The influence of motion integration on shifts in perceived position

Peter J. Kohler, Caeli E. P. Cavanagh and Peter U. Tse
Department of Psychological and Brain Sciences, Dartmouth College, NH, USA

BACKGROUND. The perceived position of a briefly presented static stimulus can be shifted in the direction of nearby motion (Whitney & Cavanagh, 2000).

QUESTION. How does integration of local motion signals into global motion percepts influence the position shift?

STIMULUS. Bistable diamond stimuli (Lorenceau & Shriffrar, 1992).

> Diamonds translated horizontally 4° visual angle in opposite directions at 30°/s towards the same end position, in an interleaved fashion (see demo).

> When one diamond was moving the other was stationary at the starting position.

> Diamonds waited 83ms at the end position before moving back, while a dot was presented on top of the diamond in one of four quadrants.

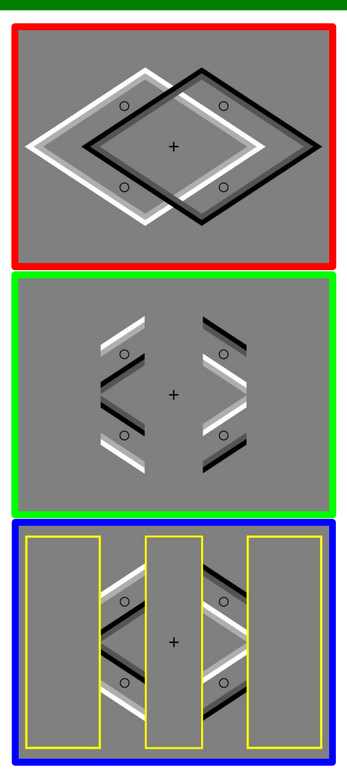
> The dot was shifted in opposite directions depending on which diamond was moving, and colored red and blue, so the shift was easily distinguishable.

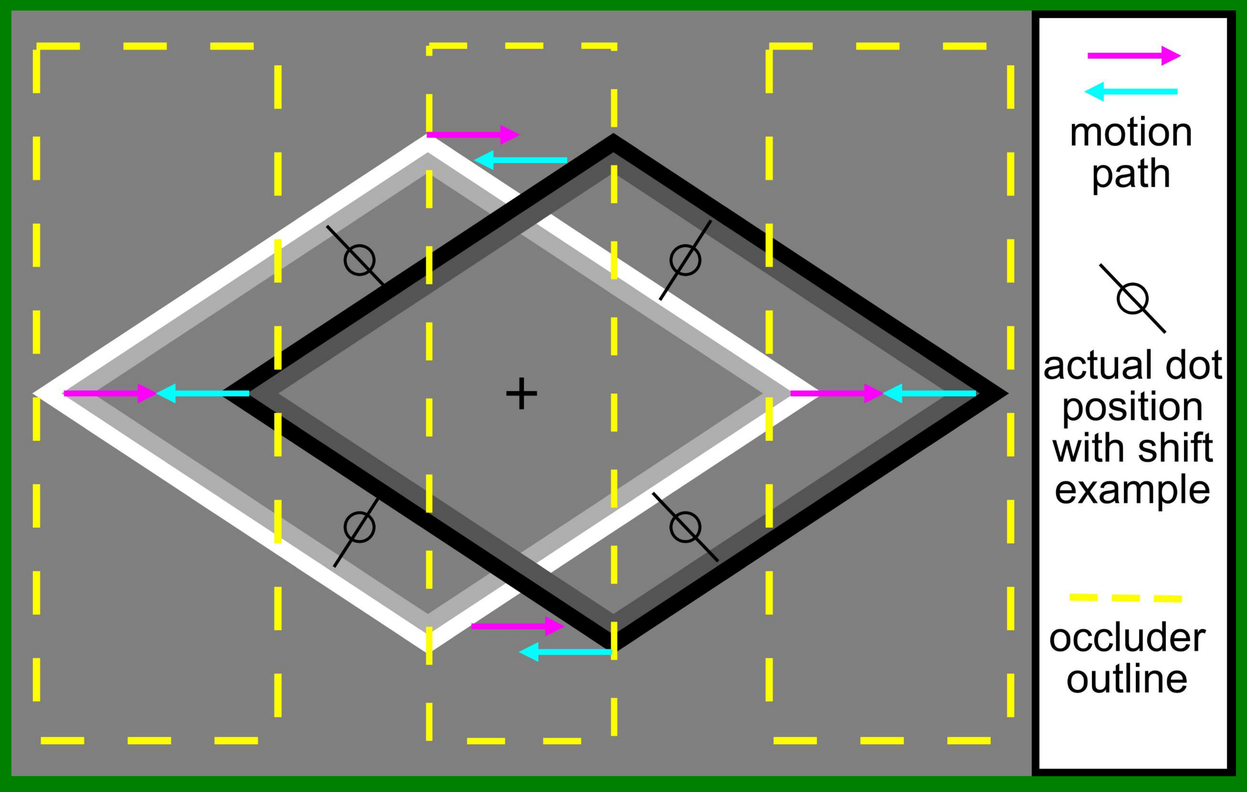
> Global motion percepts were manipulated in 3 experimental conditions:

C1) Full Diamond
horizontal bias

C2) Occluded
vertical bias

C3) With Frames
horizontal bias





> Importantly, local motion at the dot position is the same in all three conditions, and overall motion is the same between Condition 2 and 3.

> Subjects adjusted a dumbbell marker on a separate screen to match the perceived distance and angle of the shift. Fixation was monitored using an eye tracker.

RESULTS. 2-level repeated-measures ANOVA found main effect of condition on angle ($p<0.001$) and distance ($p<0.001$), but no main effect of dot quadrant and no interactions.

Angle: Planned t-tests
a) C1 more horizontal than C2 ($p<0.005$).
b) C1 more horizontal than C3 ($p<0.005$).
c) C3 more horizontal than C2 ($p<0.005$).

Distance: Planned t-tests
a) C2 bigger shift than C1 ($p<0.005$).
b) C2 bigger shift than C3 ($p<0.005$).
c) no difference between C1 and C3.

CONCLUSIONS. Global motion can influence perceived position when local motion is kept constant (C1 vs C2) and even when overall motion is kept constant (C2 vs C3). Position shifts must be computed at a neural processing stage later than that which resolves global motion.