Signed language perception

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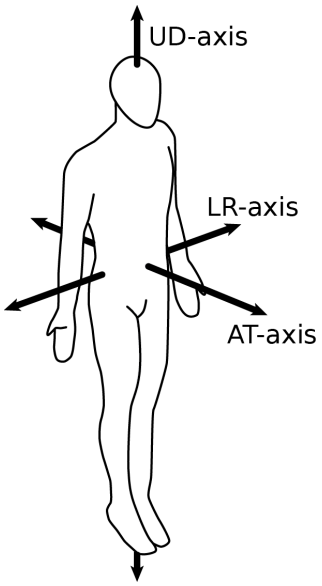
Learning objectives. After reading these notes, you should be able to:
- identify the three axes of movement;
- classify movement in a sign according to those axes;
- explain the effects of AT-movement on the retinal image; and
- explain why AT-movement is dispreferred due to these effects.

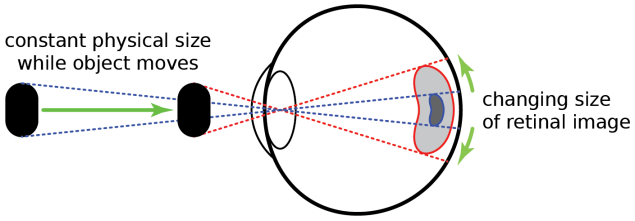
Our visual perception is sensitive to direction of movement, and this can have consequences for the structure of signed languages (see Sanders 2018 for full discussion of this issue, which is summarized here). Movement occurs in three dimensions, and movement in those dimensions can be defined by referring to the three axes shown in the image below (Sanders and Napoli 2016).



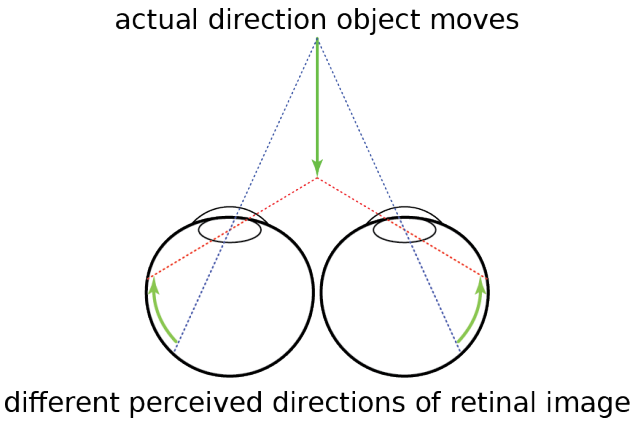
The **away-toward (AT)** axis points forward and backward through the signer's torso. The **up-down (UD)** axis points upward and downward through the signer's head and feet. The **left-right (LR)** axis points leftward and rightward through the signer's side.

When light waves bounce off an object and enter our eye, they are focused to form an image on the surface of our **retina** in the back of the eye. The retina is curved, but the image formed on it is essentially two-dimensional, along the UD-axis and LR-axis. So when an object moves in parallel to those two directions, its image on our retina also moves parallel to the same axes.

However, when an object moves along the AT-axis, its image has nowhere to move in that direction. Instead, as the object gets closer to the eye, the lights waves enter the eye at a steeper angle (the red lines in the image below), which increases the size of the retinal image. Thus, we perceive AT-movement as a change in size in the UD- and LR-dimensions.



An additional complication for AT-movement is that the eyes are next to each other and receive slightly different retinal images of the same object. When an object moves directly toward the eye along the AT-axis, its image in each eye moves differently. In the left eye, the image moves to the left, while in the right eye, the image moves to the right, as shown in the image below.



Thus, in order to "see" AT-movement, we have to infer it through the cognitive effort of integrating two effects (plus others not discussed here): changing size of the retinal image, and different directions of movement of the retinal image (Regan et al. 1986, Regan and Kaushal 1994). However, for UD- and LR-movement, there is less cognitive effort, since they are perceived more directly as equivalent movement of the retinal image. Sanders (2018) finds that the additional cognitive effort of AT-movement makes it slightly less common in signed languages than UD- and LR-movement.

References

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