Debriefing, Golomb Lab

Our lab's research builds on prior work by the Principle Investigator (Julie Golomb) to understand the processes that contribute to the perception of a stable visual world. The PI's prior research revealed that despite our subjective impression that visual information is coded relative to the world (spatiotopically), to a remarkable extent visual processing occurs in eye-centered (retinotopic) coordinates. Attended locations are natively encoded in retinotopic coordinates; even when task demands require spatiotopic attention, a "retinotopic attentional trace" erroneously persists for a brief period of time after an eye movement (Golomb, 2008JN; Golomb, 2010JN; Golomb, 2010JOV; Golomb, 2011APP). This retinotopic attentional trace can have striking implications for behavior: despite our lifetime of practice with spatiotopic tasks, spatial memory is actually more precise in raw retinotopic coordinates than in ecologically relevant spatiotopic coordinates (Golomb, 2012PNAS), and further, irrelevant objects appearing in the retinotopic location can distort perceptual processing at the spatiotopic location (Golomb, under revision). This work suggests a mechanism whereby spatiotopic position must be continually reconstructed with each eye movement to achieve visual stability, in a process that may not be as fast or efficient as previously thought.

Current experiments in our lab build off of these findings by exploring a number questions that arise as a consequence thereof. (a) What are the mechanisms by which spatiotopic position is reconstructed, and what determines whether and when information about eye position is integrated with an object's retinotopic position to create the perception of absolute location? (b) Are the costs of a predominantly retinotopic system balanced by any ecologically relevant benefits? Are certain populations of people more or less susceptible to retinotopic interference? Could training alter these effects? (c) What implications do these findings have for visually-guided action and 3D perception? Do spatiotopic coordinates become more important in these more naturalistic scenarios?

Finally, an important aspect of this research is the integration of object identity and location. Ultimately it is not enough to update locations only – we also need to be able to link these locations with information about features and objects. To this end, we are also conducting studies addressing how object features are bound to their correct locations and how this process is affected by eye movements. These will be important keys to understanding how our brains achieve stability across both eye movements and object movements.

If you have any questions about the research, please visit our lab's website at http://faculty.psy.ohio-state.edu/golomb/lab/ or contact our lab manager Lasya Pidaparthi at pidaparthi.3@osu.edu.

If you are interested in joining our lab, please contact Julie Golomb at Golomb.9@osu.edu.