CSE473/573 Summer 2018 - Homework 4

Due date: 16 Jul 2017

July 3, 2018

1 Computational Photography - 40%

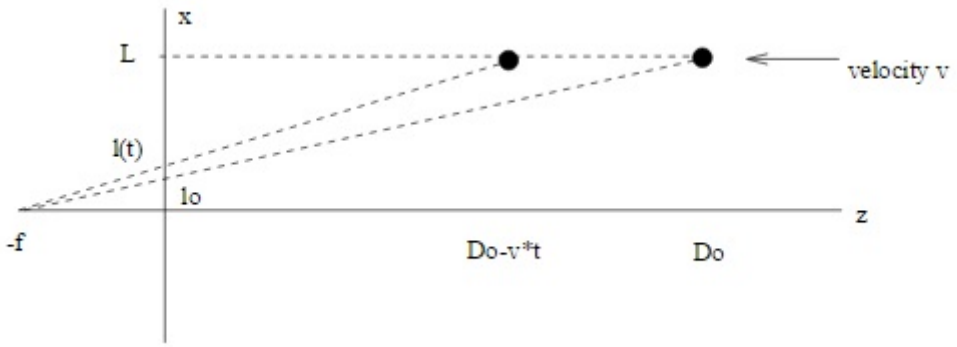
1. What is Exposure Fusion? Discuss the challenges of implementing it on Mobile Devices (Use Google Scholar to look up existing work and cite the references) – 10%
2. What are light field cameras? Describe how Lytro camera works – 10%
3. What are the underlying principles of Coded Aperture Photography and Coded Exposure Photography? Read through the paper or the presentation posted on this web page https://groups.csail.mit.edu/graphics/CodedAperture/ and elaborate on defocusing Image and obtaining Depth from a Conventional Camera with a Coded Aperture - 10%
4. Assuming the camera noise to be a gaussian distribution, explain the mathematics behind the fact that - Adding multiple images and averaging the intensity values reduces the effect of the camera noise - 10%

2 Stereo Vision - 20%

1. https://www.robots.ox.ac.uk/~vgg/hzbook/hzbook2/HZepipolar.pdf Study through the section 9.3 Fundamental matrices arising from special motions. Describe all the cases involved in your own words - 10%
2. https://www.youtube.com/watch?v=DgGV3l82NTk Watch this video and briefly discuss about the degrees of freedom, the rank of Fundamental Matrix. Also, briefly discuss your understanding of Trifocal Tensor citing a valid reference. - 10%

3 Optical Flow - 40%

1. What is Aperture effect in the context of Optical Flow? – 10%
2. Describe how Lucas-Kanade Tracker works – 10%



3. In the above figure, the object is moving with speed v parallel to the optical axis (z) of the camera and $z(t_0) = D_0$. You need to find the time-of-impact t' such that z(t')=0.

   Hint– From the figure, it is evident that $t' = (D_0 - vt)/v$ and we know I(t) which is location of the object at time t on image plane. Also the object is very far from the camera initially $D_0 >> f$ – 20%