

Mislocalization of a moving object in three-dimensional space

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Introduction

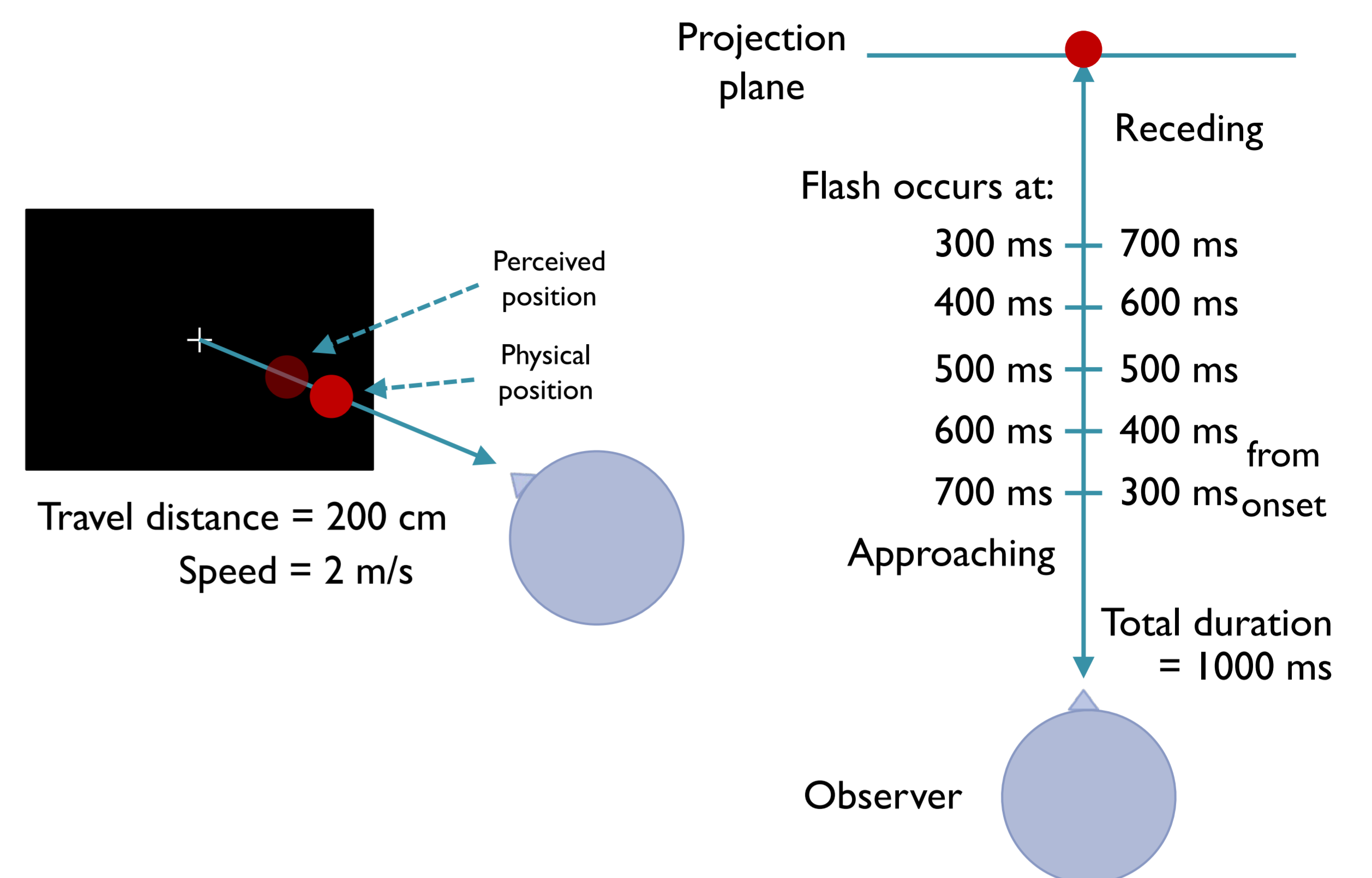
- The visual system exhibits biases in localizing moving objects
- A sudden onset of visual event causes a moving object to be seen at a position different from it actually is (flash-lag effect; Nijhawan, 1994)
- Previous studies have used relatively slow objects moving for short distances (Harris et al., 2006; Heber et al., 2009; Ishii et al., 2004)

Objectives

- To examine localization of an object moving in depth at a relatively fast velocity for a long distance using 3D projector, for ecological validity
- To examine whether the flash onset time or the actual distance of the object from the observer would determine the mislocalization effect

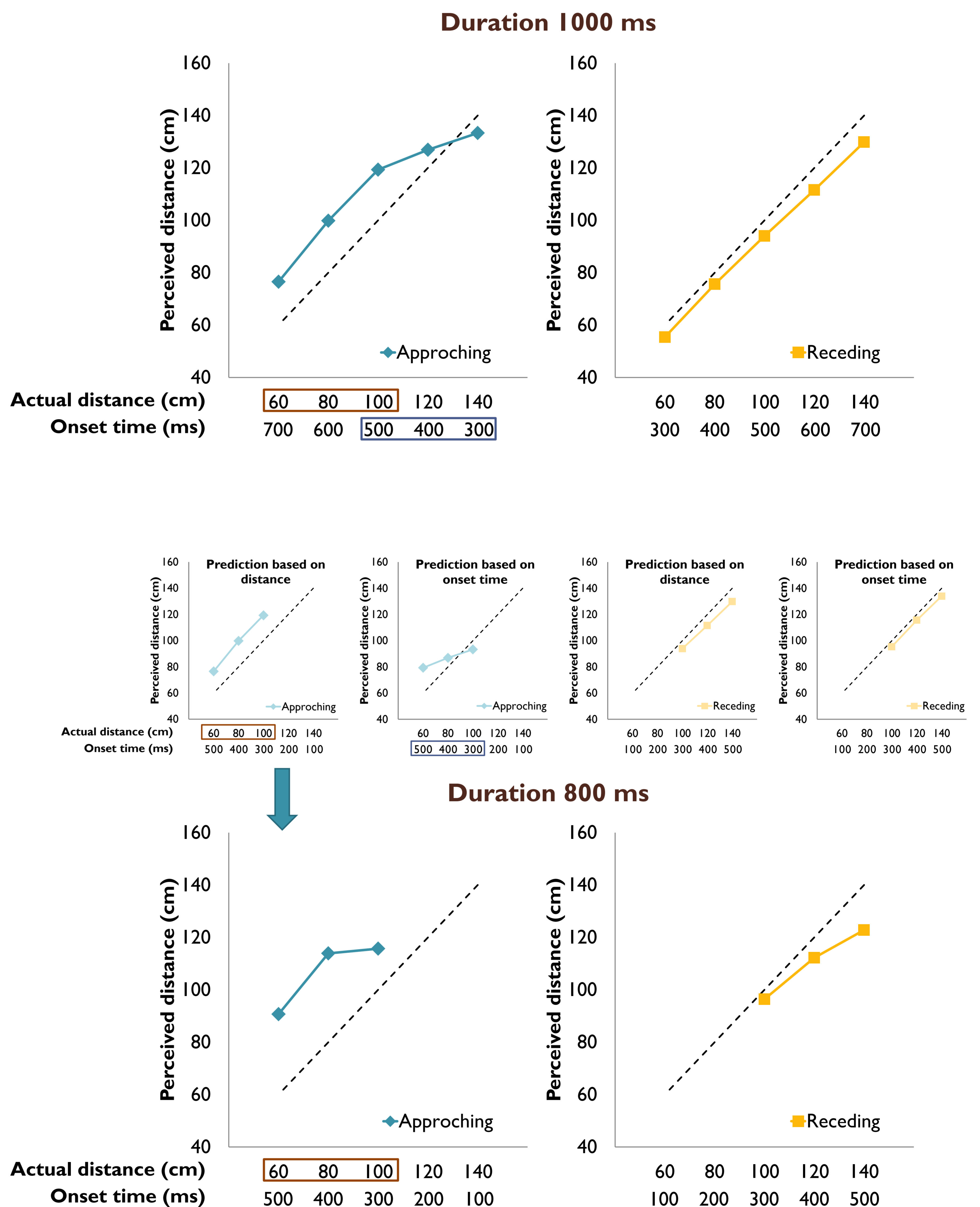
Experiment 1: mislocalization in 3-D space

- An object moved at a constant velocity in depth, and the background was flashed (into white for 16 ms) once at various timings during the journey
- Observers judged whether a probe object placed at various distances was nearer or farther in depth than the position of the moving object when the flash occurred
- Results:
 - Observers generally perceived the approaching object to be farther than it actually was
 - The mislocalization effect seemed to occur either (a) when the object was closer than 100 cm or (b) when it was after more than 500 ms onset



Experiment 2: distance or time from onset?

- The movie section corresponding to 200 ms to 1000 ms used in Experiment 1 was presented
- If the effect depends on the distance, the data of 300, 400, and 500 ms onset should resemble that of 500, 600, and 700 ms onset in Experiment 1
- ➔ As seen from the data, this was the case
- If the effect depends on onset time, the data should resemble that of 300, 400, and 500 ms onset in Exp 1, plus the physical difference of 40 cm
- Results:
 - The distance from the observer but not flash onset time determined the direction of the effect



Discussion

- There is a qualitative difference in localization for approaching and receding motion, implying that the visual system might localize approaching and receding objects differently
- The particularly strong mislocalization for approaching objects at close distances might suggest the moving object increased observer's arousal or vigilance, which made any other transient stimulus appear earlier, leading to the stronger mislocalization

References

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