Pascal Stump

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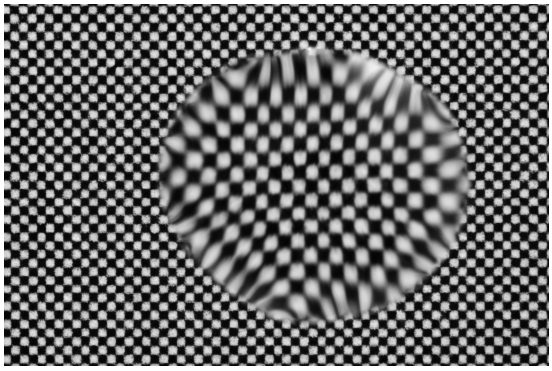
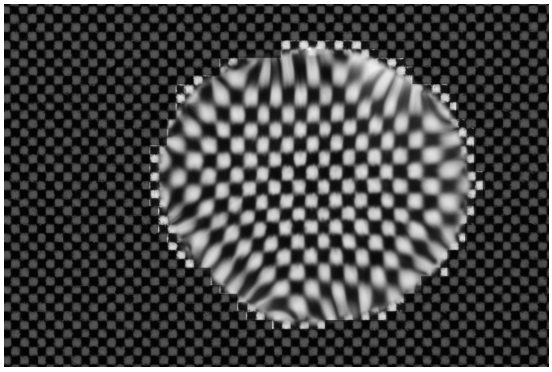
| Topic | Sensor, Actuator and Communication Systems |
| Project Partners | Roche Diagnostics International Ltd , Rotkreuz , ZG |

# Fluid Film Detection

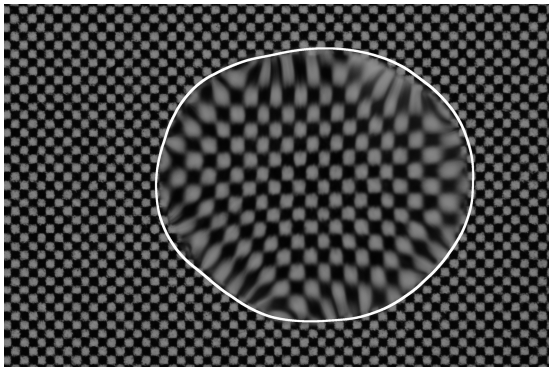
## Non-Contacting Fluid Film Detection on a Microscope Slide



25 µl water on a microscope slide with a 0.25 mm background chessboard pattern.



The detected water drop after the hit-or-miss transformation. (background grayed out)



Hit-or-miss boundary smoothed with active contour.

Introduction: Roche Diagnostics is the world's leading provider of in-vitro diagnostic (IVD) applications and system solutions for clinics, laboratories and doctors' offices. Microscope slides are one of the common platforms to perform diagnostic applications, e.g. microarrays. While handling this microscope slide, the applied thin fluid film of sample or reagents evaporates partially. For quality of results it is crucial to ensure that the fluid film remains at the required positions throughout the whole process until measurement of diagnostic result. The task of this project is to find a suitable measurement method to automate this process control.

Proceeding: At the beginning of this project, a set of basic requirements were specified with the industrial partner, to learn the needs and wishes for the future measurement method. With these basic requirements—non-contacting, measurement time lower than 1 second and X-Y resolution between 0.5 and 1 millimeter—the search for a suitable measurement method was started. From literature a couple of established methods were found which could measure a fluid film but none of them fits the basic requirements of the intended application perfectly. So a new approach was established and tested during the second part of this project.

Result: The measurement method makes use of the optical distortion of water on a glass surface. For this, a camera is mounted above the microscope slide and below of this slide a background pattern is placed. This image gets processed with an Octave script. The most challenging part was to separate the background (chessboard pattern) from the foreground (water drop). The best tested way to do this is a hit-or-miss transformation of the image. The pattern size used for the background pattern defines the resolution of this measurement method. Another resolution enhancement is a hit-or-miss boundary deformation with active contour. Beside the foreground/background separation it is supposed that the optical distortion gives also information about the volume of the fluid film. This promising approach was not elaborated but is discussed in the documentation of this work.