

Topic:

Design and Implementation of an Advanced Illumination System for ComplexEye

Topic description:

ComplexEye^[1] is a high-throughput biological microscope designed for cell migration analysis. Illumination is essential for reliable observation of this process.

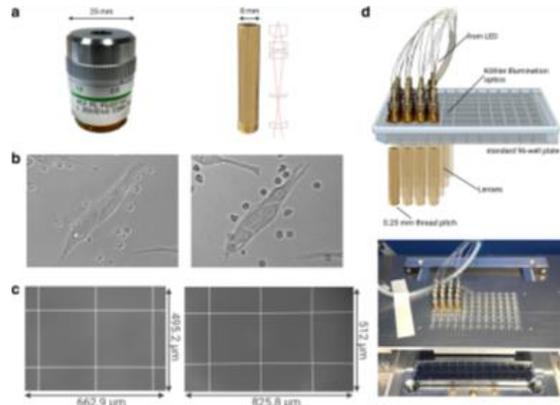


Fig.1 Illumination System of ComplexEye^[1]

The current illumination system, which is depicted in Fig.1 supports 16 channels. To meet the demands of the next project phase, which requires analyzing a larger number of samples simultaneously, the illumination system needs to be scaled up. The goals of this thesis are as follows:

1. Development of the illumination system supporting 24 or 32 channels with better performance compared to the current version
2. Integration of ventilation system to manage heat dissipation
3. The brightness of the system should be controllable via PC without PWM

Work content:

- Literature review on the state-of-the-art LED illumination systems for microscopy
- Familiarization with the current illumination system and its limitation
- PCB design and development
- Design and manufacturing of the system housing using 3D printing
- Implementation of PC-based brightness control software
- Written documentation of the work

Requirements / prerequisites:

**not mandatory*

- Studies in the field of electrical engineering or comparable
- Willingness to learn PCB design tools (e.g., KiCad) and 3D printing techniques
- Strong communication skills, reliability and team spirit

Thesis character:

75% practical / 25 % theory

Contact person:

M.Sc. Xingzhou Chen
Tel: +49 203 / 379-92819
Email: xingzhou.chen@uni-due.de

Reference:

[1] Cibir, Z., Hassel, J., Sonneck, J. et al. ComplexEye: a multi-lens array microscope for high-throughput embedded immune cell migration analysis. *Nat Commun* 14, 8103 (2023). <https://doi.org/10.1038/s41467-023-43765-3>