

CYBERWORLDS
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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



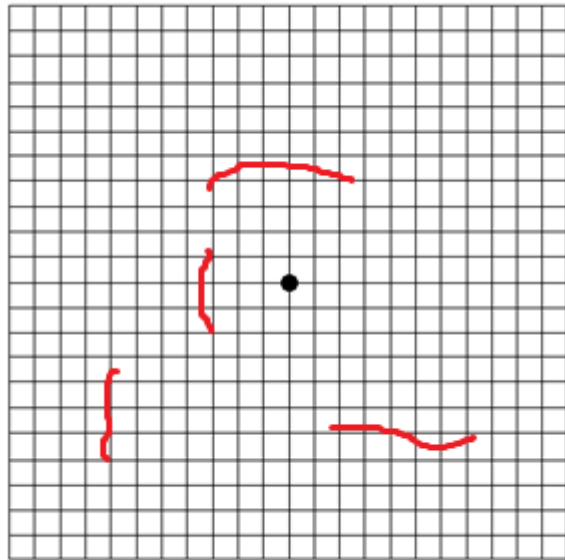
The perception of the unimpaired vision



The perception of the distorted vision

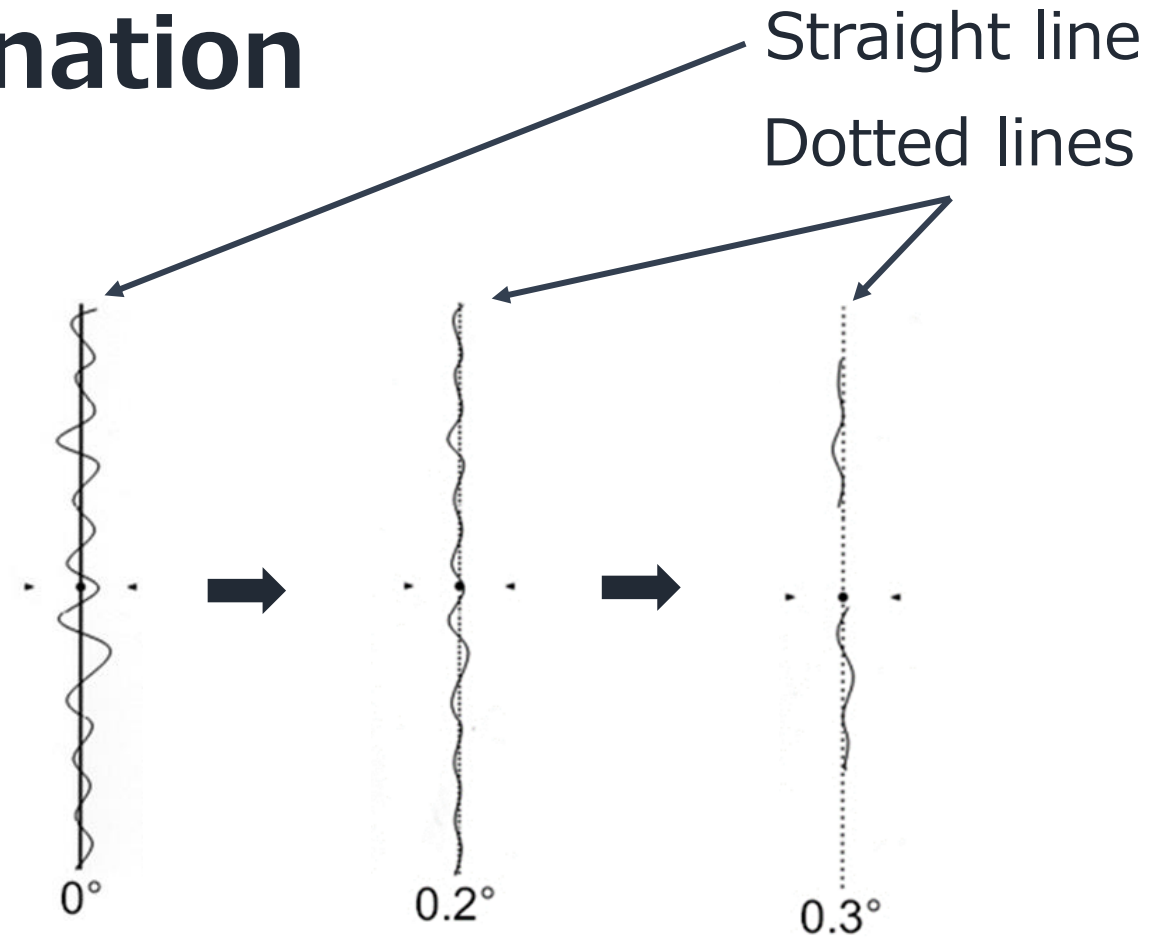
Purpose: quantify the distorted view

Common clinical examination



AMSLER CHART
(Amsler, 1953)

➔ Not quantitative



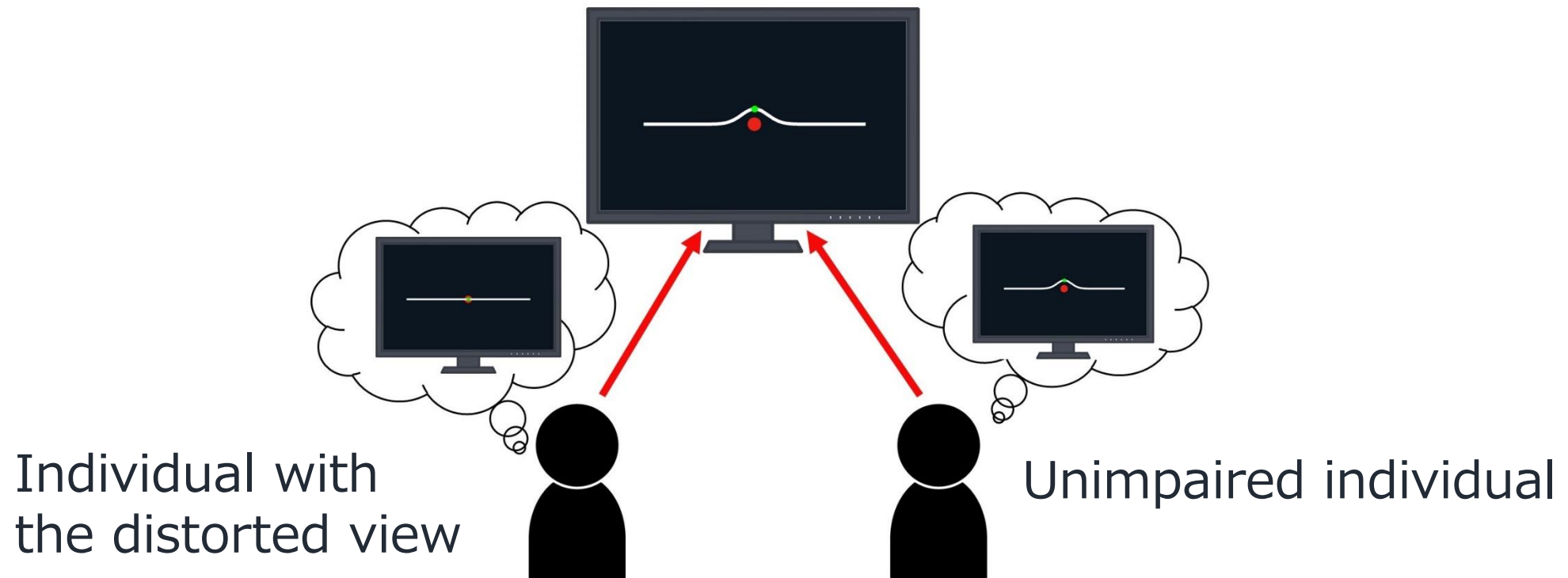
M-CHARTS
(Matsumoto+, 2003)

➔ 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**



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

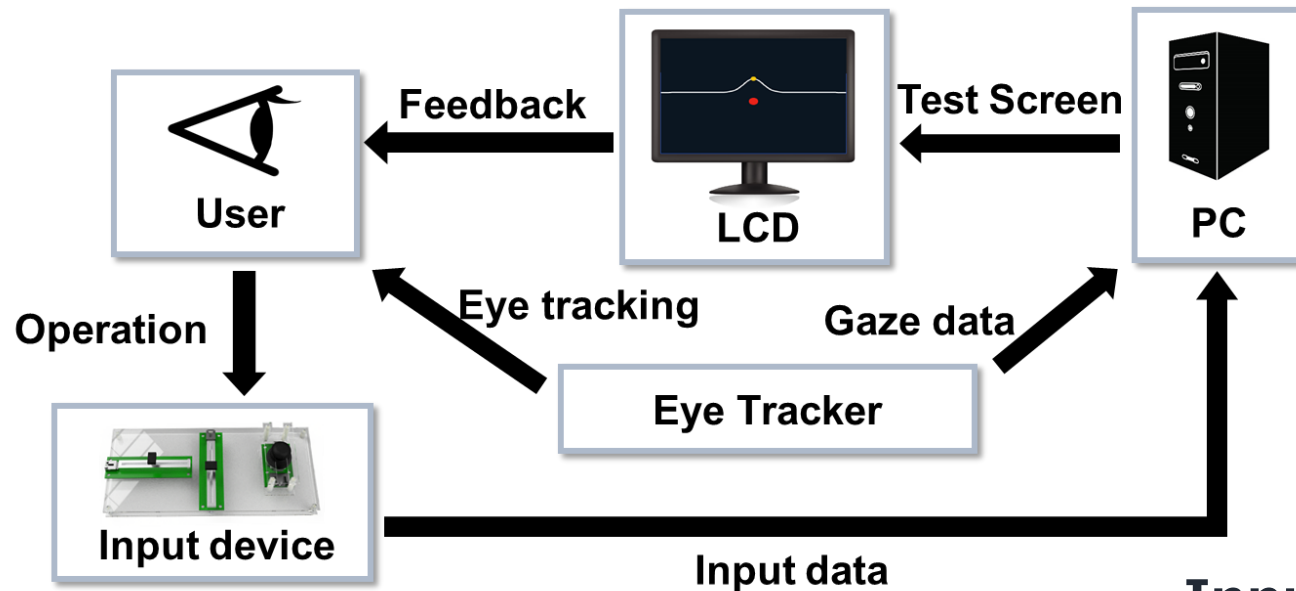


The perception of an **unimpaired** individual

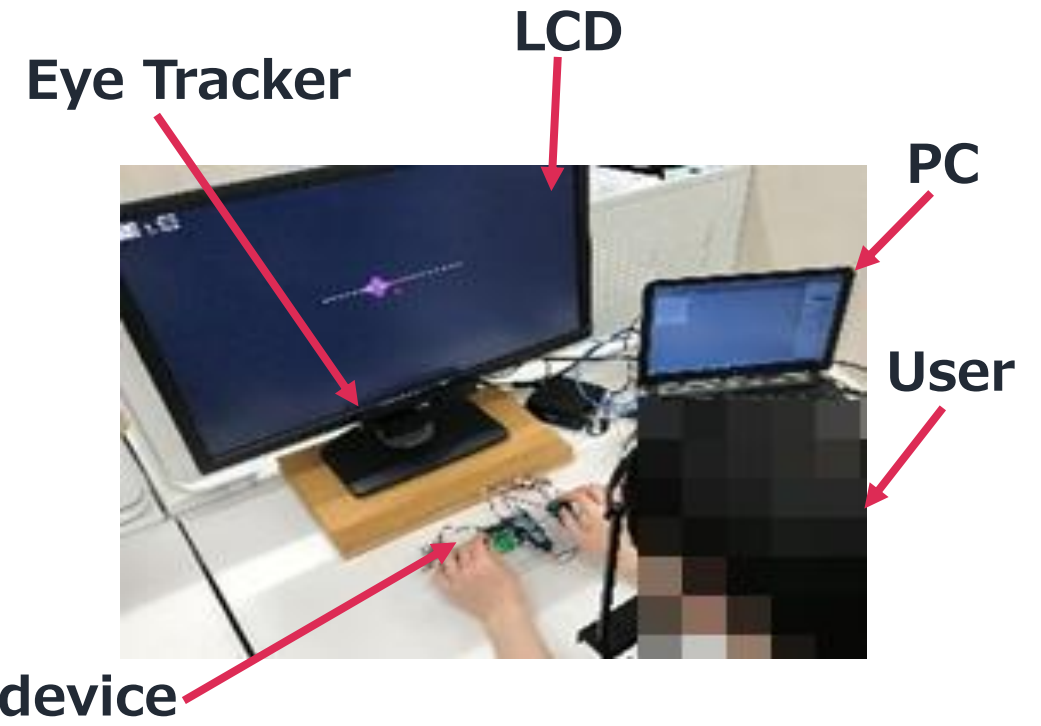


The perception of an individual **with the distorted view**

Implementation



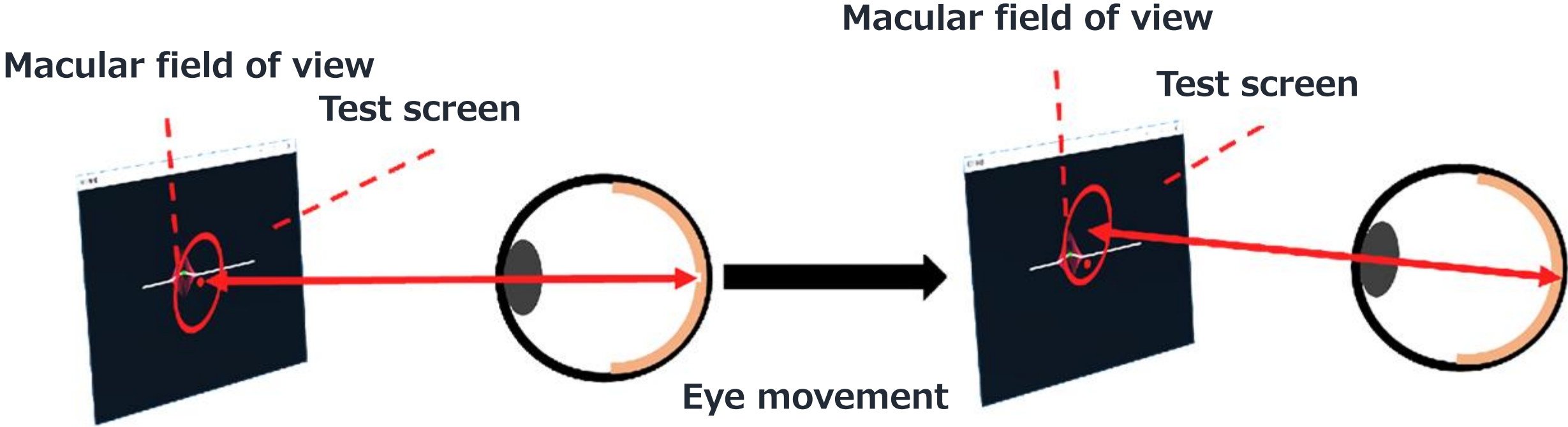
Block Diagram



System Setup

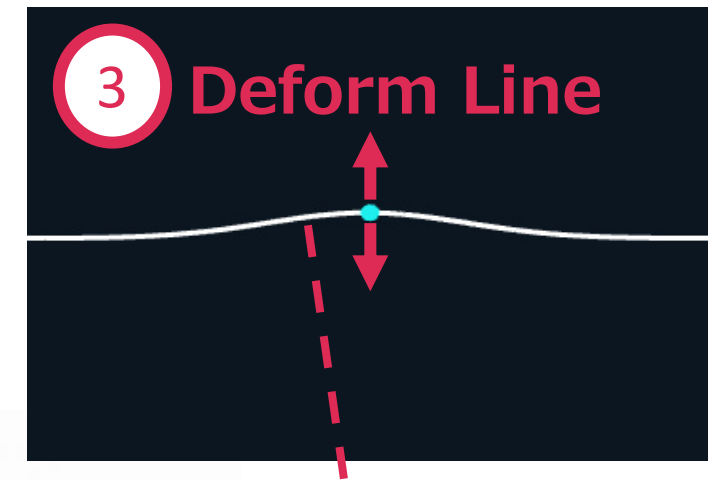
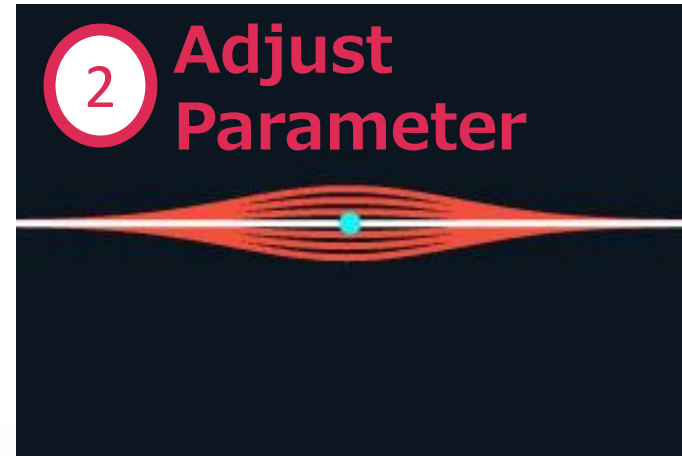
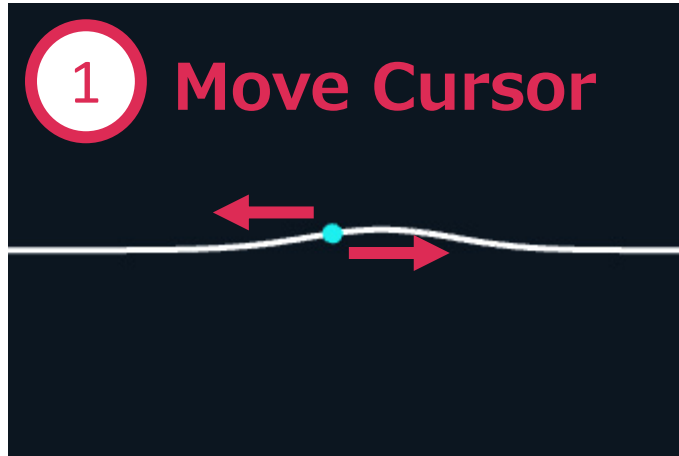
Set the distance between LCD and User to 60cm

Necessity of Eye-tracker



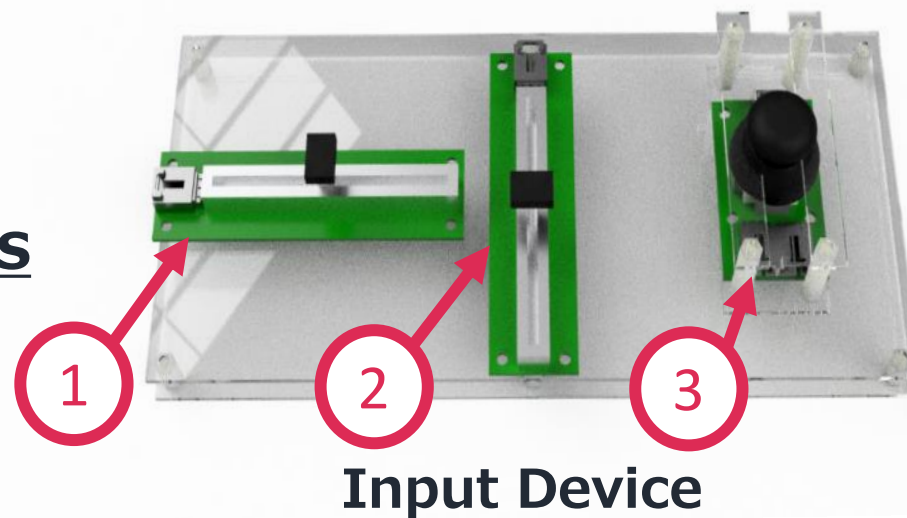
We ignore the operation when the patient's gaze is not on the fixation-inducing stimulus

Interaction Design



Radial Basis Function
(Gaussian)

3 simple sensors



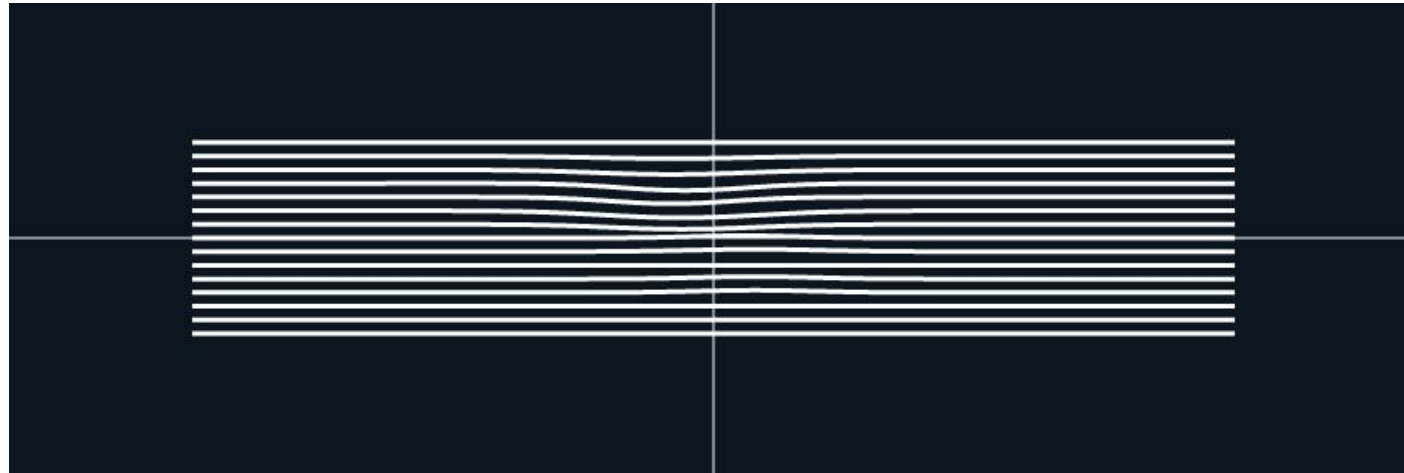
DEMO



**Decide a point to deform
by operating a slider**

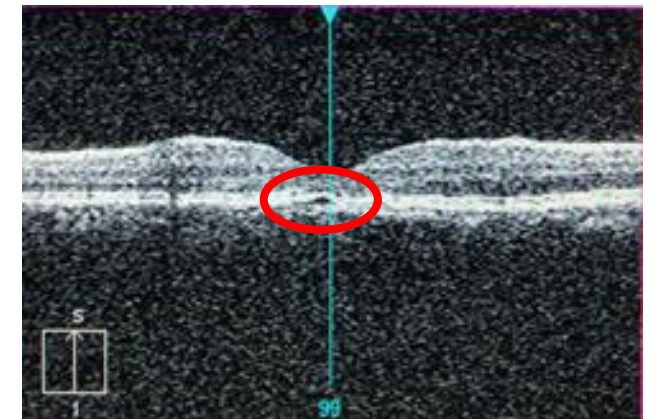
Evaluation Experiment

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



The distorted distribution in vertical direction

The patient reported he perceived
no distortion with the resulting image



OCT image (right eye)
Just after the examination

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

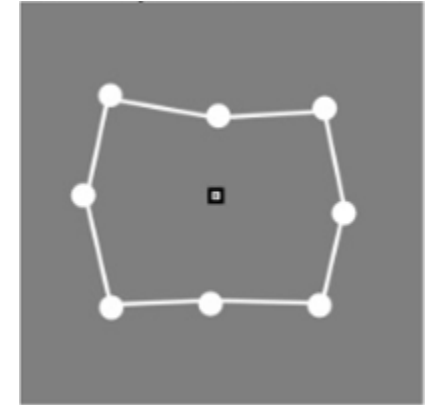
Relate Work on Computer-Based Examination Square Completion Task [Wiecek+, 2014]

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

➔ Ours is a display-level resolution

- 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



Result

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!