Supplementary Information

Spatiotemporal Mapping of Nanotopography and Thickness Transitions in Ultrathin Foam Films

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Submitted on:

Descriptions of Image Analysis Codes

Image analysis codes are developed using Matlab R2016a to analyze images/videos of ultrathin foam films. The codes are designed especially for RAW format images/videos (12-bit depth) recorded by using high-speed color camera (FASTCAM Mini UX100). The set of codes includes user-defined functions and scripts applying the functions. The descriptions of the codes are listed below:

List of user-defined functions:

1. AverThicknEvol:

The function is used to obtain the average thickness of a square sample region selected in a video.

2. CircleFitter:

The function fits a circle to a set of points located on the boundary of an object.

3. ColorMapPlotter:

The function plots a data set, z(x,y) as a color map in Cartesian coordinates.

4. DomainFinder:

The function is used to obtain the location and size of a circular domain selected in a video.

5. FilmFinder1:

The function is used to obtain the location and size of a circular thin film selected in a video.

6. HeaderReader:

The function is used to obtain the information of a RAW format video, including the size, the duration, the frame rate, and the white balance setting of the video.

7. ImageAdjuster:

The function removes the background noise of an RGB image by using a referenced RGB image and the mean intensity of the background.

8. ImageExtractor:

The function extracts a selected video frame from a video as an RGB image directly, with white balancing.

9. ImageExtractor0:

The function extracts a selected video frame from a video as an RGB image by using gradient-corrected linear interpolation method, with white balancing.

10. ImageExtractor1:

The function extracts a selected video frame from a video as an RGB image directly, without white balancing.

11. ImageObjectTracer1:

The function is used to obtain the binary image and the boundary of a selected object inside a circular thin film.

12. ImageRefiller:

The function assigns a particular value to the image pixels outside a specified region.

13. ImaxImin:

The function is used to obtain the average intensity of a square sample region selected in a video.

14. ReferenceExtractor:

The function is used to obtain the RGB image which will be used as a reference to remove the background noise and the mean intensity of background. The image is extracted with white balancing.

15. ReferenceExtractor1:

The function is used to obtain the RGB image which will be used as a reference to remove the background noise and the mean intensity of background. The image is extracted without white balancing.

16. ThicknessMap:

The function constructs the thickness map of a circular thin film, by converting pixel-wise intensity to thickness.

17. ThinFilmInterf:

The function calculates the thickness of an ultrathin film from the reflected light intensity based on the principle of thin film interference, by following Scheludko in 1967.

18: WhiteBalanceMask:

The function is used to obtain a multiplicative mask used for white balancing a video.

Scripts for analysis:

1. StepwiseThinning:

The function creates the average thickness vs. time plot of a square sample region on a stratifying thin film.

2. ThicknessMapping:

The function creates the thickness map of a stratifying thin film.

3. DomainAnalysis:

The function determines the location and size of an isolated domain on a stratifying thin film varying with time.