EN 520.665 Machine Perception Fall 2020

Homework # 3

1. Consider a camera moving along its optical axis toward a planar surface at right angles to the optical axis.
2. Show that the optical flow is given by

u = Wx/Z, v = Wy/Z

where W is the velocity and Z the distance to the plane.

1. Is the optical flow stationary (that is, independent of time)?
2. Is the Laplacian of the optical flow zero?
3. How could you predict the time to impact?
4. Derive the equations for estimating optical flow using the calculus of variations approach.
5. Derive the equations for optic flow when the moving object is a 3D planar patch, aX+bY+cZ=1.

Assume the small rotation matrix R, with angular velocities A, B and C respectively along the three axes and the translation vector with components U,V and W along the three axes.

Due 11/19/20