Slot Coating Experiment: Detecting Contact line

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Coating process is a significant step for manufacturing film. Especially, slot coating, classified as pre-metered method, can precisely control the final wet thickness by modulating flow rate and production speed. The flow region between the slot die and the moving web is called the coating bead. It is bounded by two gas/liquid interfaces, or upstream and downstream menisci. The location of the upstream interface (or contact line) is an important criterion of coating defect, e.g. ribbing and bead break up.
In this study, we detect interfaces by analyzing an image from slot coating experiment. An image of the die lip face is taken through the tansparent quartz roll by a camera. In this image, interfaces have several important features in intensity and form. Therefore, we combined region-based segmentation with morphological processing. Rough region of interface can be detected by applying image to global thresholding using Otsu's method. Then, we find exact location using hit-or-miss which is the morphological tool. We automatically detect exact location of interface using this technique. It is very useful for analyzing many images at once, including video images. Finally, we can get an useful information about transient flow behavior from experiments, which will be applied to experimental frequency response analysis.