Motion Silences the Perception of Changing Image Quality in Naturalistic Videos

Lark Kwon Choi[1,3], Alan Conrad Bovik[1,3], and Lawrence Kevin Cormack[2,3]

[1]Department of Electrical and Computer Engineering, The University of Texas at Austin
[2]Department of Psychology, The University of Texas at Austin
[3]Center for Perceptual Systems, The University of Texas at Austin

Failure to detect changes in stimulus luminance (or color, etc.) termed "silencing" occurs in the presence of rapid motion (Suchow and Alvarez, 2011). It is possible that silencing is useful in naturalistic contexts, serving to suppress the perception of cast shadows on moving objects, say, or preventing video artifacts from being distracting. We conducted human experiments examining the perception of "flicker" caused by variation in image quality for moving objects in videos. 42 naive subjects evaluated the amount of perceived flicker of moving objects in the random ordered 36 test videos, which included six flicker-free reference videos and 30 degraded, flickering videos. The flicker was generated by alternating video frames of different quality levels (e.g.: bad, poor, good, and excellent). An eye and head tracker (faceLAB 5, Seeing Machines) was used to monitor gaze position (subjects' heads were unrestrained), and subjects reported their percepts by moving a mouse continuously throughout the stimulus presentation. The results indicate that the reduction of the visibility of flickering in natural videos depends on both the overall video quality and the speed of motion. When the video quality was high, the perceptual visibility of flickering is low and less sensitive to motion, whereas when the video quality was poor, the impact is large. Furthermore, although subjects held their gaze on the moving objects, lessflicker was seen on fast-moving objects. We interpret this result to suggest that large coherent motions near the fixation point might silence the awareness of flickering on natural videos. The responsible mechanism might be useful in the real world, where the light coming from moving objects can change dramatically (due to passing through areas of light and shadow, e.g.) even for a rigid object with a constant trajectory.

This work was supported by the Intel and Cisco Corporations under the VAWN program and by the National Science Foundation under Grants IIS-0917175 and IIS-1116656.