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2/24/25

Pattern Recognition & Computer Vision

1. What makes the bi-illuminant dichromatic reflection model different from the standard dichromatic reflection model.

A standard dichromatic reflection model is the combination of body reflection and surface reflection. A bi-illuminant dichromatic reflection model accounts for ambient and direct light sources.

2. Why is it challenging to make use of the idea of log space chromaticity?

It can be challenging to make use of the idea of log space chromaticity because illumination in general is very complex. Shadows are features that specifically make it difficult to accurately represent an image.

3. Why do we use projective coordinates when modeling the relationship between the 3-D world and a 2-D image of it?

We use projective coordinates when modeling the relationship between the 3D world and 2D image of it because they allow for a linear representation of transformations. They help us represent depth when converting a 3D world into a 2D image.

4. What do the extrinsic parameters of a camera specify?

Extrinsic parameters specify where the camera is in a space. The parameters of the transformation required to convert world coordinates to camera Euclidean coordinates are extrinsic parameters.

5. What do the intrinsic parameters of a camera specify?

Intrinsic parameters describe the internal distortion within a camera. It is the parameters of the transformation from camera Euclidean coordinates to image Euclidean coordinates.

6. What are the four coordinate systems we use for developing the camera calibration matrix? Give a few sentences on each that show your own understanding of them.

World coordinate system – Universally used coordinate system to describe the position of objects in a 3D space. Origin is at an arbitrarily selected point.

Camera Euclidean coordinate system – Centered at the camera's optical center and aligned with the camera's orientation. The Z typically points outwards from the camera's center.

Image Euclidean coordinate system – A 2D coordinate system used to represent pixel coordinates in the image plane. Origin is usually in the top left corner of the image plane.

Image affine coordinate system – Used to represent affine transformations of points in an image plane. It handles translation, scaling, and rotation.