

Perceived Temporal Frequencies Tutorial Exercise

Exercise

Consider an object that has a flat surface of homogeneous texture, with maximum spatial frequency of $(f_x, f_y) = (3, 4)$ cycles/meter, and is moving at constant speeds of $(u_x, u_y) = (1, 1)$, $(u_x, u_y) = (4, -3)$, $(u_x, u_y) = (4, 0)$, $(u_x, u_y) = (0, 1)$ meters/second. What is the temporal frequency of the object surface at any point? Supposing that the eye tracks the moving object at a speed equal to the object speed, what are the perceived temporal frequencies at the retina for the different moving speeds? What will happen if the eye moves at a fixed speed of $(\tilde{u}_x, \tilde{u}_y) = (2, 2)$ meters/second?