ENPM673 – Perception for Autonomous Robots

Homework 1

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Due date: 8th February 2022, 11:59PM

Submission guidelines:

- This homework is to be done and submitted individually.
- Your submission on ELMS/Canvas must be a pdf file, following the naming convention
- YourDirectoryID_hw1.pdf. If your email ID is abc@umd.edu or abc@terpmail.umd.edu, then your Directory ID is abc. Remember, this is your directory ID and NOT your UID.
- For each section of the homework, explain briefly what you did, with detailed calculation and units.

Problem 1:

Assume that you have a camera with a resolution of 10MP where the camera sensor board has dimensions of a width of 14mm and height of 10mm. It is also given that the focal length of the lens of the camera is 25mm.

1. Compute the Field of View of the camera in the horizontal and vertical directions. **[20]**
2. Assuming you are detecting a human that is moving in front of the camera. The minimum distance that this human can be from the camera is 10 meters and the maximum distance is 50 meters. Assuming that an average human height is 5' 7" and width is 50 cm, compute the minimum and maximum number of pixels that this person will occupy in the camera as images when passing in front of the camera. **[40]**
3. Compute the distance that you will need to focus your camera to, to get the best performance, given that the aperture diameter is 8.9 mm. The circle of confusion is 0.019 mm. Justify your answer. **[40]**

   Hint : Experiment with different focus distances of 7m, 8m, 9m, 10m and 11m to find the most suitable value.