Abstract View

MOTION BIASES POSITION JUDGMENTS: A UNIFIED EXPLANATION FOR THE FEATURE-FLASH, FLASH-LAG, FLASH-DRAG, AND FROHLICH ILLUSIONS.

D.M.Eagleman*; T.J.Sejnowski

 CNL, Salk Inst, La Jolla, CA, USA

We propose that several superficially distinct illusions can be explained by a single mechanism. Several illusions share a common feature: when asked to localize a moving object at instant t, observers mislocalize the object in the direction of motion that occurs in the ~80 ms following t (Eagleman & Sejnowski, 2000). We propose this mislocalization occurs because motion signals from area MT feed back to bias position judgments in V1. To unify several illusions, we present a combination of new psychophysical results and modeling. First, we address the feature-flash illusion, in which a sudden color change of a moving bar is mislocalized to a later point in the trajectory. While it has been suggested that the illusion results from delayed feature binding (Cai & Schlag, 2001), we instead present 4 experiments demonstrating that motion signals shift localization of the feature-flash. We further show that motion signals can differentially bias individual edges of objects in transformational motion, such that a flashed object can have illusory size changes along any of its dimensions. Motion biasing offers a unifying explanation for 3 other illusions: (1) the Flash-Lag effect results from shifted localization of the moving object in the 80 ms following the flash. (2) In the Frohlich effect, the perceived starting position is shifted in the direction of later motion. (3) In the Flash-Drag illusion, motion signals can bias stationary objects -- here the timestamping flash is itself mislocalized. We present a computational model in which motion biasing results from area MT feedback to V1. Biasing of position judgments is a strategy by which the visual system uses motion information from a small window of time after an event to shift delayed, judged positions closer to their true locations in the outside world. In this way, several phenomena classified as motion illusions expose a sensible evolutionary adaptation that allows us to perceive a better representation of the present.

Citation:

close