

PHASE SHIFTING METHOD

In this script the phases of all pixels in image plane are computed given the four captured camera images.

Firstly, import the camera images; then initialize a matrix "phase_x" with the same dimension of the images of zero.

Two for loops are used to scroll all the pixel values of the 4 camera images for detecting phase along x dimension: this is the main part of the code, where the phase of every pixel(i,j) (in total there are 1080x1920) is computed using the intensity of the corresponding pixel (i,j) in the 4 images using the formula given by the theory.

To make this computation, atan2 function is required to compute the arctan in all the four quadrants (otherwise there would be no univocity). However, atan2 function is defined by $[-\pi, \pi]$, while instead we want values from $[0, 2\pi]$. To avoid this problem, we keep values from $[0, \pi]$ and if the found phase for pixel(i,j) is negative, we add 2π to reconstruct the whole period $[0, 2\pi]$.

An image is plotted just to verify correctness of the results.

Same exact procedure is repeated to compute phases along y direction, given the captured camera images corresponding to y projected patterns.

A manual check of phase_x and phase_y obtained matrix confirms that the values are in the desired range and results are correct (in the second question of the quiz, results will be furthermore confirmed due to found coordinate of corresponding pixels in the projector frame).