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Visual Assessment of Distorted View for Metamorphopsia Patient by Interactive Line Manipulation

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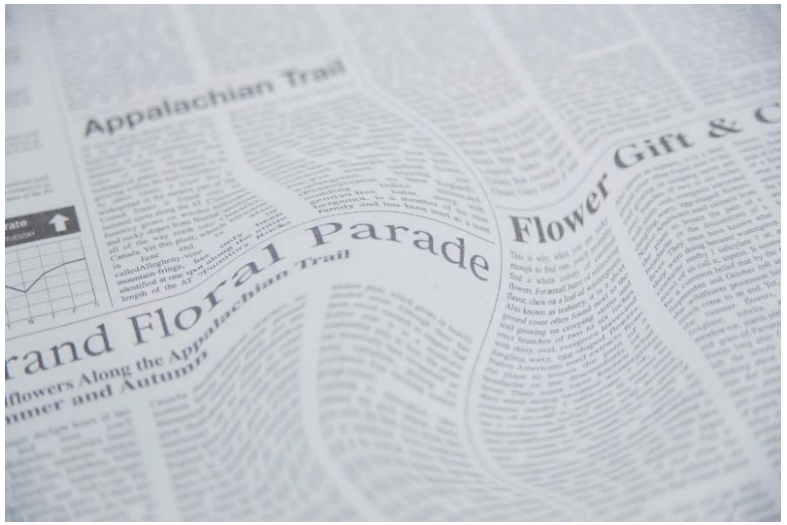
The Distorted View of Metamorphopsia

is **visual defects** from macular degeneration

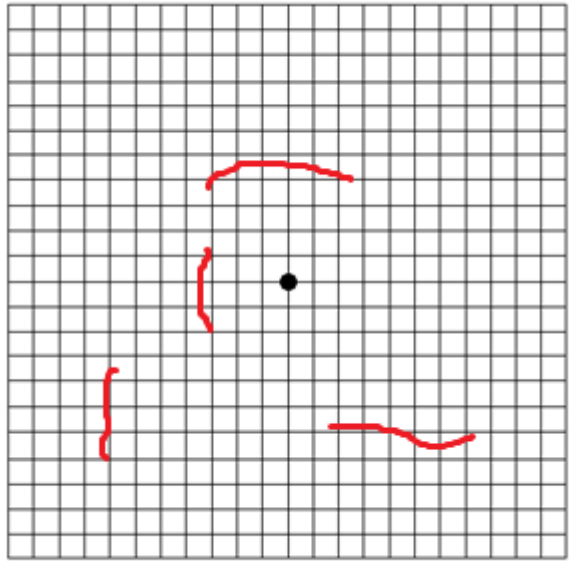
The perception of the unimpaired vision



The perception of the distorted vision

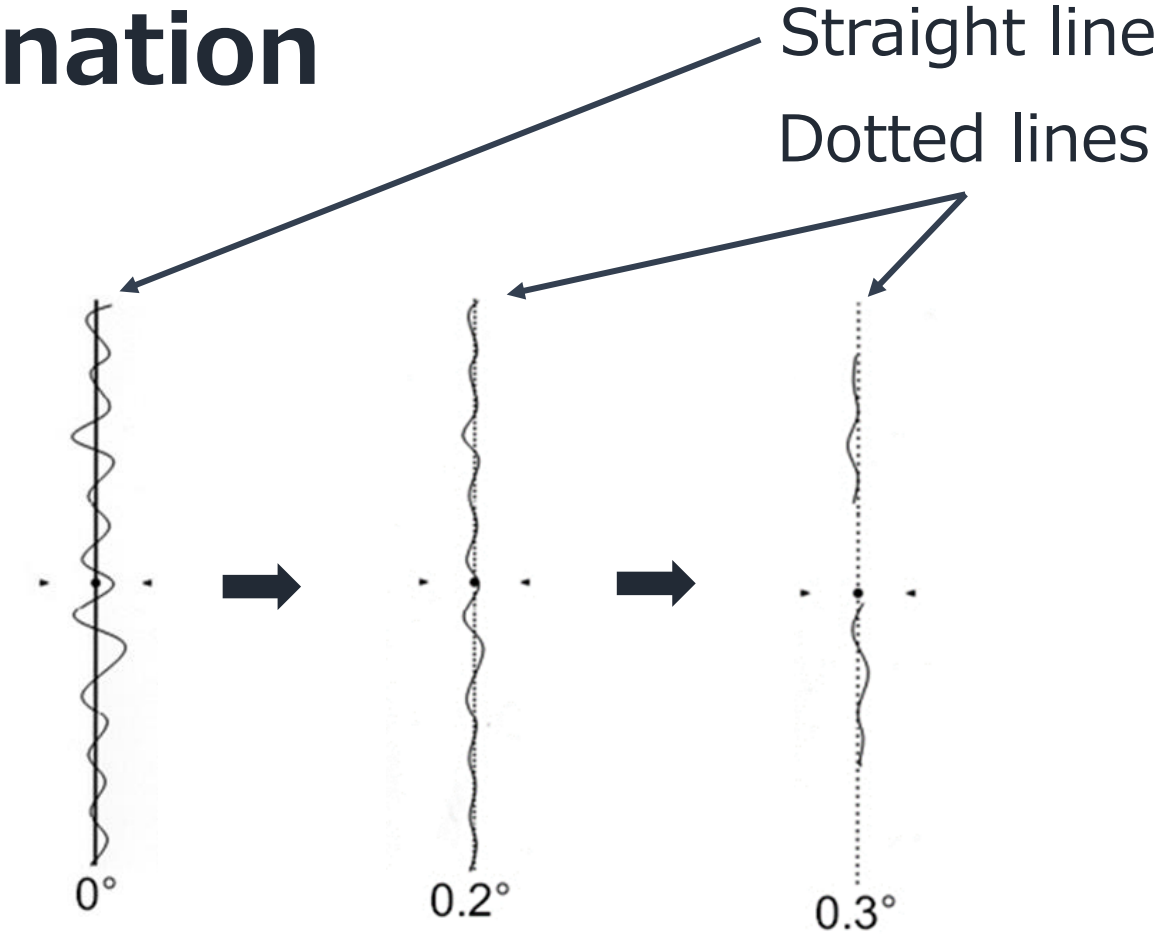
Purpose: quantify the distorted view

Common clinical examination



AMSLER CHART
(Amsler, 1953)

➡ Not quantitative



M-CHARTS
(Matsumoto+, 2003)

➡ Lack that how the view is distorted

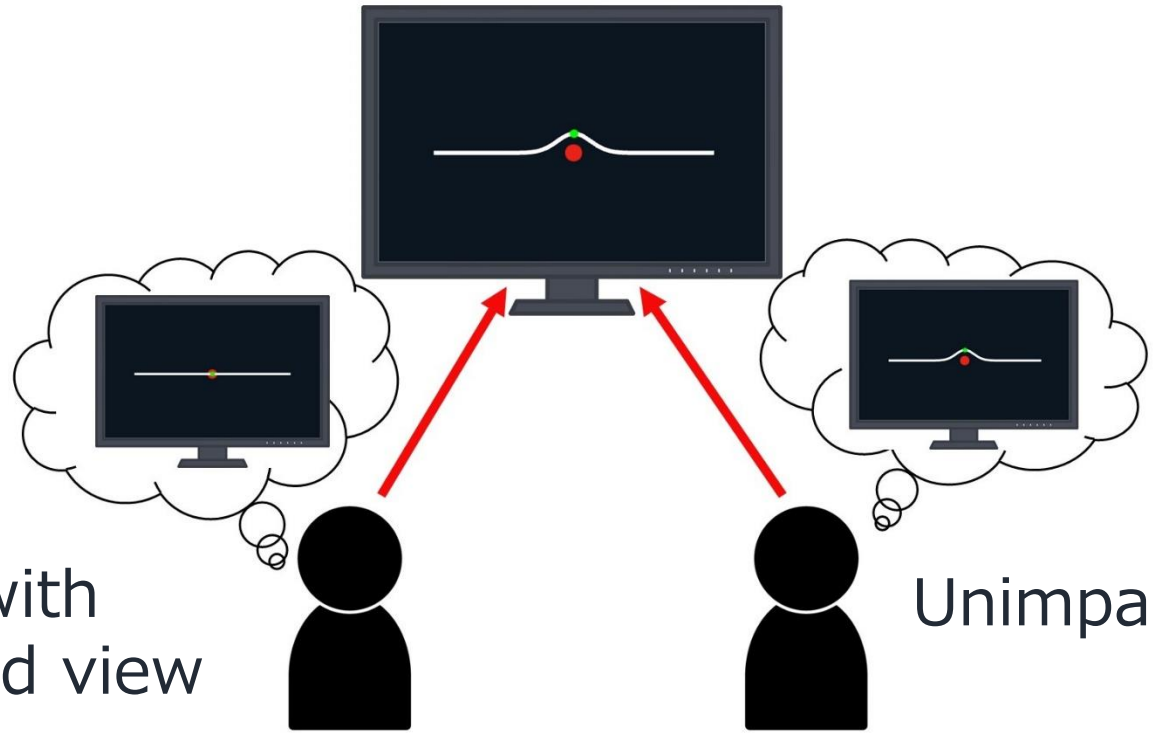
Contributions

Our method : **Interactive Line Manipulation**

- can measure the perceptual distribution of distortion

in high resolution in space

- is **designed for easy manipulation by elderly patients**



Individual with
the distorted view

Unimpaired individual

Interactive Line Manipulation Method

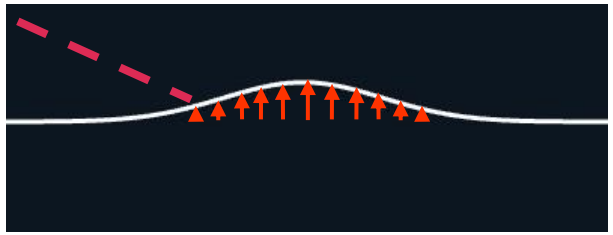
prior to line manipulation

The perception of an unimpaired individual

The perception of an individual with the distorted view

Distribution of Distortion

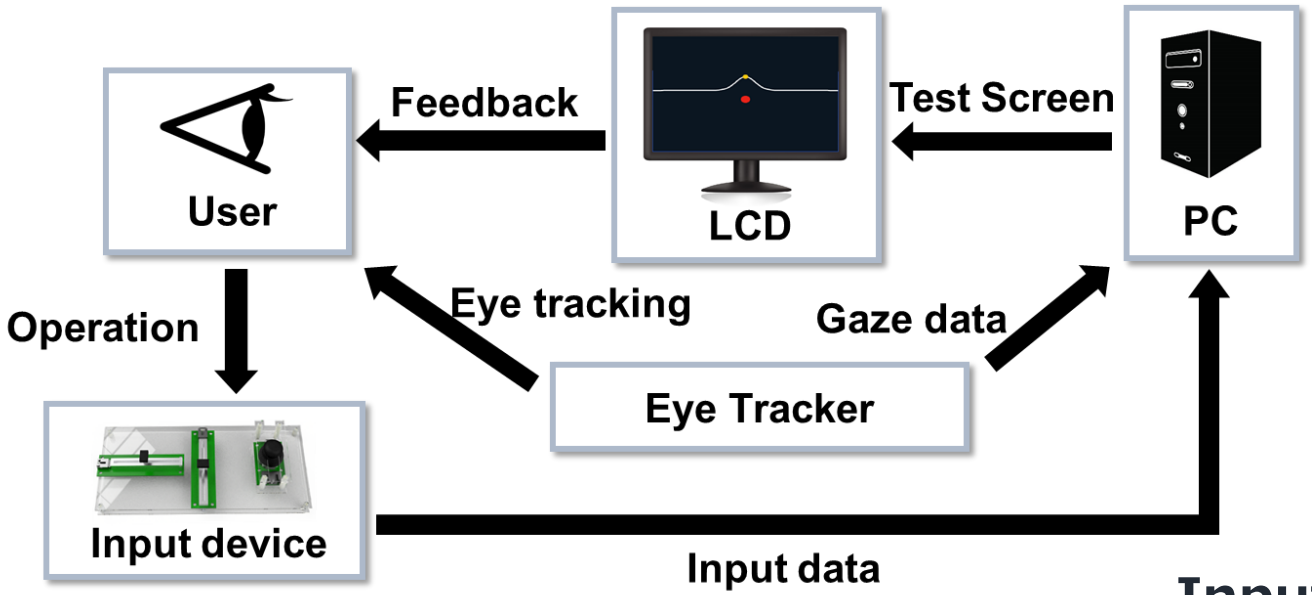
after line manipulation



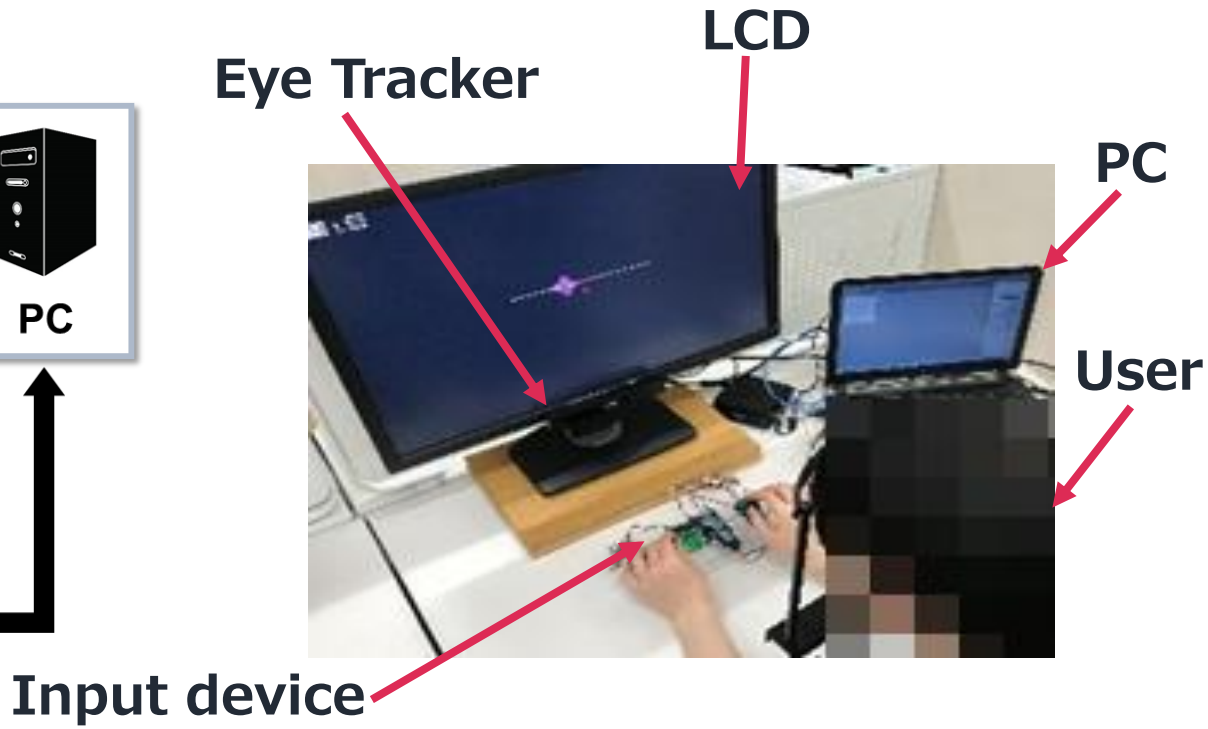
The perception of an unimpaired individual

The perception of an individual with the distorted view

Implementation

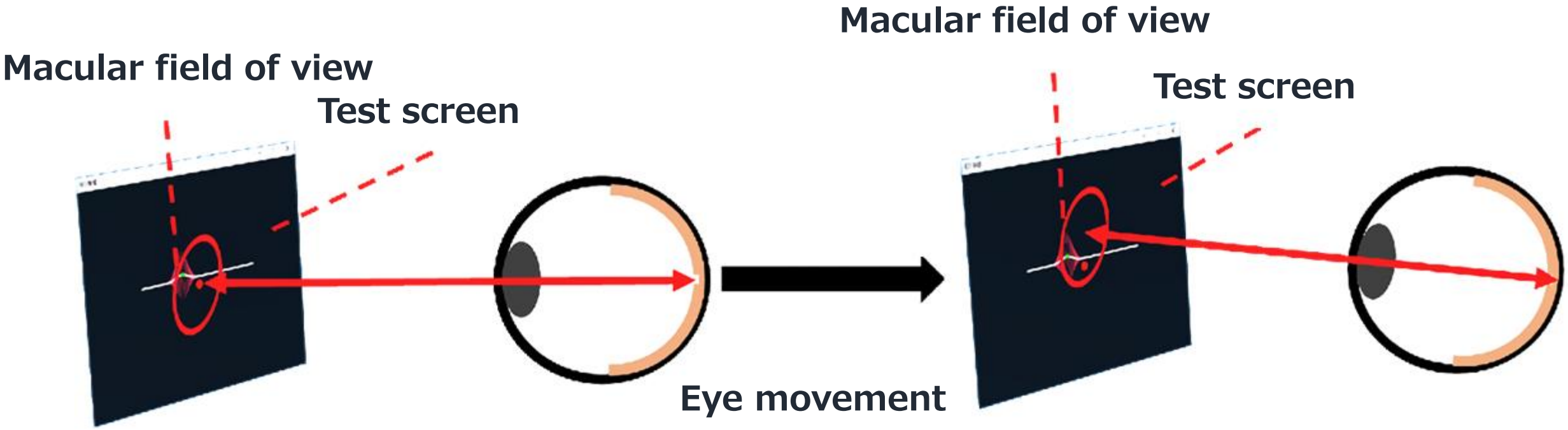


Block Diagram



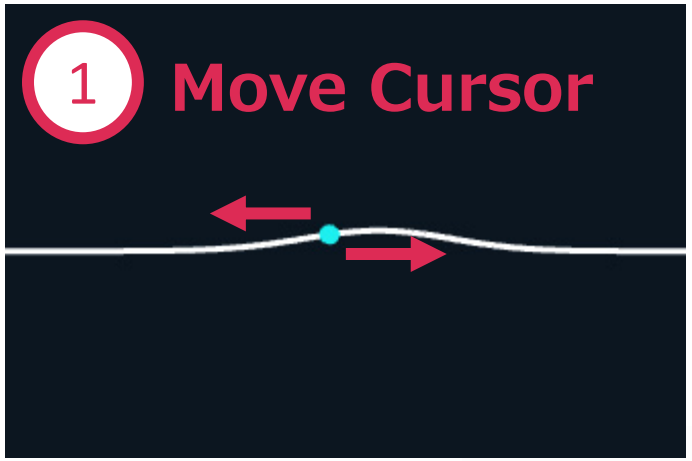
System Setup
Set the distance between LCD and User to 60cm

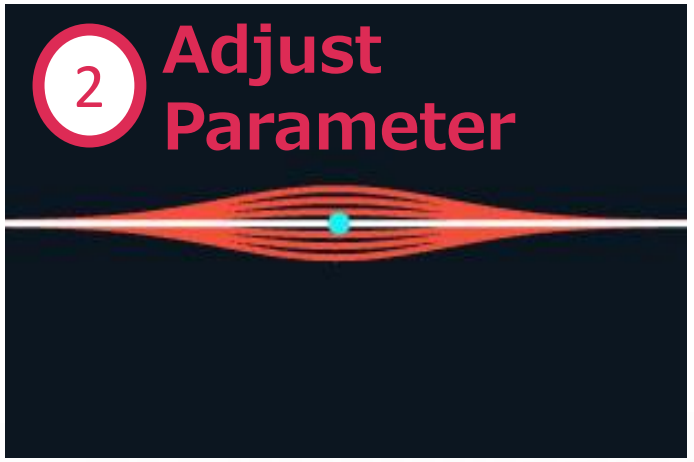
Necessity of Eye-tracker

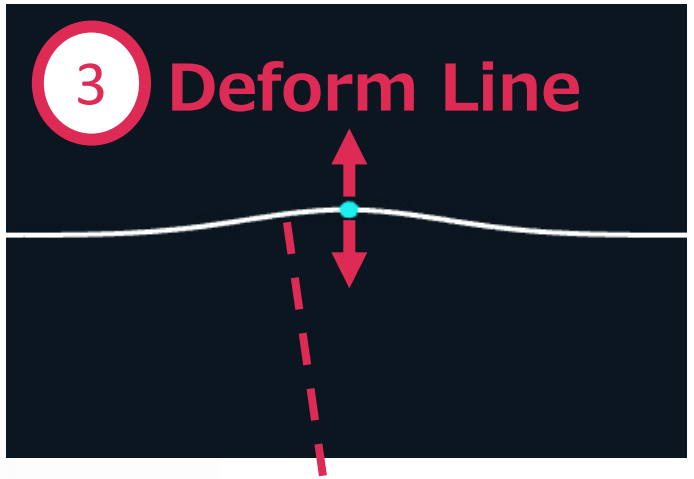


We ignore the operation when the patient's gaze is not on the fixation-inducing stimulus

Interaction Design

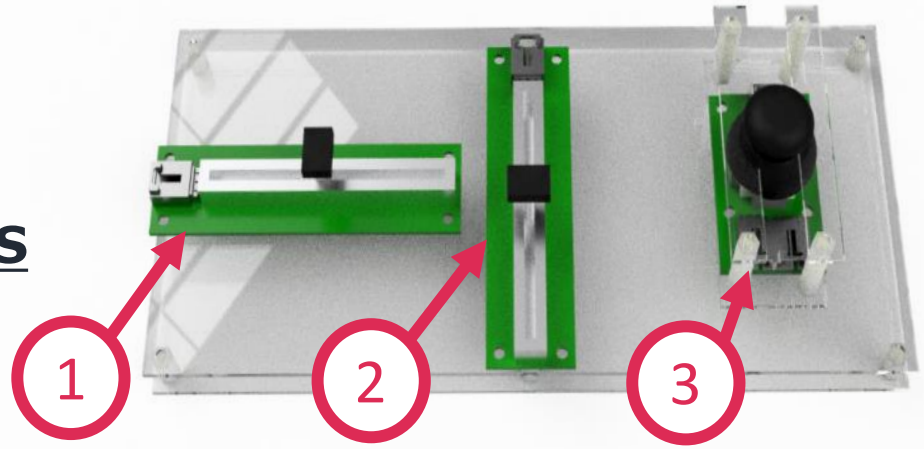






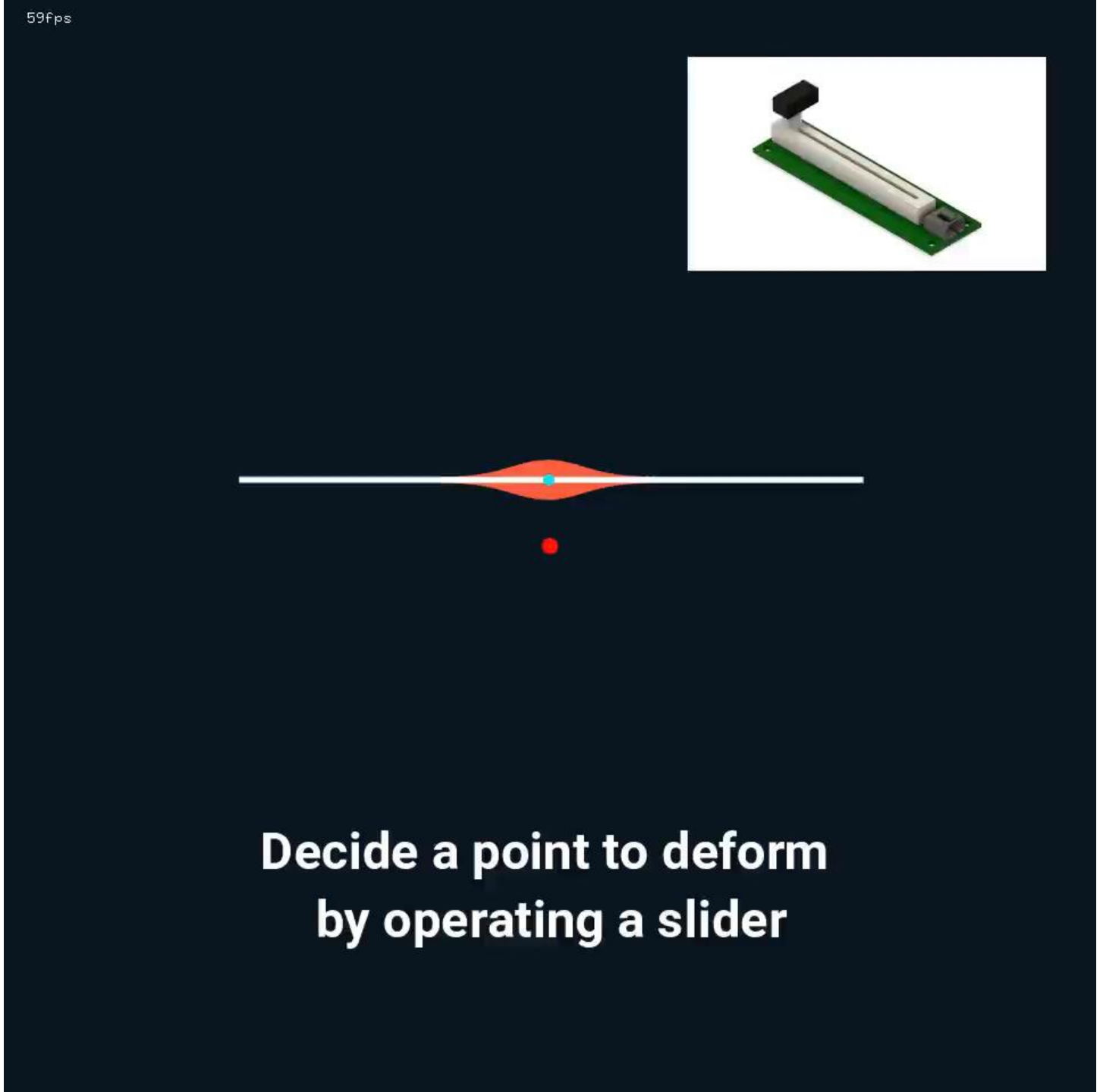
Radial Basis Function
(Gaussian)

3 simple sensors



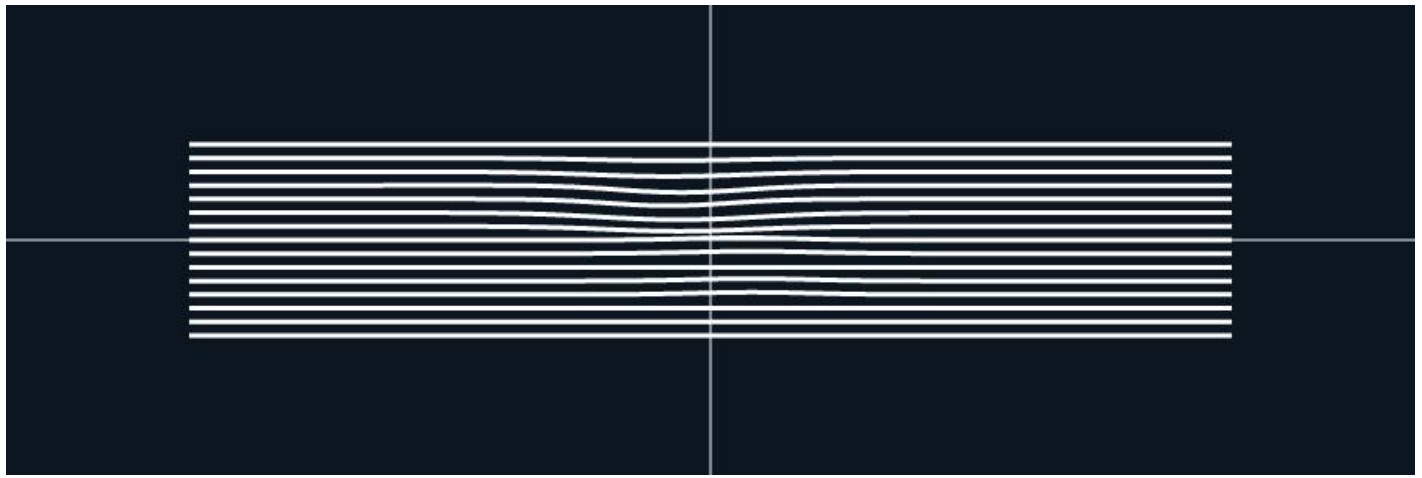
Input Device

DEMO

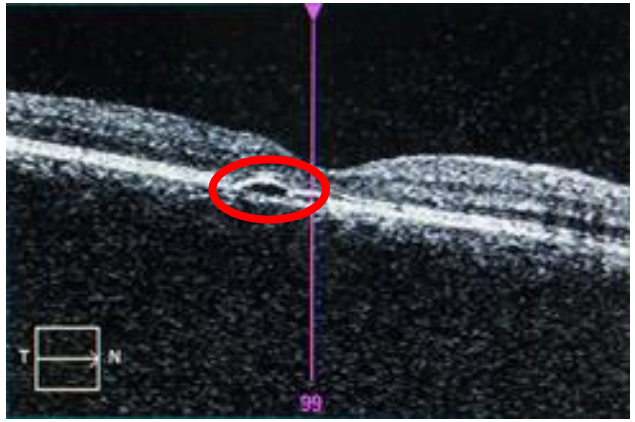


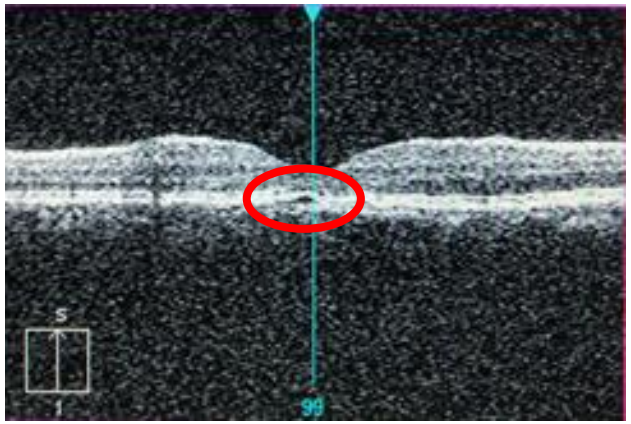
Evaluation Experiment

The results of the examination (right eye) of a patient



The distorted distribution in vertical direction





OCT image (right eye)
Just after the examination

<u>The patient reported he perceived no distortion with the resulting image</u>

Simulation of Patient View

Normal vision (Original image)

Simulated vision of a patient

➡ Help people to understand how a patient view the world

Limitation and Future Work

Minimize examination time

The examination takes 30 min in total at present

➡Design a more efficient algorithm

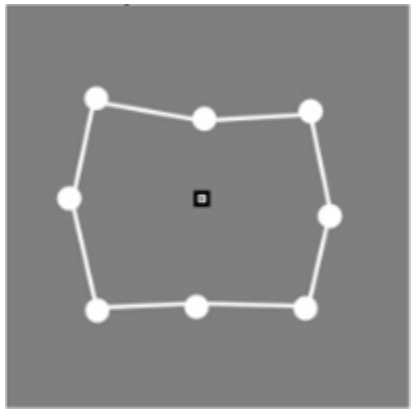
Verify our method

- We succeeded in visualizing the distorted view of one metamorphopsia patient
- Experiments with more subjects are required

Relate Work on Computer-Based Examination Square Completion Task [Wiecek+, 2014]

• It can obtain the local magnitude and direction but it used only 8 test points

➡Ours is a display-level resolution



Result

• Mouse interaction to adjust the points might be difficult
(because the users need to fixate the center point)

➡Ours is designed to use by elderly patients

Acknowledgement

This work is supported by JSPS Grants-in-Aid for Scientific Research (Grant No.19H05472, 17H00738)

We are deeply grateful to the subjects for helping the evaluation

Thank you for your attention!