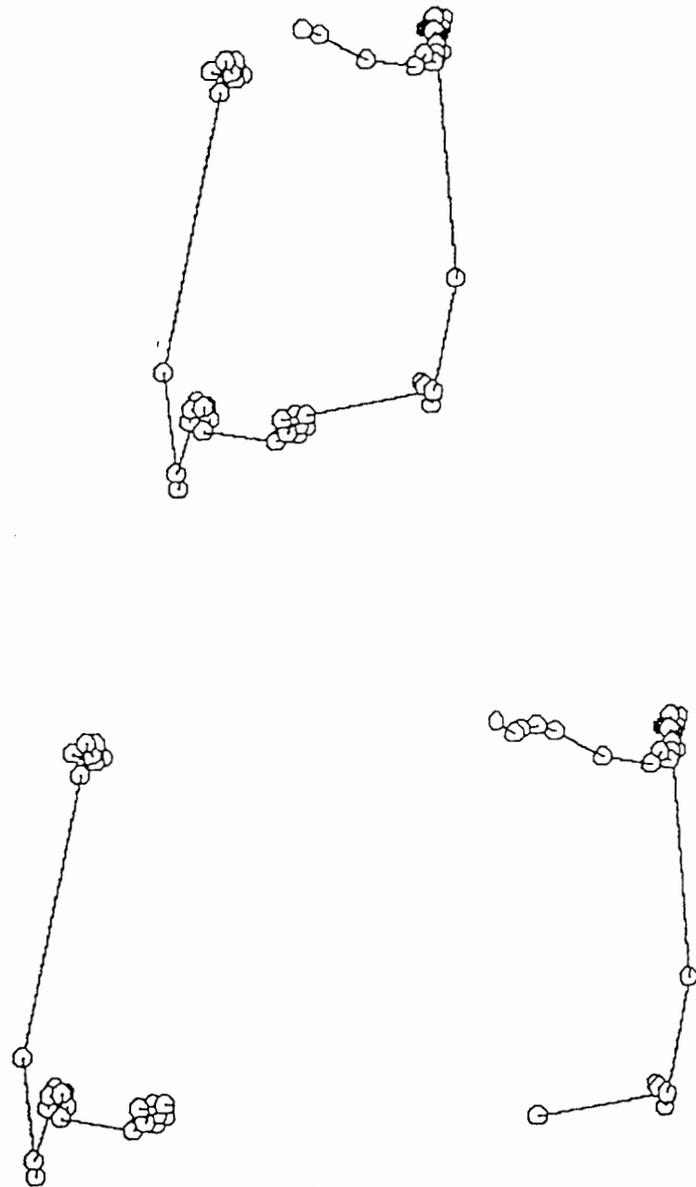


Figure 2

Eye Movement After Shot Change

(Five Frames = five gazepoints = 1/6 second)

