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Computer-assisted microscopy system for detection of Malaria

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Background

Malaria is an infectious disease with high incidence in tropical and subtropical regions. Approximately 210 million cases and about 630,000 deaths were reported in 2012. Five species of the genus Plasmodium are responsible for malaria infections: *P. falciparum, P. vivax, P. ovale, P. malariae* and also *P. knowlesi* a Plasmodium species originally thought to be restricted to macaques. These parasites can be detected and classified by microscopic examinations of stained blood smears which represents the diagnostic gold standard recommended by the WHO. To diagnose malaria the so-called thick smear is used for the initial detection of malaria parasites. In addition to that, thin smears are used for species confirmation. As the process of slide reading under a microscope is an error-prone and tedious issue Fraunhofer IIS is developing a computer-assisted microscopy system to support detection and diagnosis of malaria.

Solution

Goal of this project is the development of a system for automated scanning of blood smears and the computer-assisted detection of plasmodia in the so-called thick smear.

The system is based on the microscopic scanning platform SCube® which supports automated scanning of slides in different magnifications. The integrated objective changer supports up to three objectives and an automated oiling system enables high-resolution oil immersion microscopy.

Slide-loading is realized via cassettes that can carry up to ten slides of a standard size of 25 x 76 mm. With an optional cassette feeding module the system can be expanded to realize a continuous throughput of up to 200 slides. Detected plasmodia will be presented in a graphical user interface for manual review and approval.

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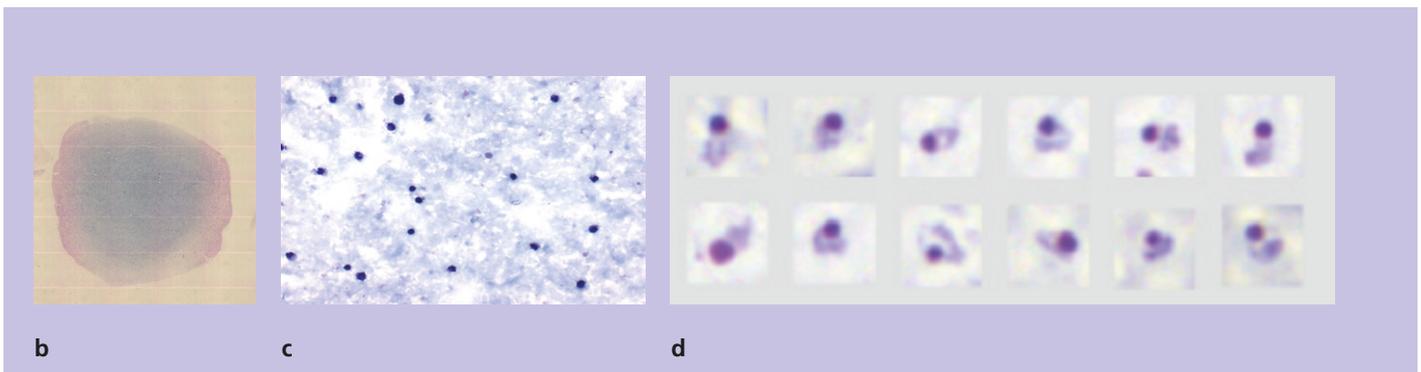
Benefits

The system supports screening for Malaria parasites in routine diagnostics in the first place. Another application scenario are clinical studies, e. g. for the development of new vaccines. Digitization of blood smears holds different advantages and benefits. The digitized blood smear is a virtual and three-dimensional representation of the microscopic view and enables the user to interactively navigate the virtual slide and analyse detected parasites in detail and to add annotations and comments. Persistent and tracable archiving of the virtual slides and diagnostic results improve documentation and quality assurance. Training and qualification of laboratory staff can also be supported in virtual and blended learning environments.

Acknowledgement