When are Trajectories for Motion-in-Depth Stimuli Perceived Accurately?
Amanda Alvarez, David Hoffman, Martin Banks, Vision Science Program, University of California, Berkeley

Cues to motion-in-depth
When motion-in-depth is simulated on a computer screen, some cues to depth are correct, and others are not. A display can present vergence and size information accurately, but focal cues to depth are correct, and others are not. A display can be shown on this display, so blur and accommodation can approximate that of real world viewing.

Task & Conditions
Presented elliptical paths in the plane of the eyes
Azimuth and aspect ratio decorrelated with different motion path sizes
Path radius = radius of path when it is circular

Results: Single plane vs. volumetric
3. Do incorrect focus cues contribute to depth misestimation?

Conclusions
Motion-in-depth trajectories are perceived most accurately (and with greatest precision) when all cues specify the same path.
Looming is critical in monocular viewing and influential in binocular viewing.
Focus cues affect perceived motion-in-depth; when they signal no change in depth, depth compression occurs.
Providing correct focus cues reduces depth compression.

When showing motion-in-depth stimuli on a display, focus cues are inconsistent with the simulated distance. The accommodative responses and blur on the retina will be different for displayed motion, and for real motion.
We have shown that these differences influence the way we see simulated depth in computer displays.
When all cues are displayed correctly (natural viewing), the visual system can use this information and observers are accurate. On a display there are conflicting or erroneous cues which can cause misperception. Performance with a restrictive display environment may therefore not be indicative of how people use visual cues in real world viewing.

References