



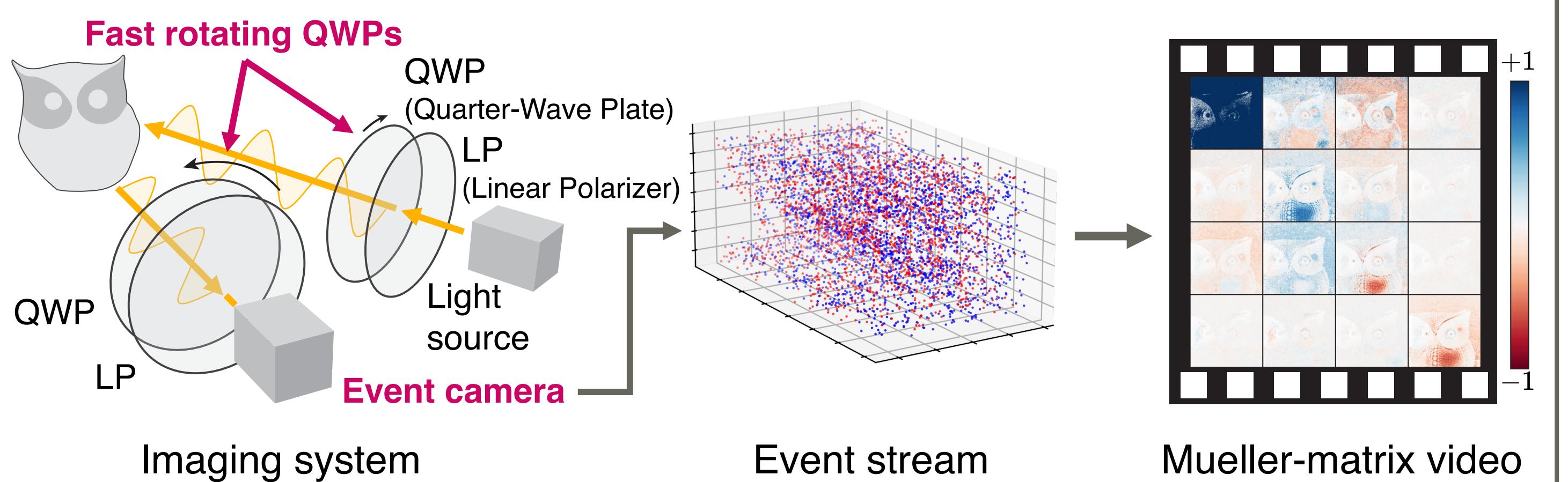
Event Ellipsometer: Event-based Mueller-Matrix Video Imaging

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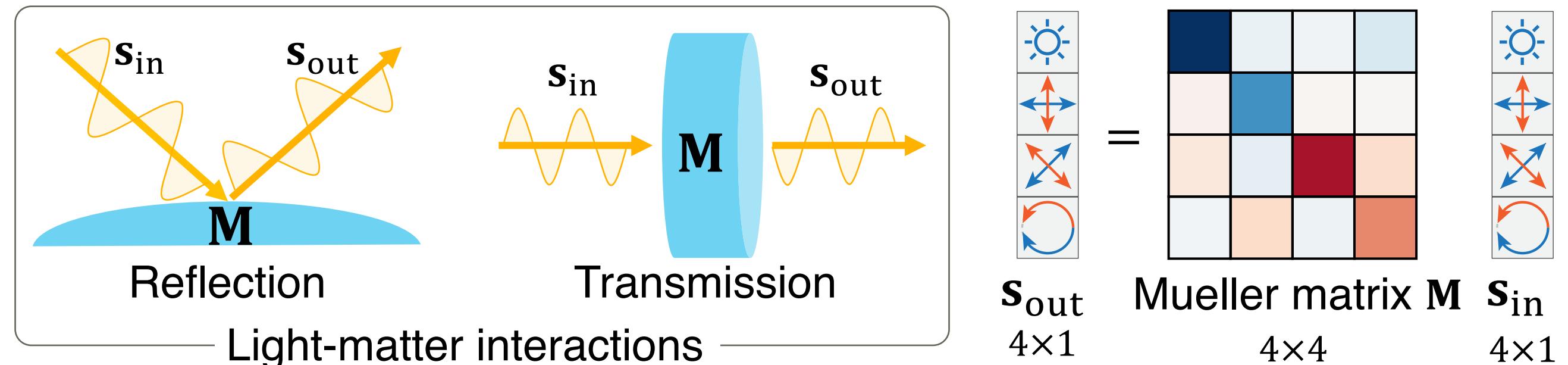
Overview

- We propose **Event Ellipsometer**, a Mueller-matrix imaging method capable of capturing **dynamic** and **HDR** scenes.
- We built an imaging system using an **event camera** and **fast-rotating QWPs**, achieving **30fps** Mueller-matrix video.

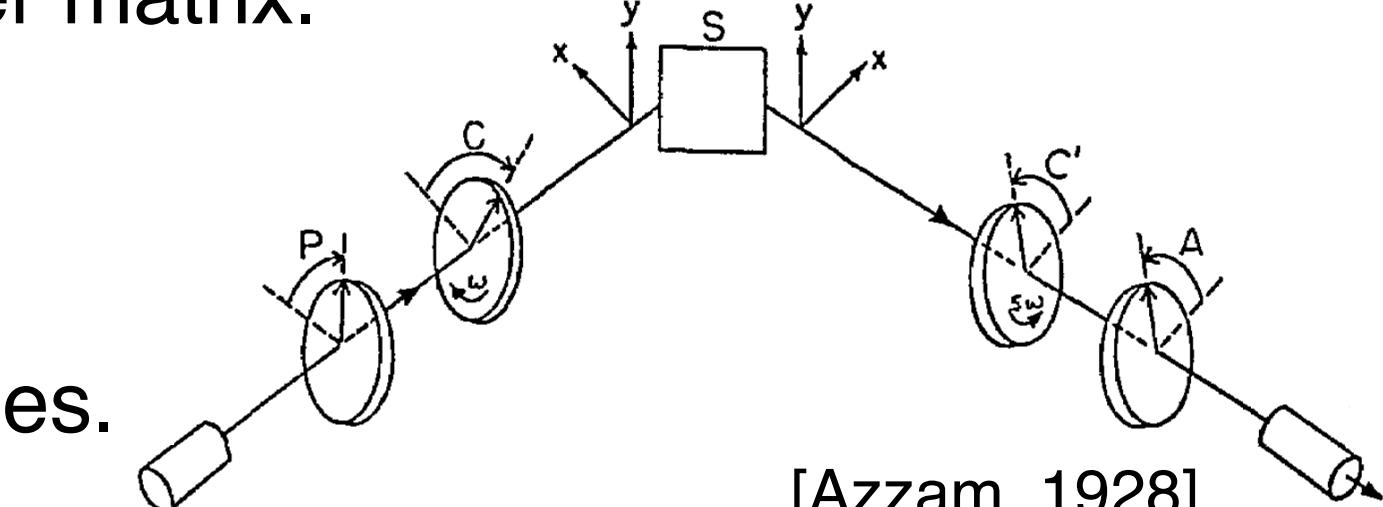


Background

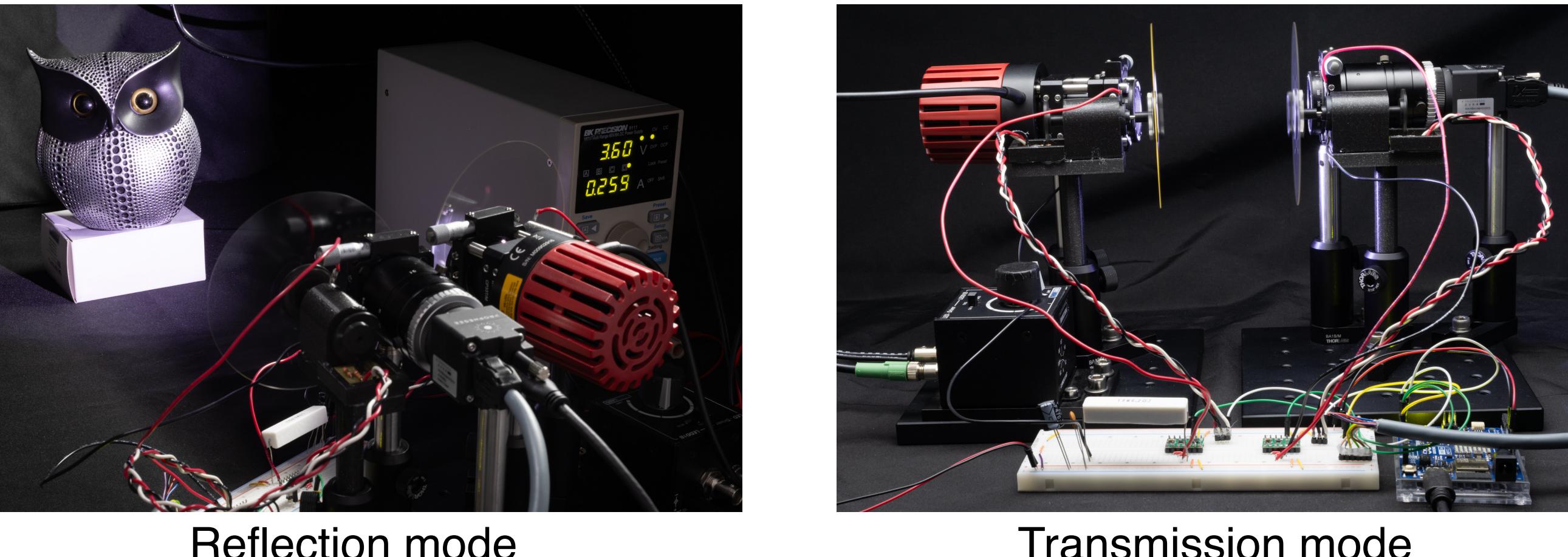
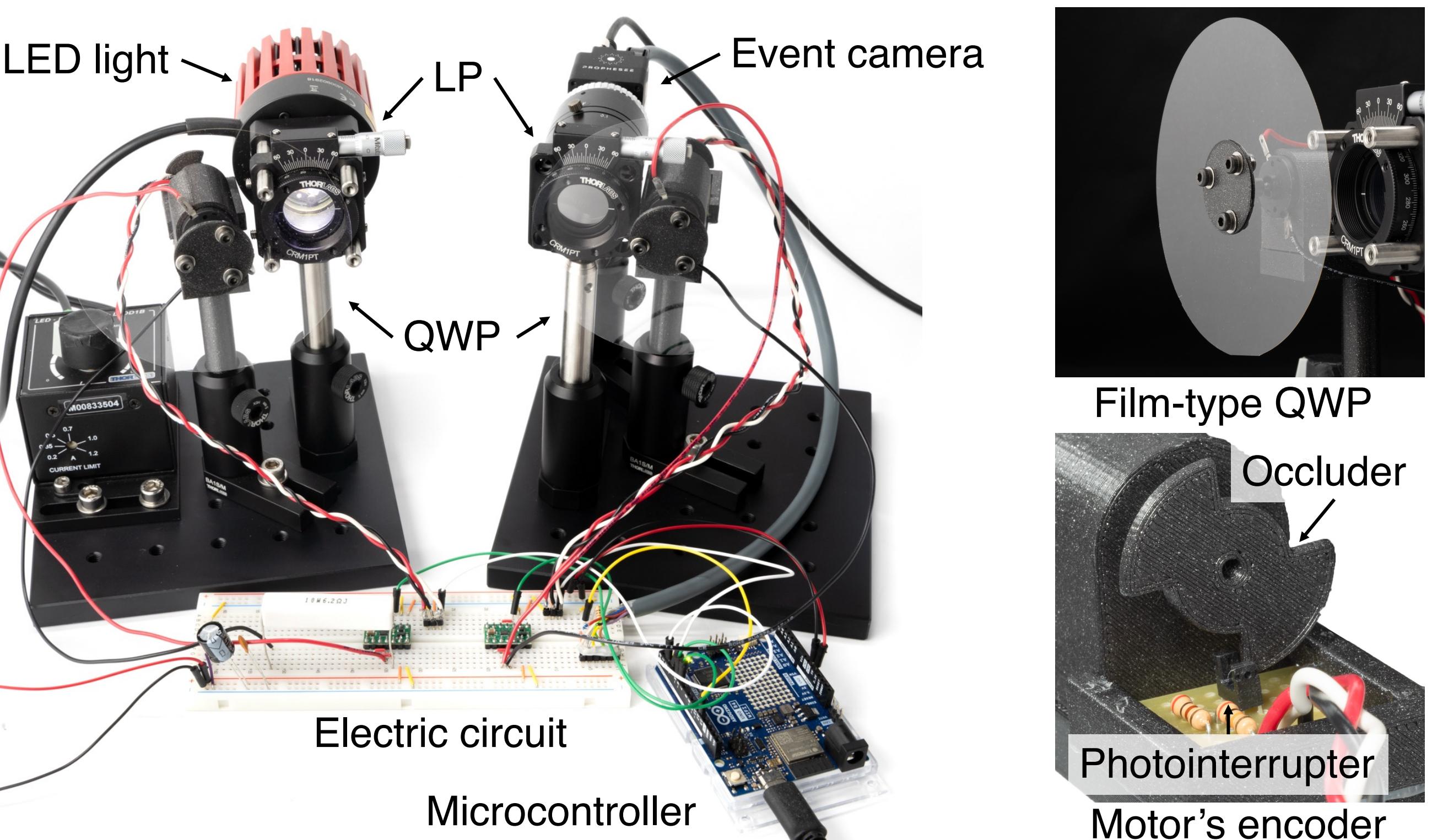
- Mueller matrix**
 - 4x4 matrix that provides **comprehensive polarization information** on how light-matter interactions change the polarization state.
 - Applications: 3D imaging, appearance acquisition, light-transport decomposition, stress analysis, etc.



- Ellipsometer**
 - A technique for measuring Mueller matrix.
- Challenge**
 - Require capturing **>20 images** while rotating QWPs, which is **impractical for dynamic scenes**.

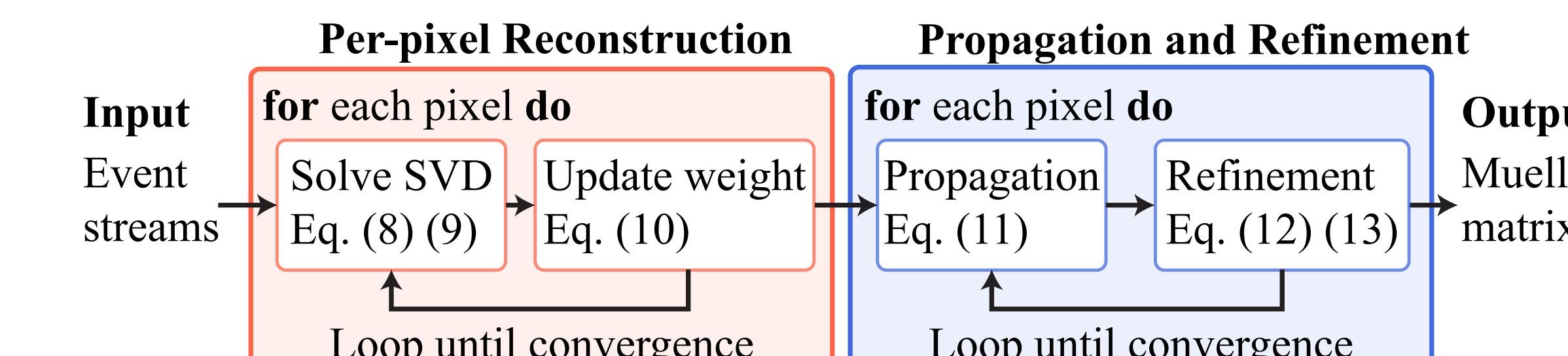


Imaging System



Reconstruction Algorithm

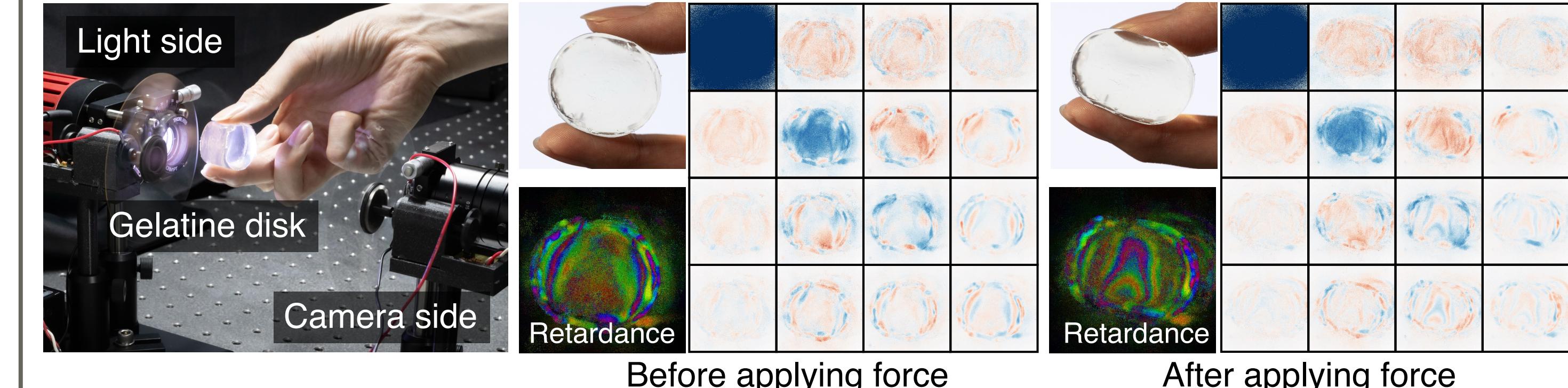
- We propose a two-stage Mueller matrix reconstruction method that incorporates spatiotemporal consistency and physical validity.



Results

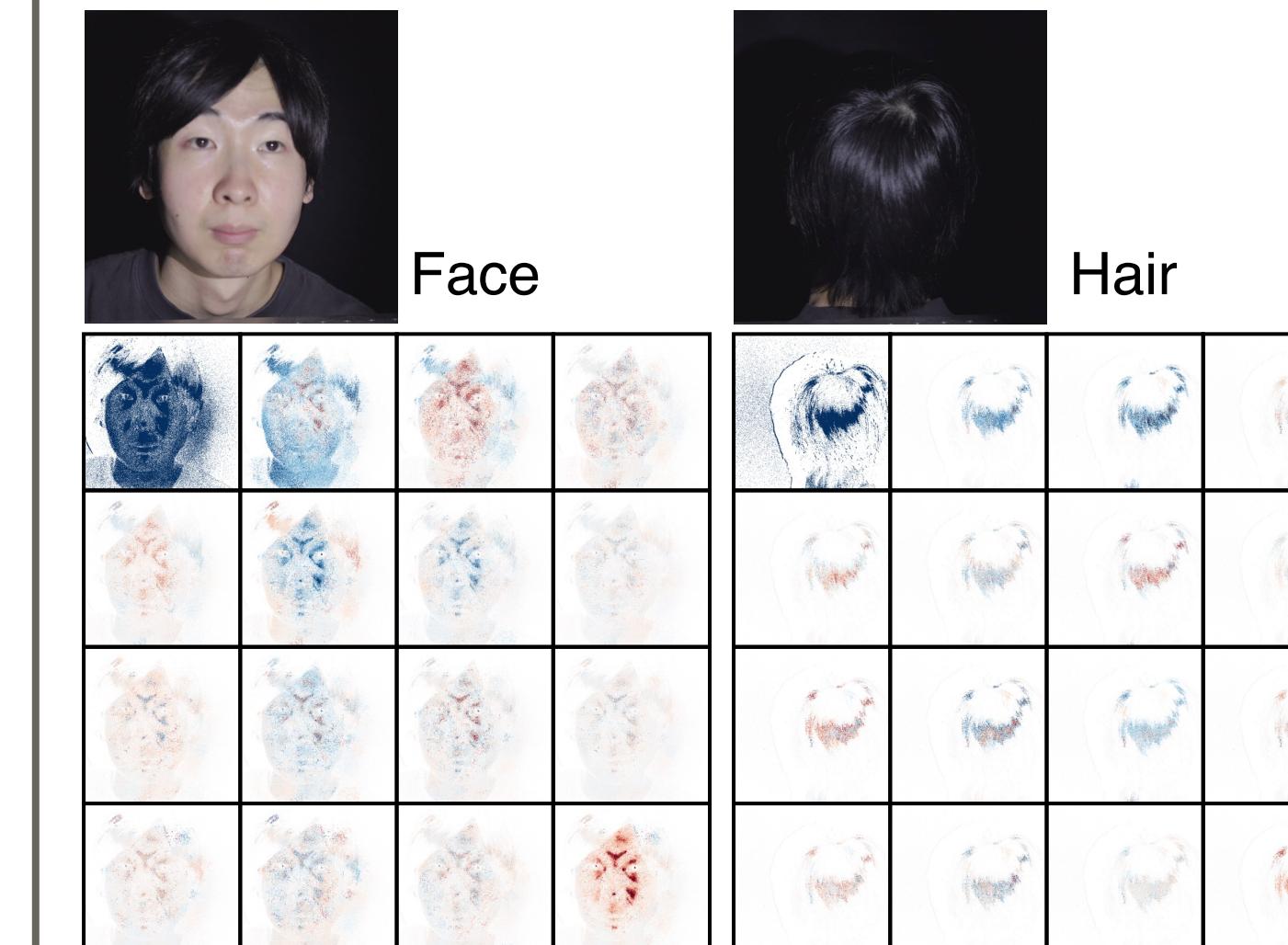
Photoelasticity of Transparent Gelatine

- The birefringence of some transparent objects changes with stress.
- Mueller matrix images reveals the distribution of stress.



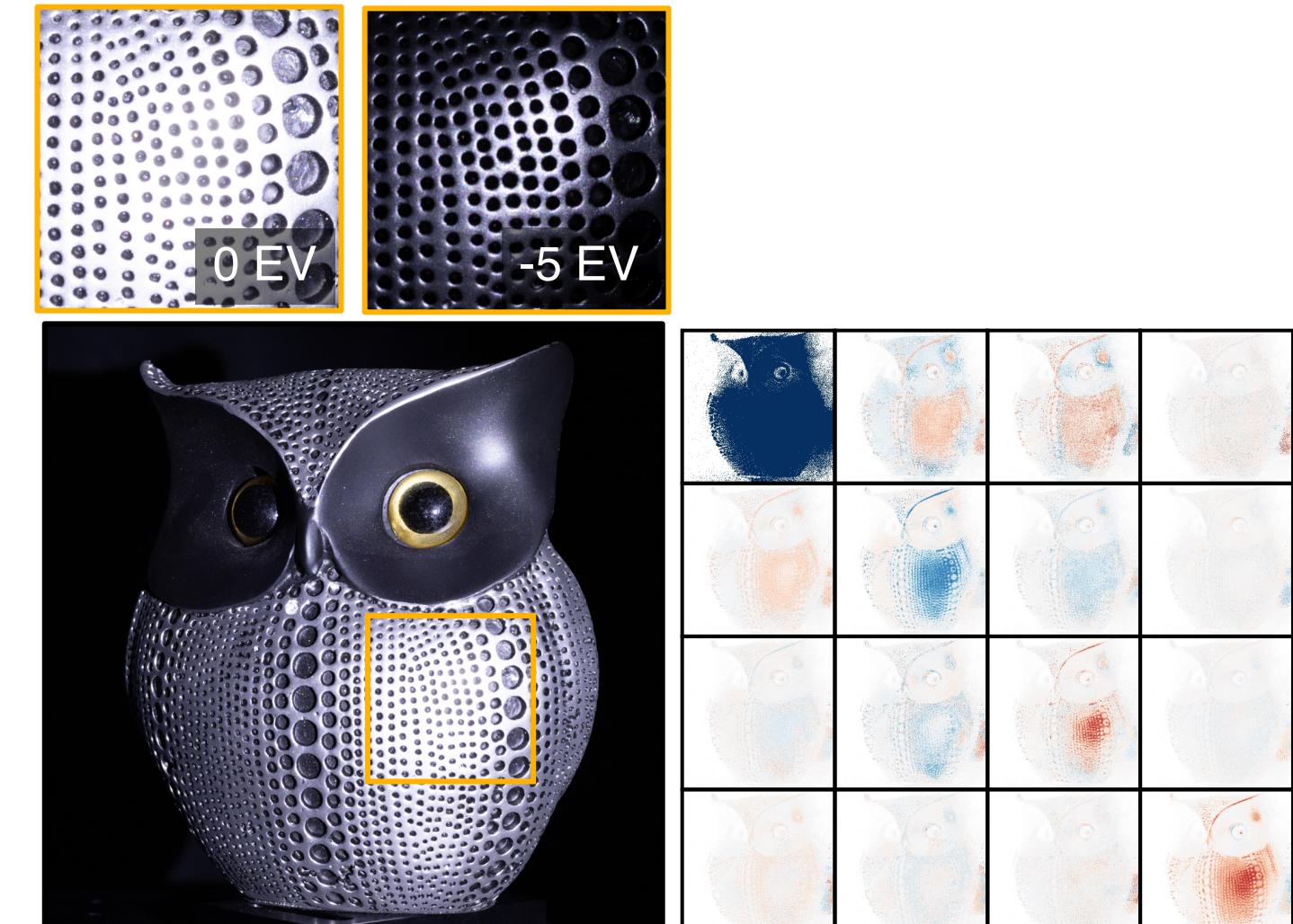
Dynamic Human Capture

- We captured dynamic human facial expression and hair movements.



HDR Mueller-matrix Imaging

- Our system enables capturing HDR scenes, thanks to HDR capabilities of an event camera.



Transparent Tape Detection

- Sticky tape exhibits birefringent properties. The Mueller matrix reveals this property, and we can clearly recognize the tape region.

