

X-PREX Image Processing Data Passing

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Divide code data passing into stages where a new dimension is added

Stage 1

Input: A Single X-Ray Image

Output: 2D $2 \times 2 \times N_p$ matrix of pin image endpoint coordinates (in units of pixels)

$$\mathbf{X}(:, :, p) = \begin{pmatrix} RowIndex_1 & RowIndex_2 \\ ColIndex_1 & ColIndex_2 \end{pmatrix}$$

Question: how do we want to handle uncertainty in the pin endpoints?

Stage 2

Input: Several \mathbf{X} (Output from Stage 1) from Multiple X-Ray Images

Output: 3D $3 \times 2 \times N_p$ matrix of pin endpoint coordinates (in units of m)

$$\mathbf{X}(:, :, p) = \begin{pmatrix} x_1 & x_2 \\ y_1 & y_2 \\ z_1 & z_2 \end{pmatrix}$$

Origin in x-y plane is the axis of rotation, $z=0$ at level of the focal point.

Stage 3

Input: \mathbf{X}_2 Output from Stage 2 for all Time Steps

Output: $\max(N_p) \times 2 \times N_TimeSteps$ matrix that is a mapping of pebble indexes between each time step