Indian Institute of Technology Hyderabad
EE6310: Image and Video Processing
Quiz 0, 03.02.2023, 10 points

1. At 6'5", fast bowler Ishant Sharma is among the tallest India cricketers. If you were going to get his autograph and were 10 feet away from him, what would be his height projected on your retina? Assume that you have perfect vision and are directly in front of him. (1)

2. Foveation: If foveation is modeled using a Gaussian mask placed at the center of an $N \times N$ image, at what distance from the center would you need half as many bits as needed at the center to represent the highest possible intensity? Assume $G(m,n) = \frac{1}{2\pi\sigma^2}\exp[\frac{-(m^2+n^2)}{2\sigma^2}]$, and the maximum possible intensity at the center to be $K-1$ where $K = 2^B$. Also assume N to be odd. (2)

3. Show that the MEDIAN filter is its own dual with respect to complementation. (2)

4. Recall from class that histogram equalization (for the case of continuous intensities) gave us a uniform random variable. Is it possible for a continuous and bounded random variable X to be transformed to a random variable $Y = f(X)$ such that the entropy of X is lower than the entropy of Y? If yes, give an example function $f(.)$. If not, justify. (2)

5. Histogram matching: Can an image I with histogram $h_I(k)$ be transformed an image J with a *desired* histogram $h_J(k)$? Recall that histogram equalization gives us an image with a "uniform" distribution. Hint: a desired PDF can be obtained by applying an appropriate transformation to a uniform random variable. (2)

6. If $h[n] = \delta[n] + \delta[n-1]$, find a non-zero signal $x[n]$ of infinite extent such that $y[n] = x[n] * h[n] = 0$ everywhere. Note that $'*'$ is the convolution operation. (1)