Computer Vision

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M2R MoSIG option GVR   Fall Semester
Lesson 3   10 Oct 2014

Exercise
Bayesian Tracking of Skin Colored Regions

We can use color statistics to build a simple Bayesian tracker for skin color regions. Assume an image has I columns and J rows and that we are looking for skin within an image window (region of interest) of size W x H contained within the image.

a) Explain how to transform RGB pixels into a two-component chrominance vector (c_1, c_2) that is normalized to eliminate illumination intensity. Why is this useful for skin detection?

b) Explain how to use histograms of chrominance vectors to determine the probability that a pixel has been imaged from skin. What size histogram do you need? Why?

c) Explain how to compute the probability that the image window contains a skin colored region using the pixel-level probabilities of skin.

d) Explain how to compute the center of gravity of the skin color region in image coordinates using the pixels within the window. What happens if the skin colored region is partly outside the window?

e) Explain how to compute the second moment of the skin color region from the probability of skin.

f) Explain how to determine the width, length and orientation of the skin color region from the second moment.