Arriving Light Control for Color Vision Deficiency Compensation Using Optical See-Through Head-Mounted Display

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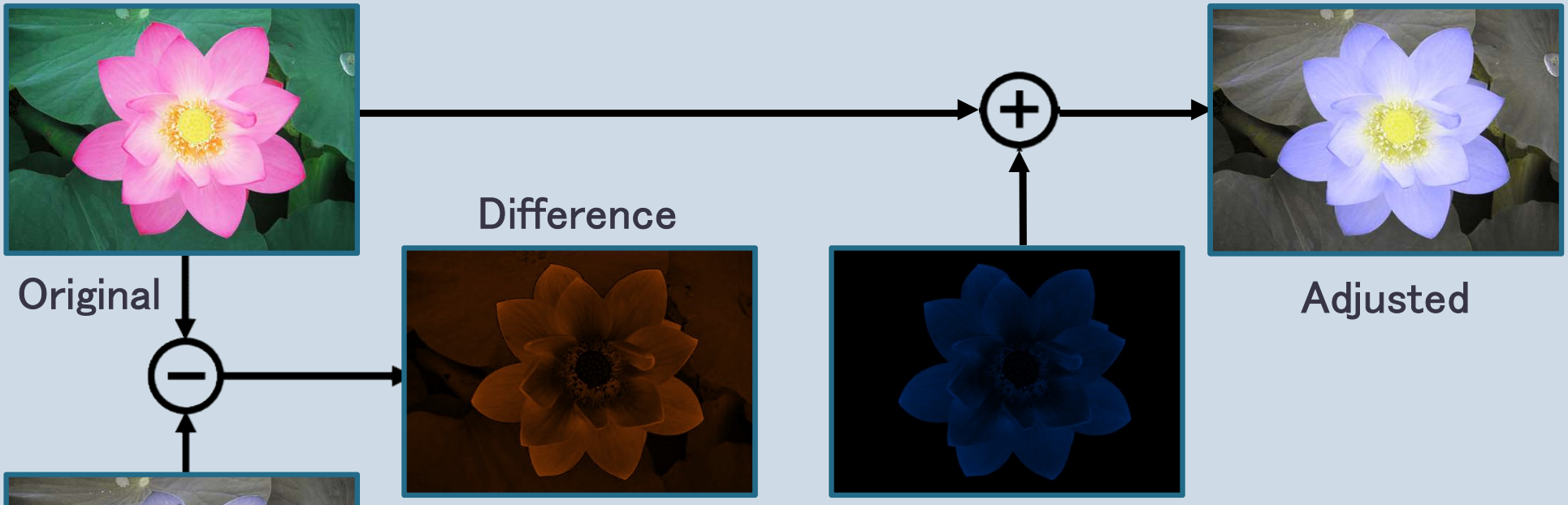
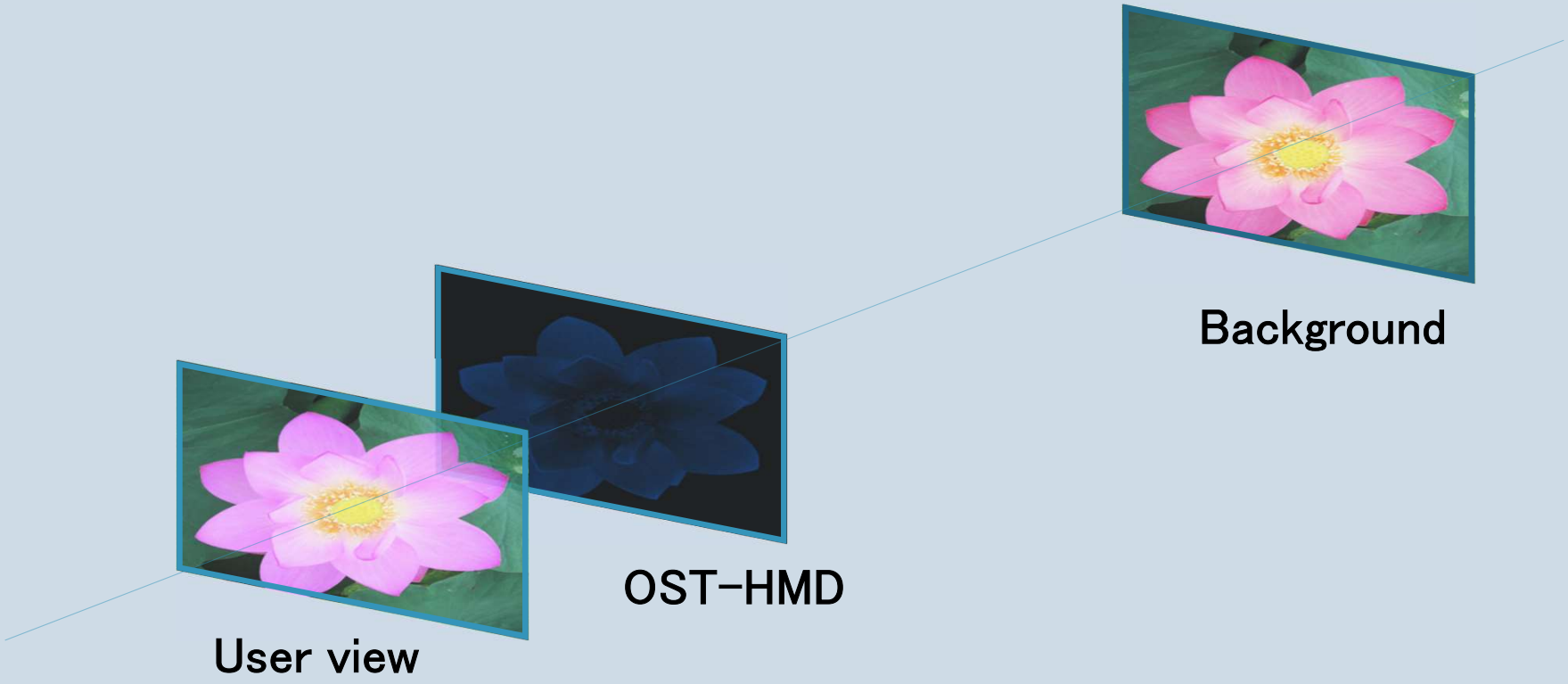
Daltonization Process



$$\begin{bmatrix} R_O \\ G_O \\ B_O \end{bmatrix} = \begin{bmatrix} 0 & 0 & 0 \\ 0.7 & 1 & 0 \\ 0.7 & 0 & 1 \end{bmatrix} \begin{bmatrix} R_{SCR} - R_{SIM} \\ G_{SCR} - G_{SIM} \\ B_{SCR} - B_{SIM} \end{bmatrix}$$

Supporting people with CVD using HMD

Light Subtraction Problem



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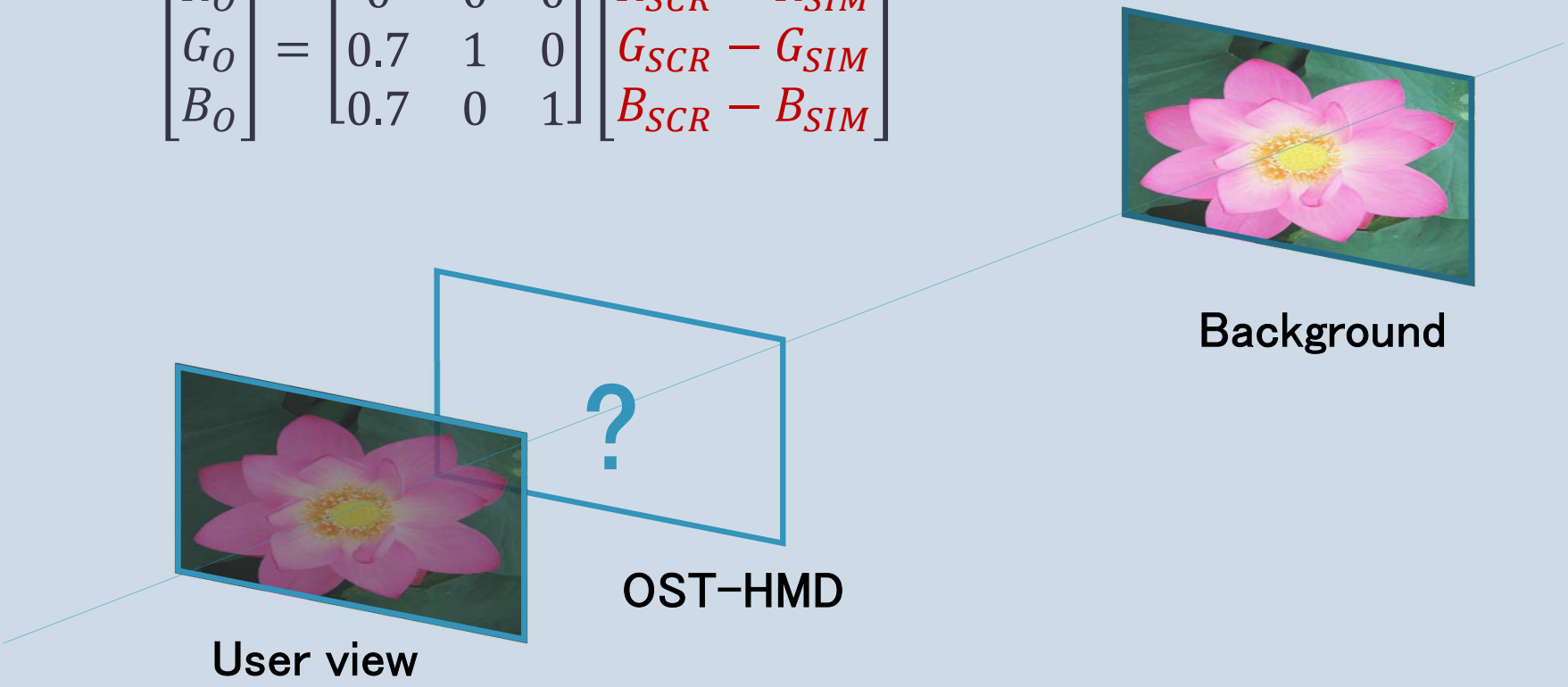
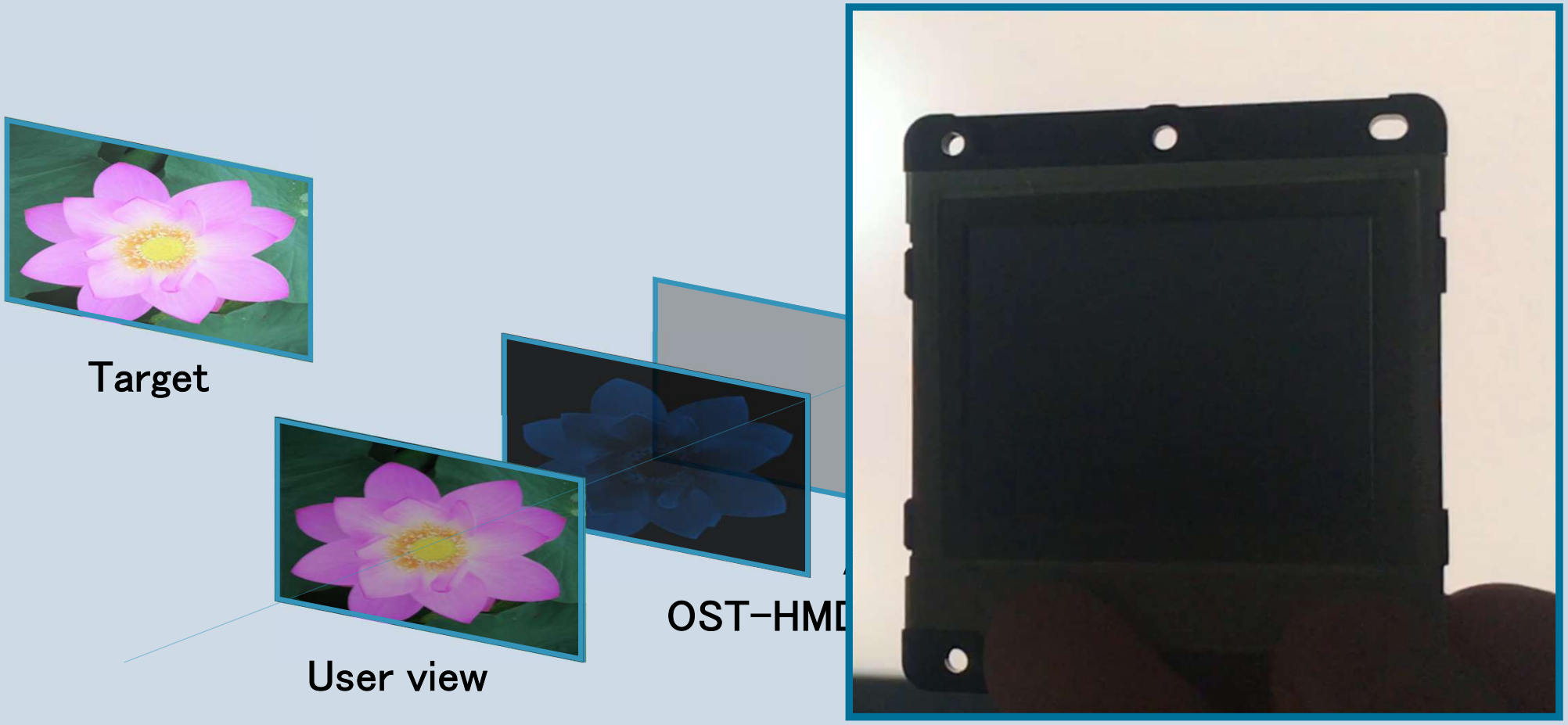
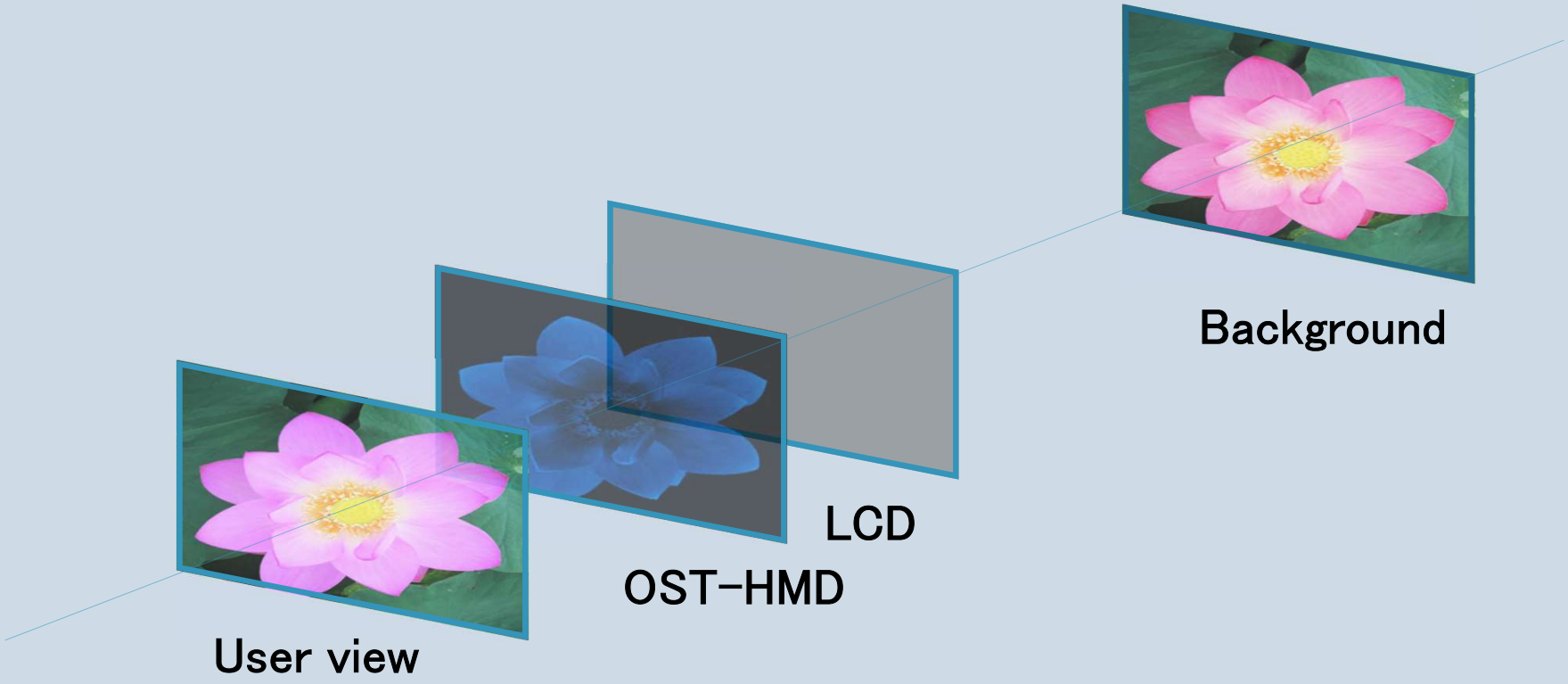


Arriving Light Control Method



Arriving Light Control Method

$$\boldsymbol{I}_U = \boldsymbol{f}_{subtraction}(\boldsymbol{I}_L) \cdot \boldsymbol{f}_{decay}(\boldsymbol{I}_S) + \boldsymbol{f}_{distortion}(\boldsymbol{I}_H)$$



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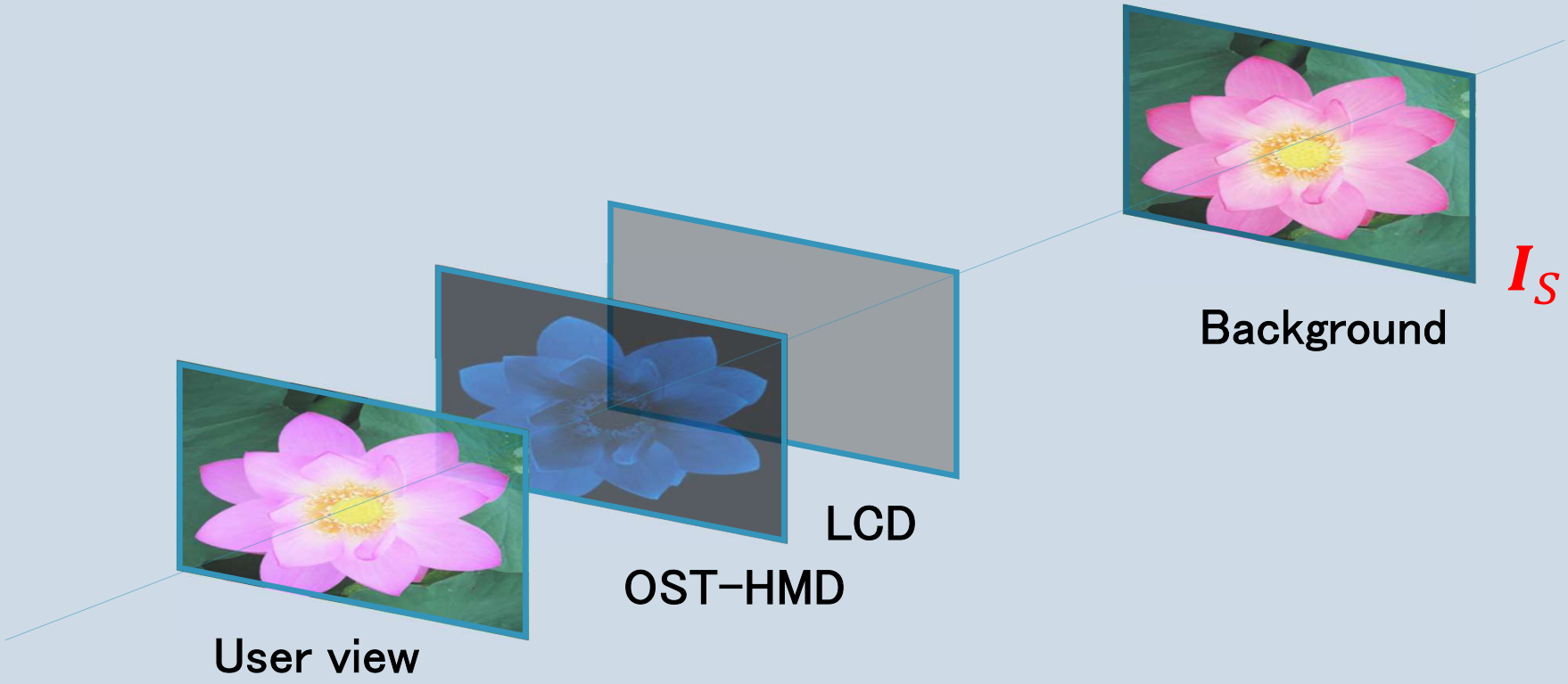

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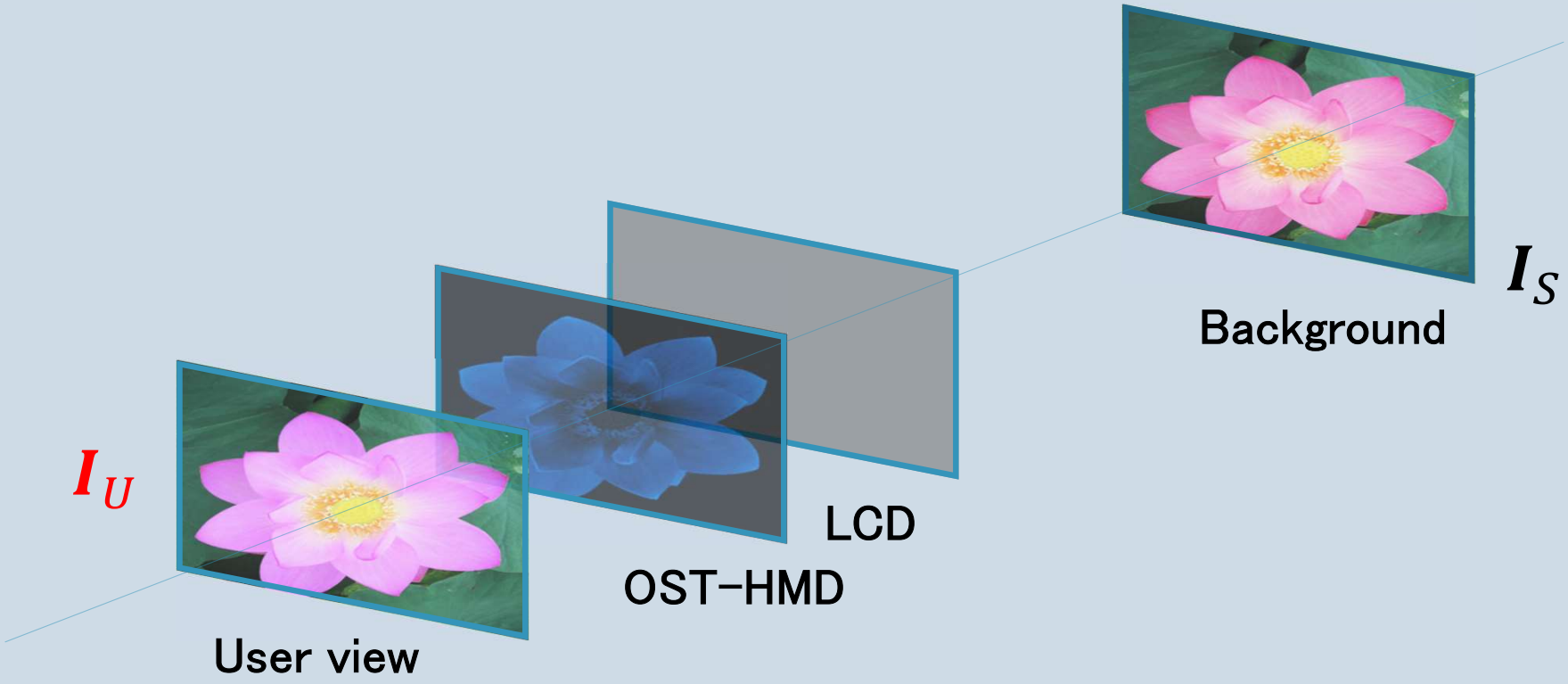

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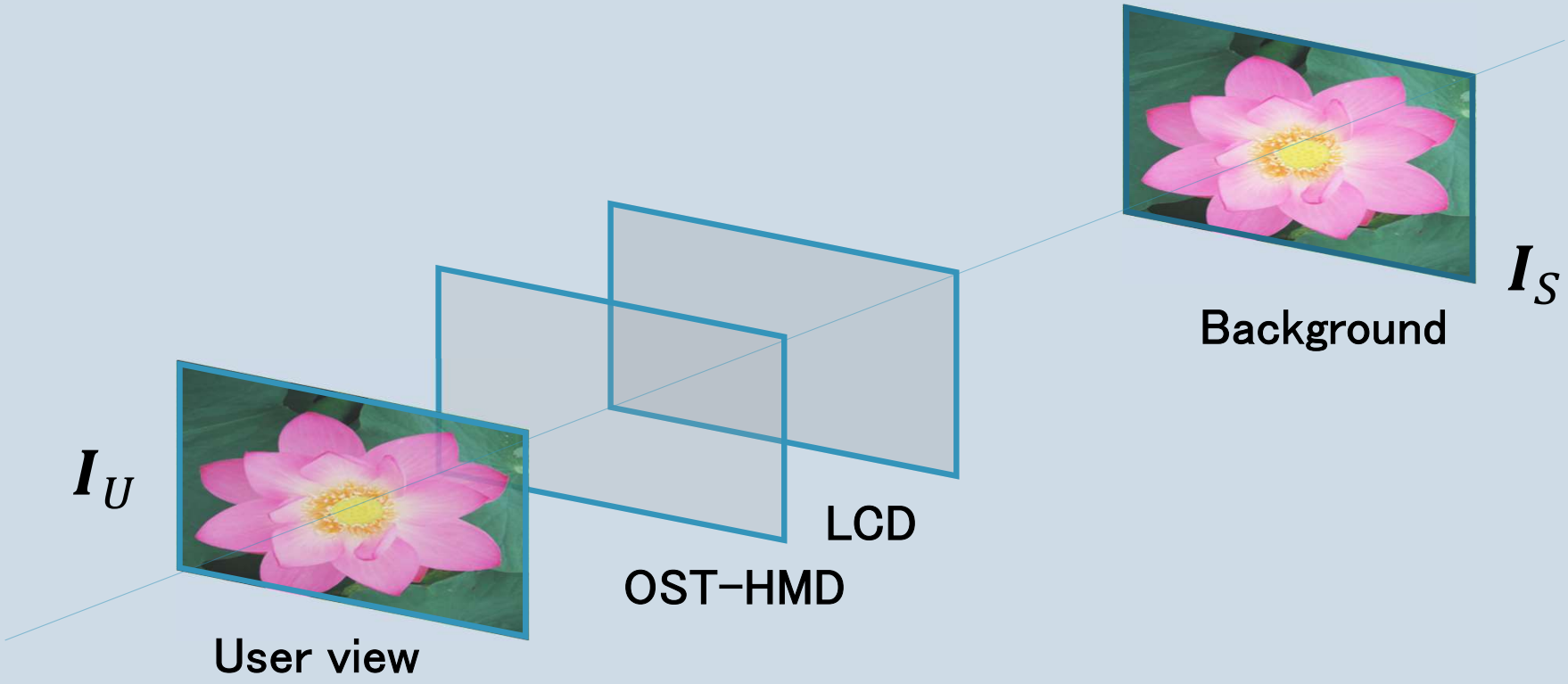

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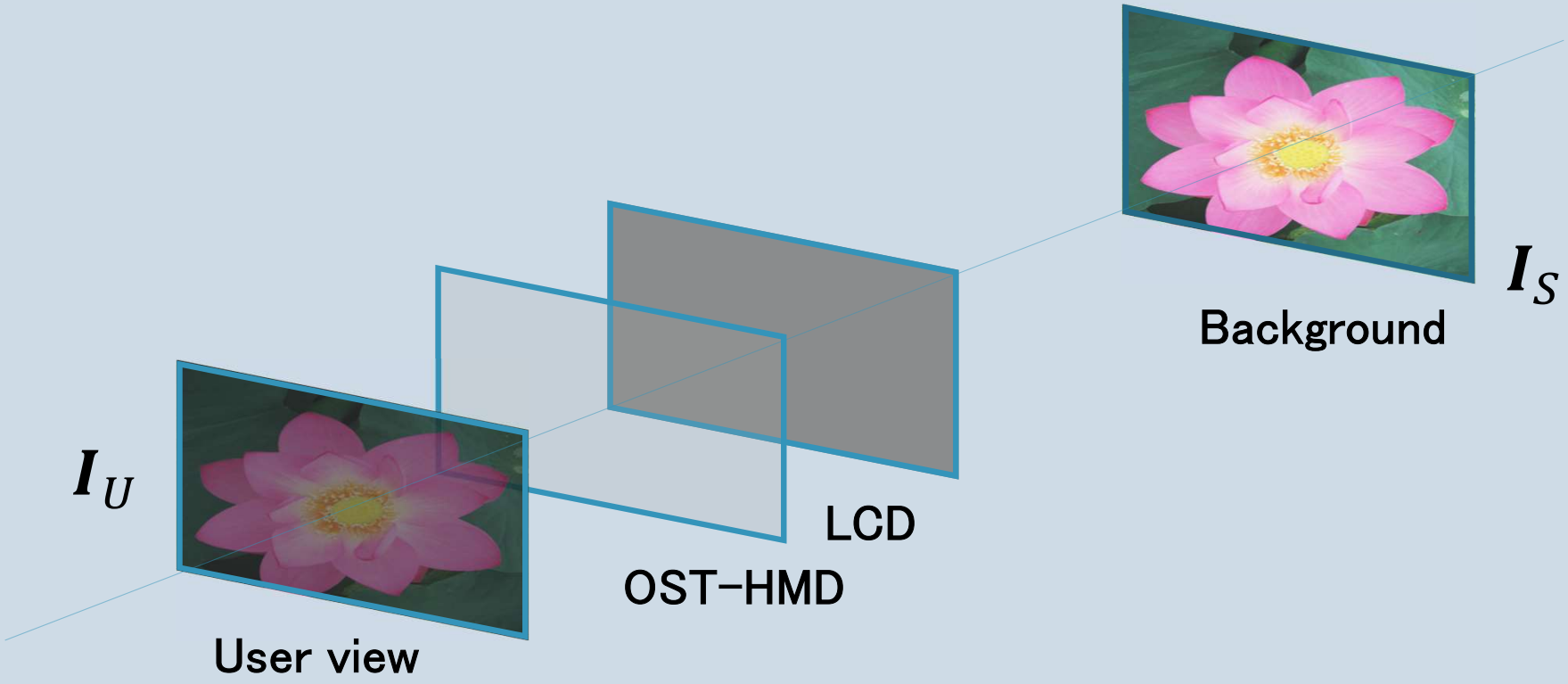

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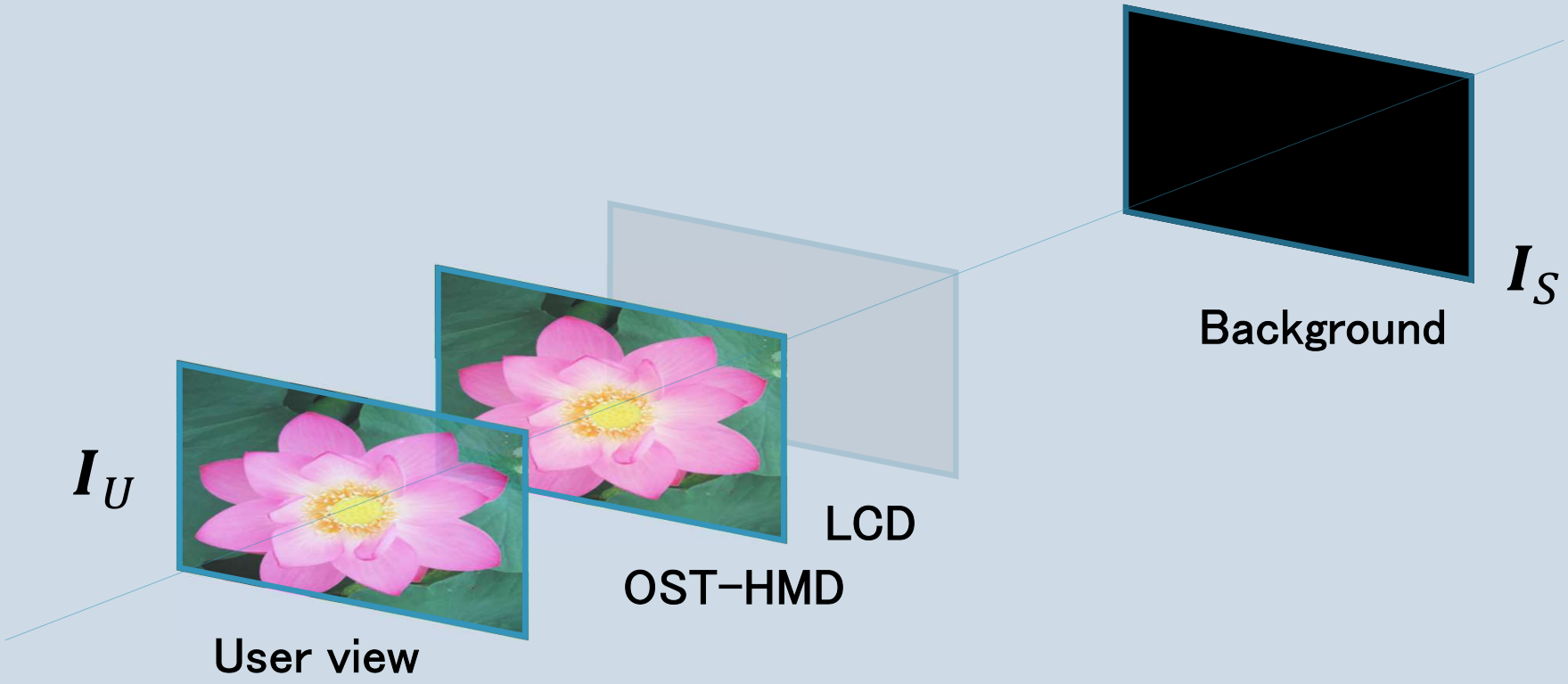
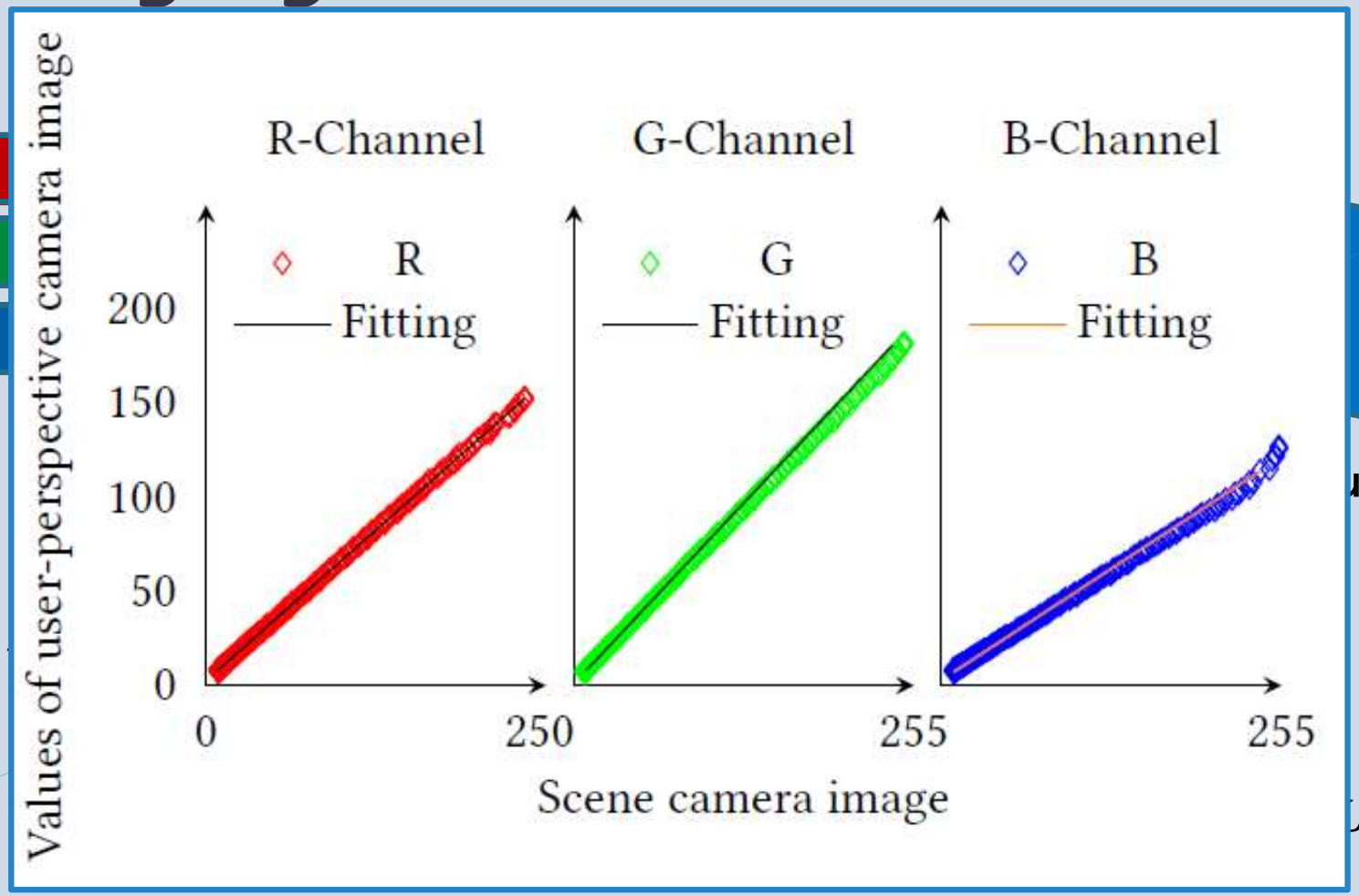


Arriving Light Control Method

I_U



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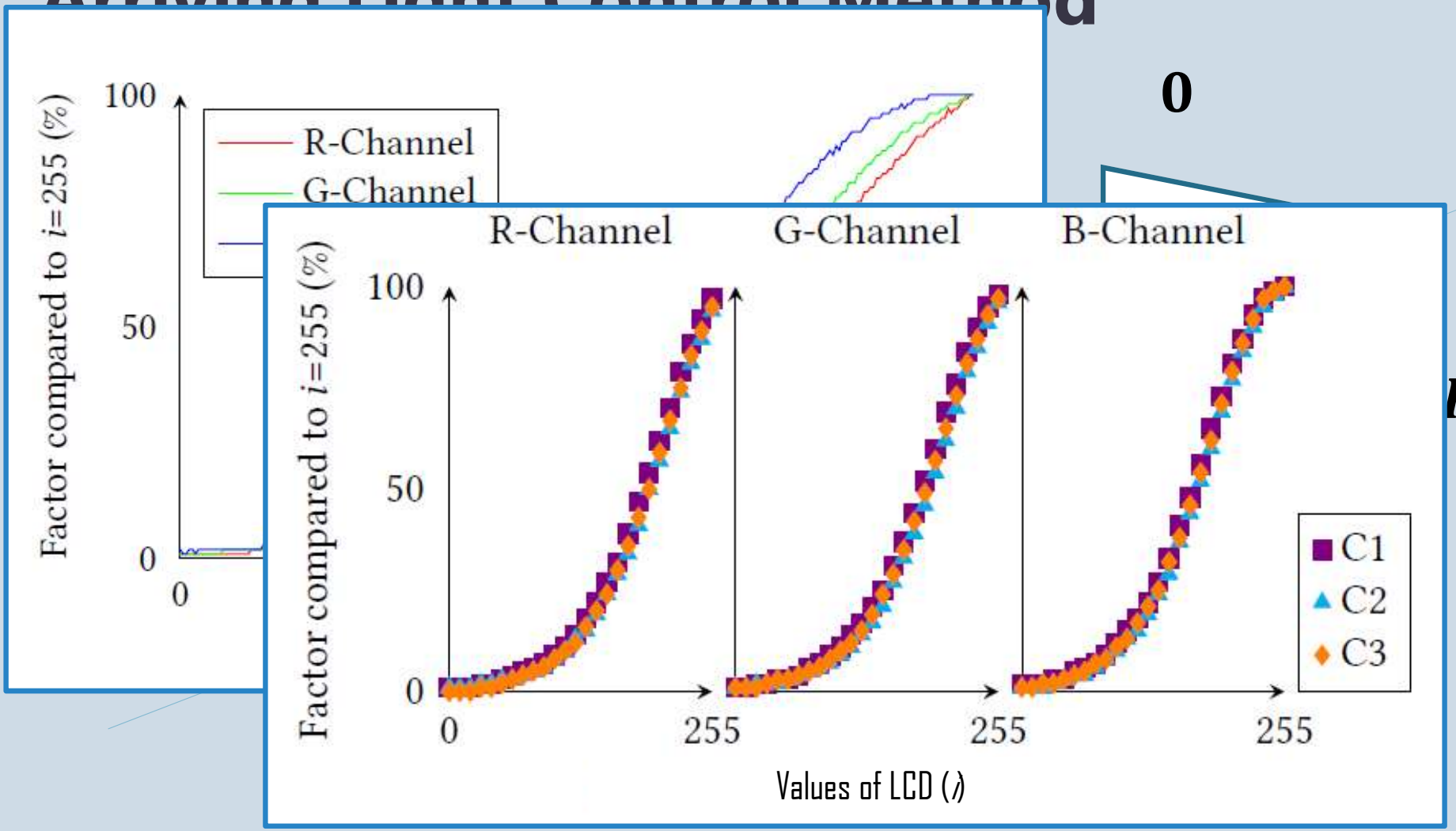
U)

Arriving Light Control Method

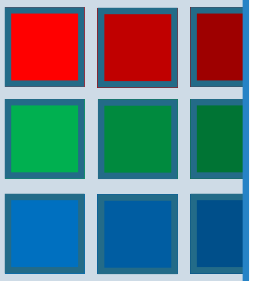


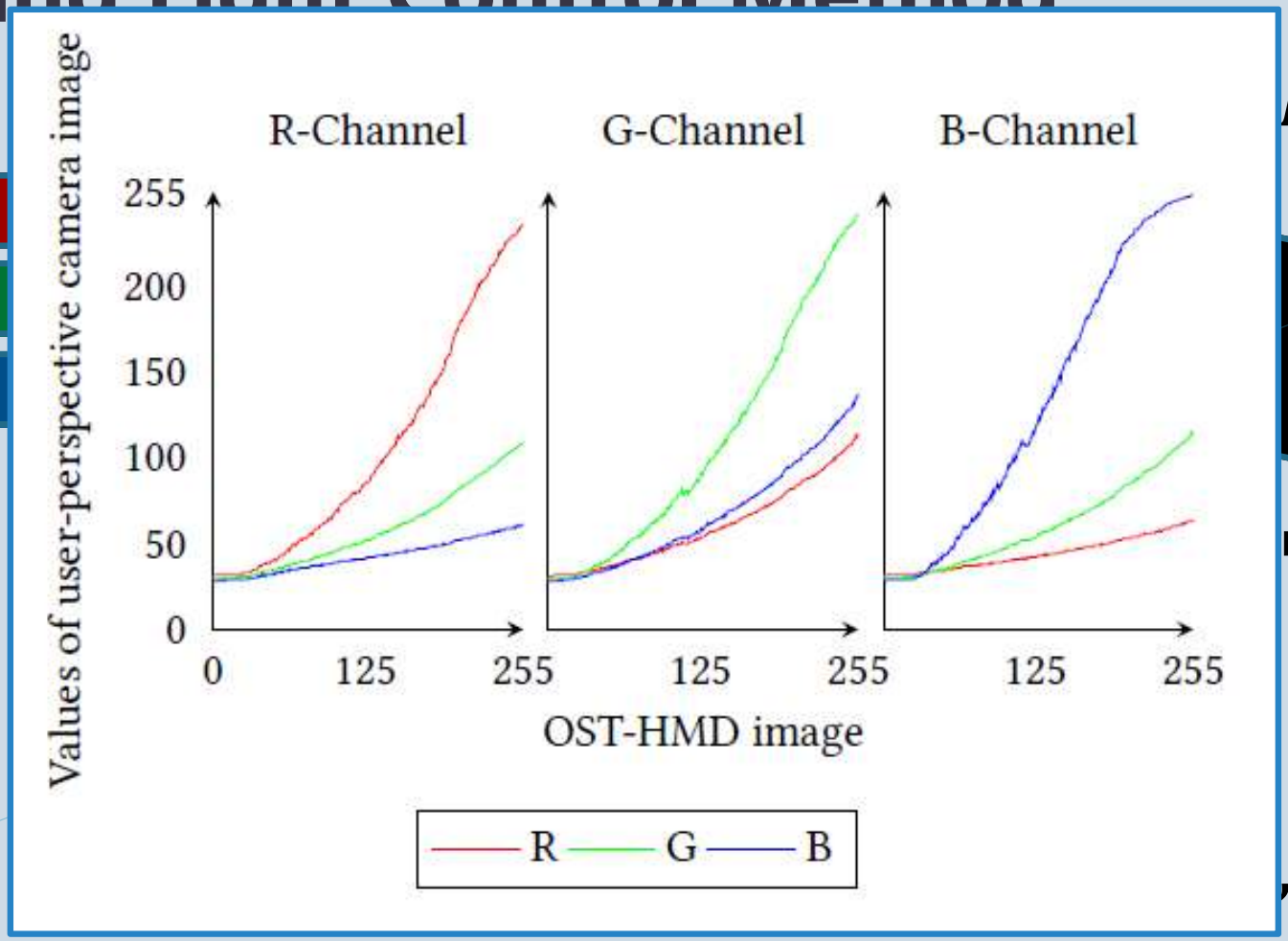
0

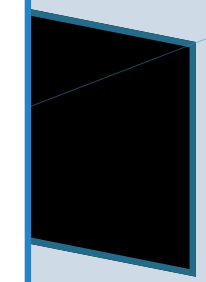
I_S

Arriving Light Control Method

$I_U =$ $I_H)$







I_S

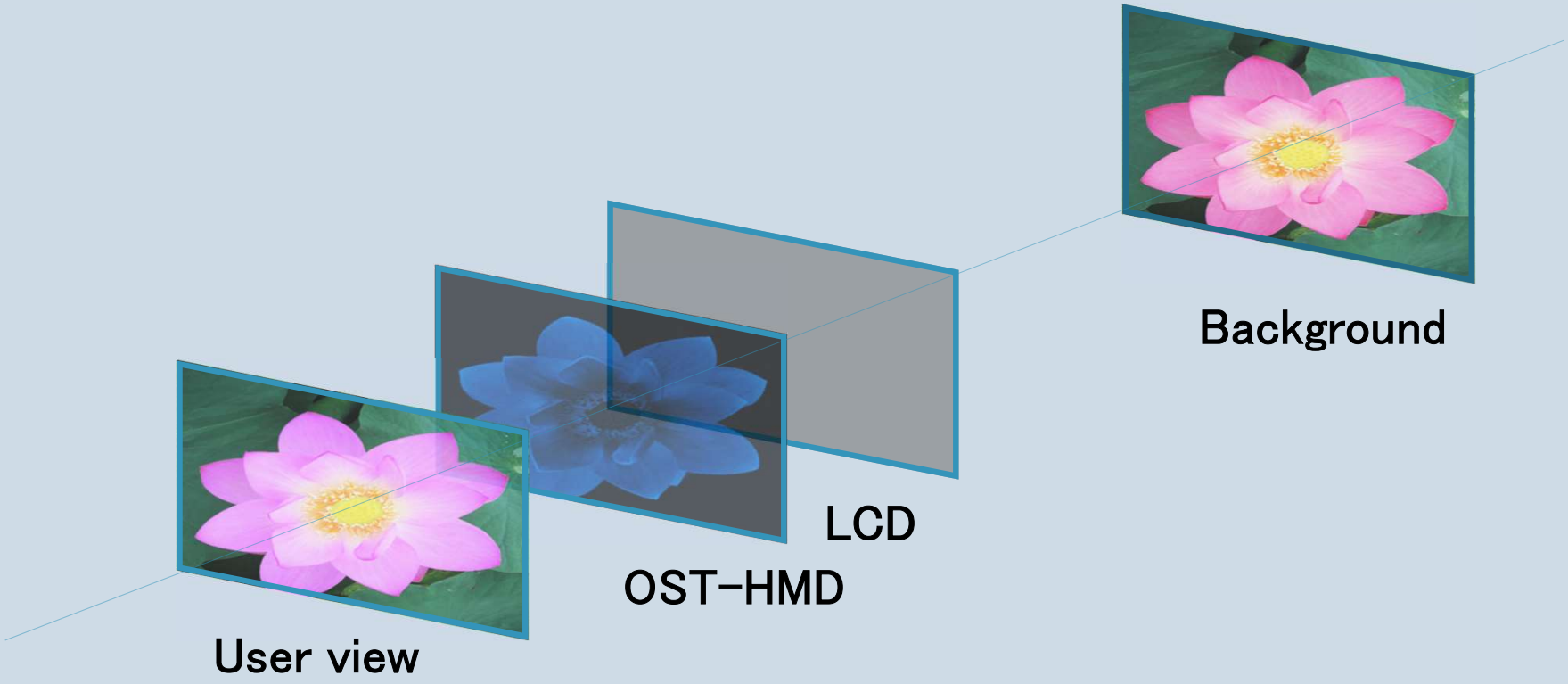
round

I_U

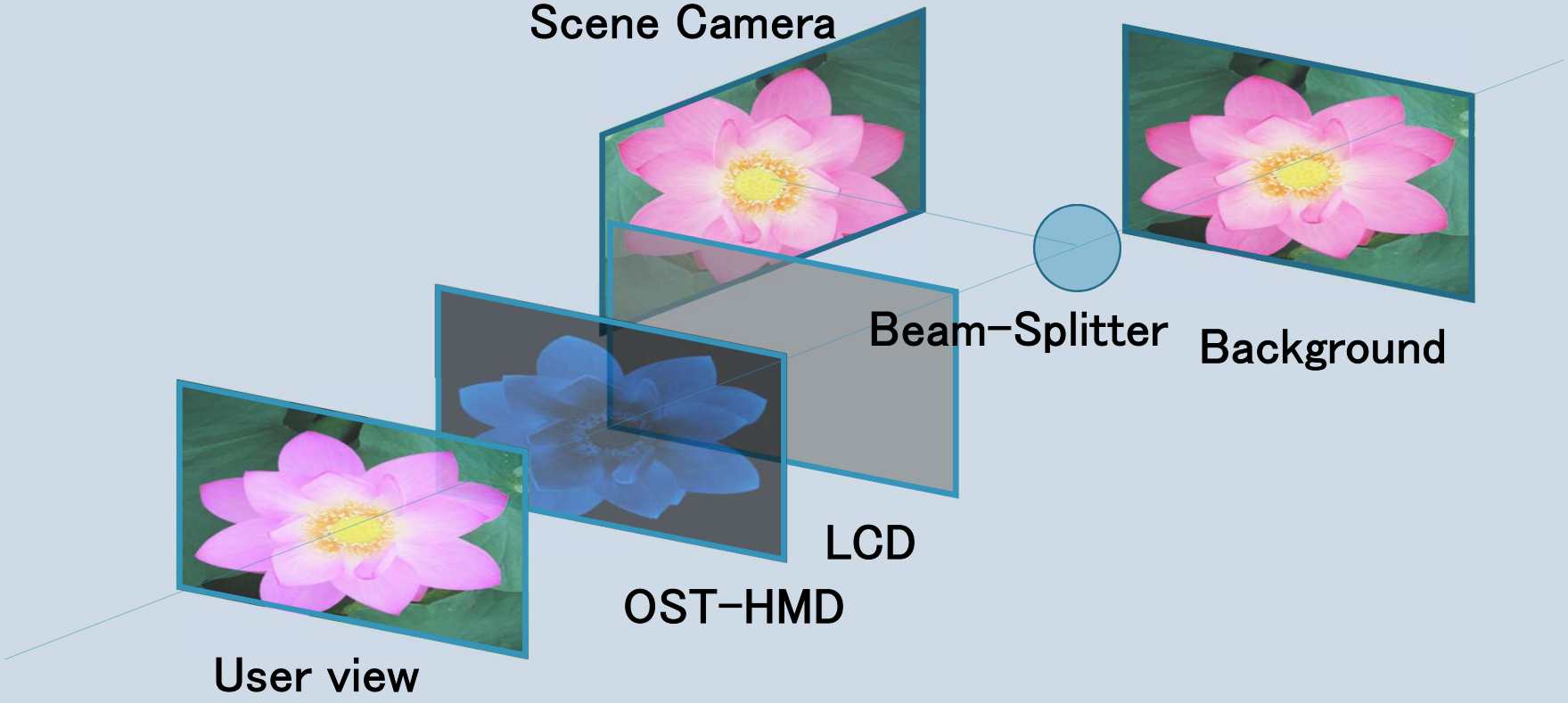
$, I_U)$

Arriving Light Control Method

$$I_U = f_{subtraction}(I_L) \cdot f_{decay}(I_S) + f_{distortion}(I_H)$$



Arriving Light Control System



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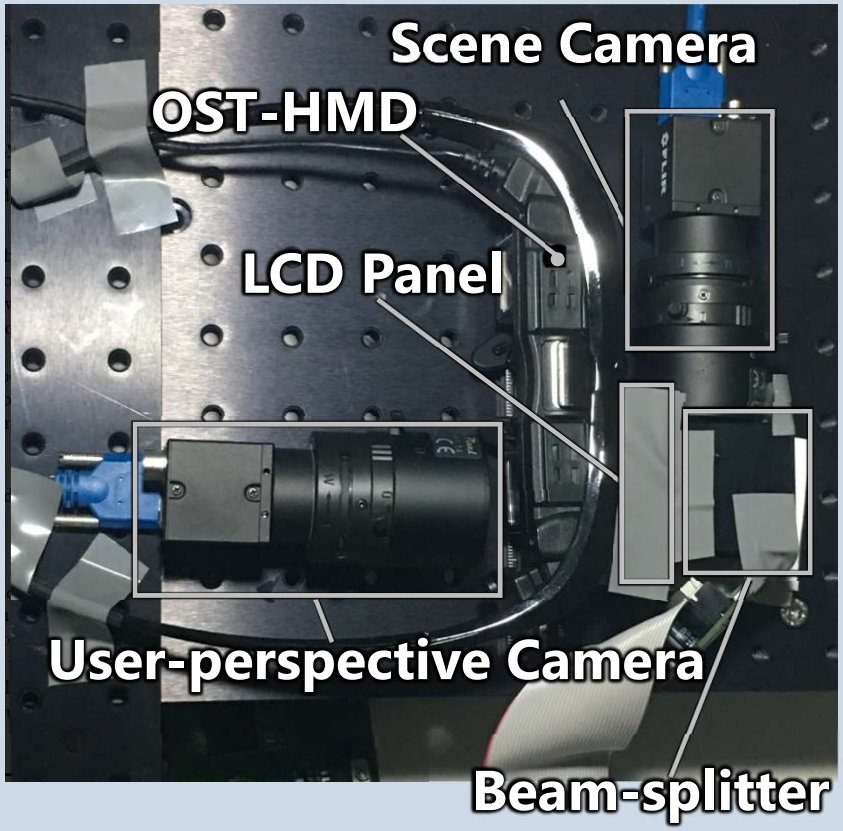
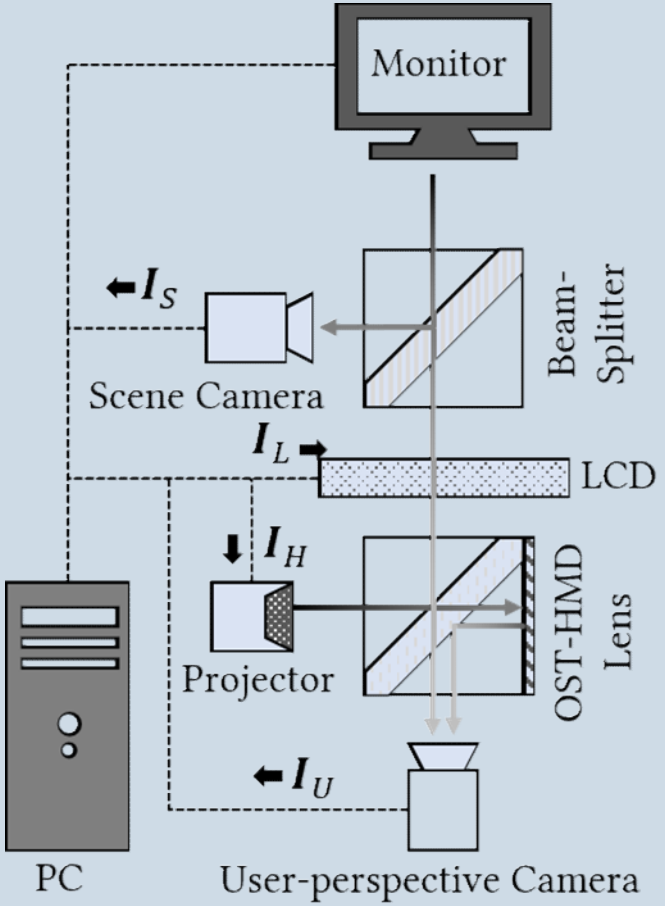
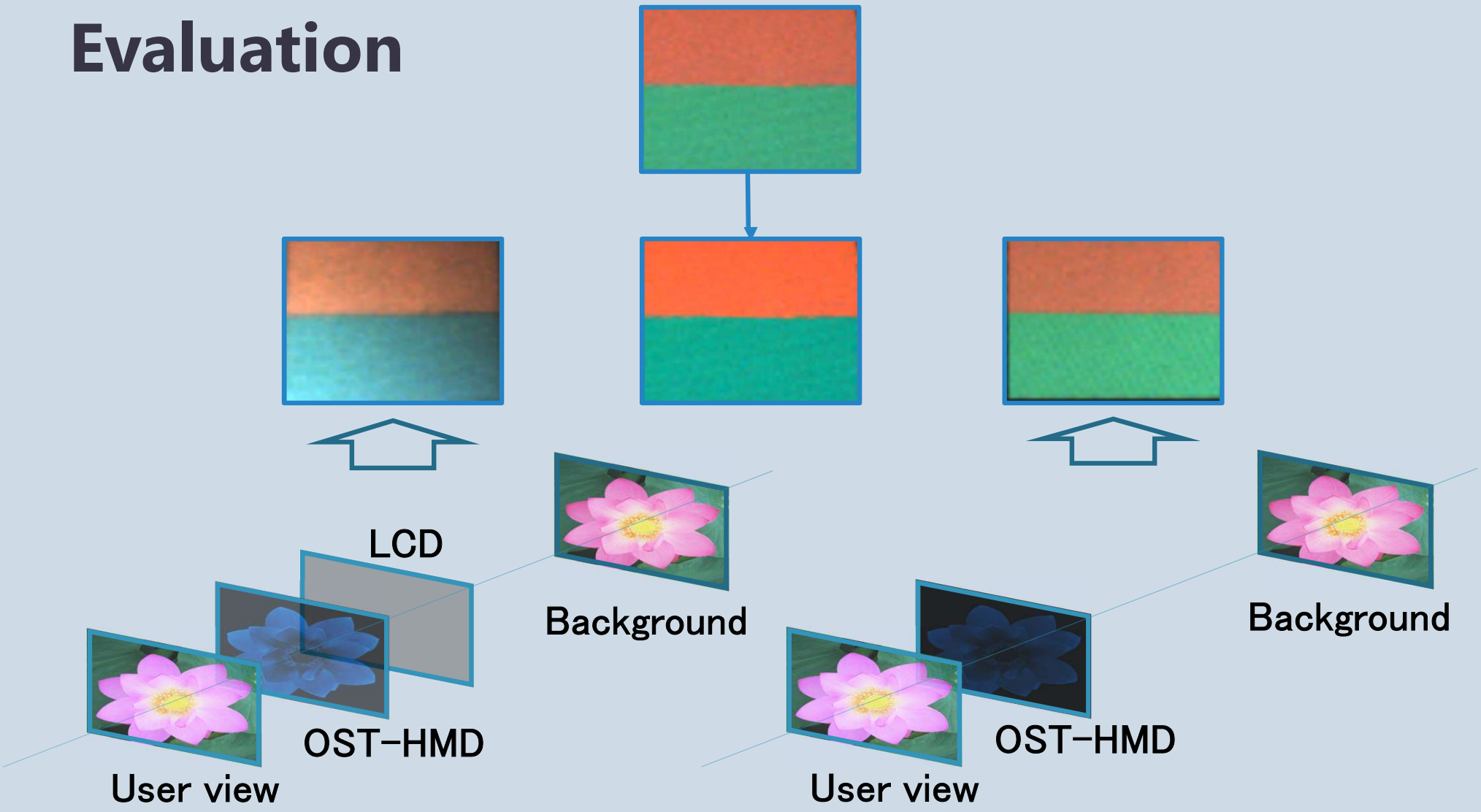
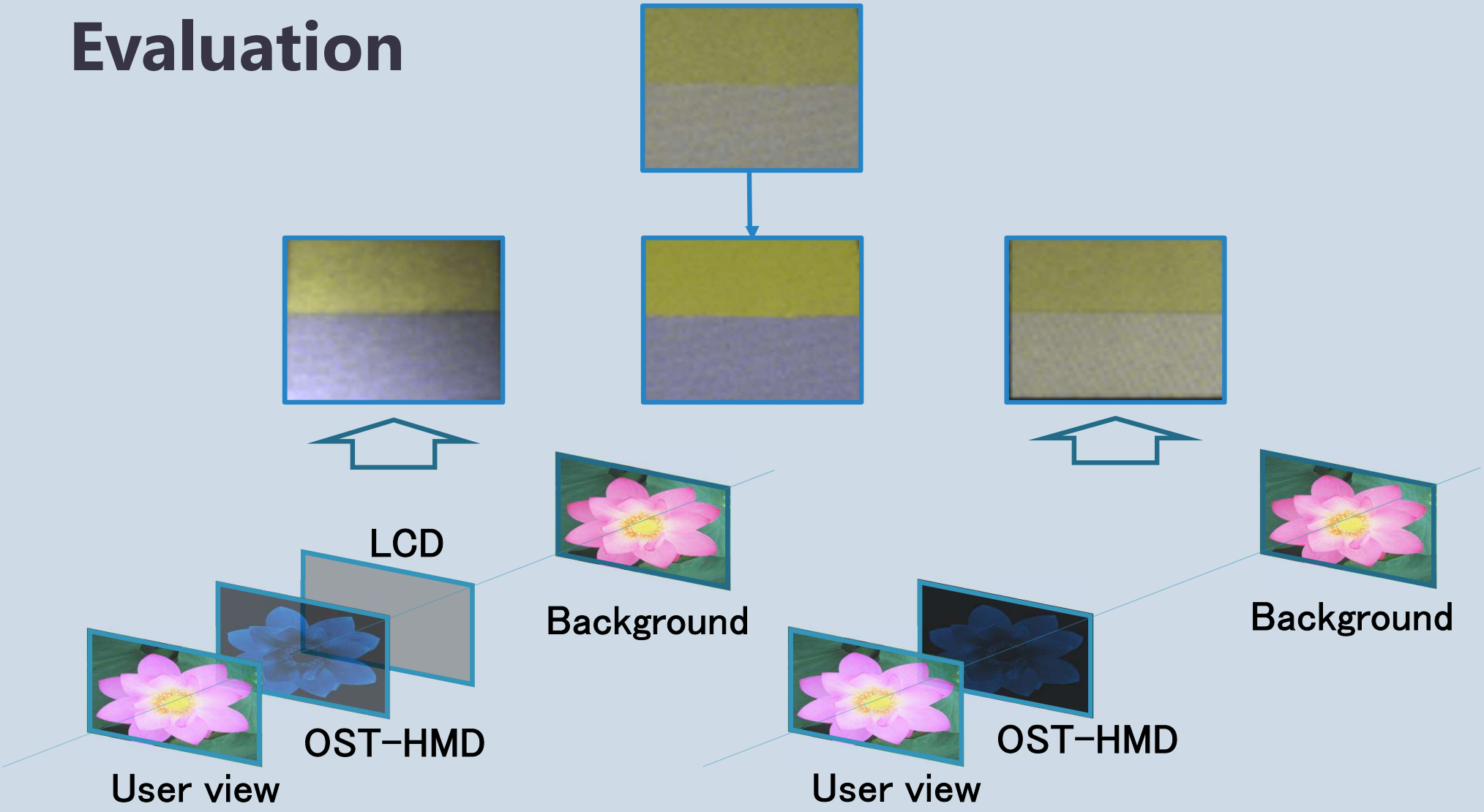




Evaluation


LCD
Background
OST-HMD
User view
Background
OST-HMD
User view

Evaluation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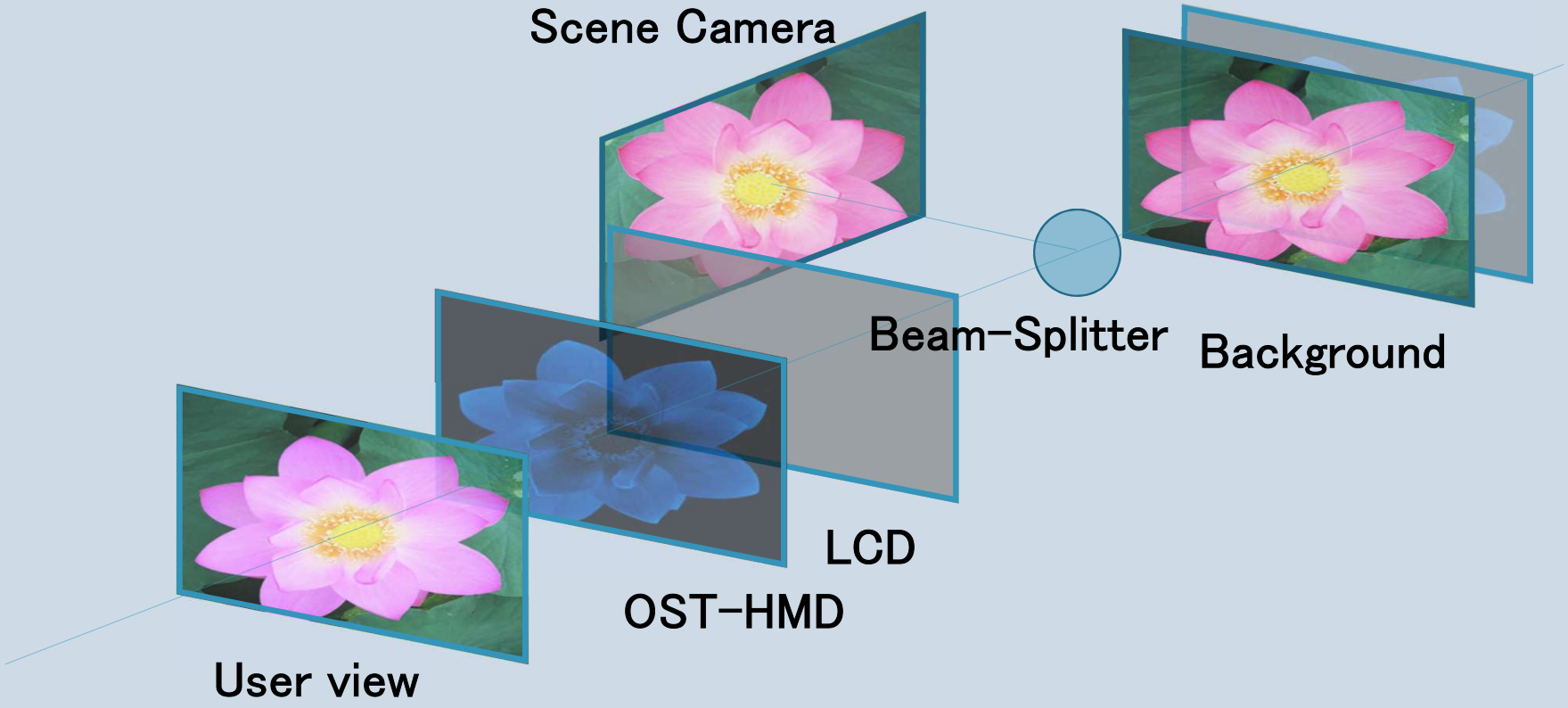
Limitations



Limitations

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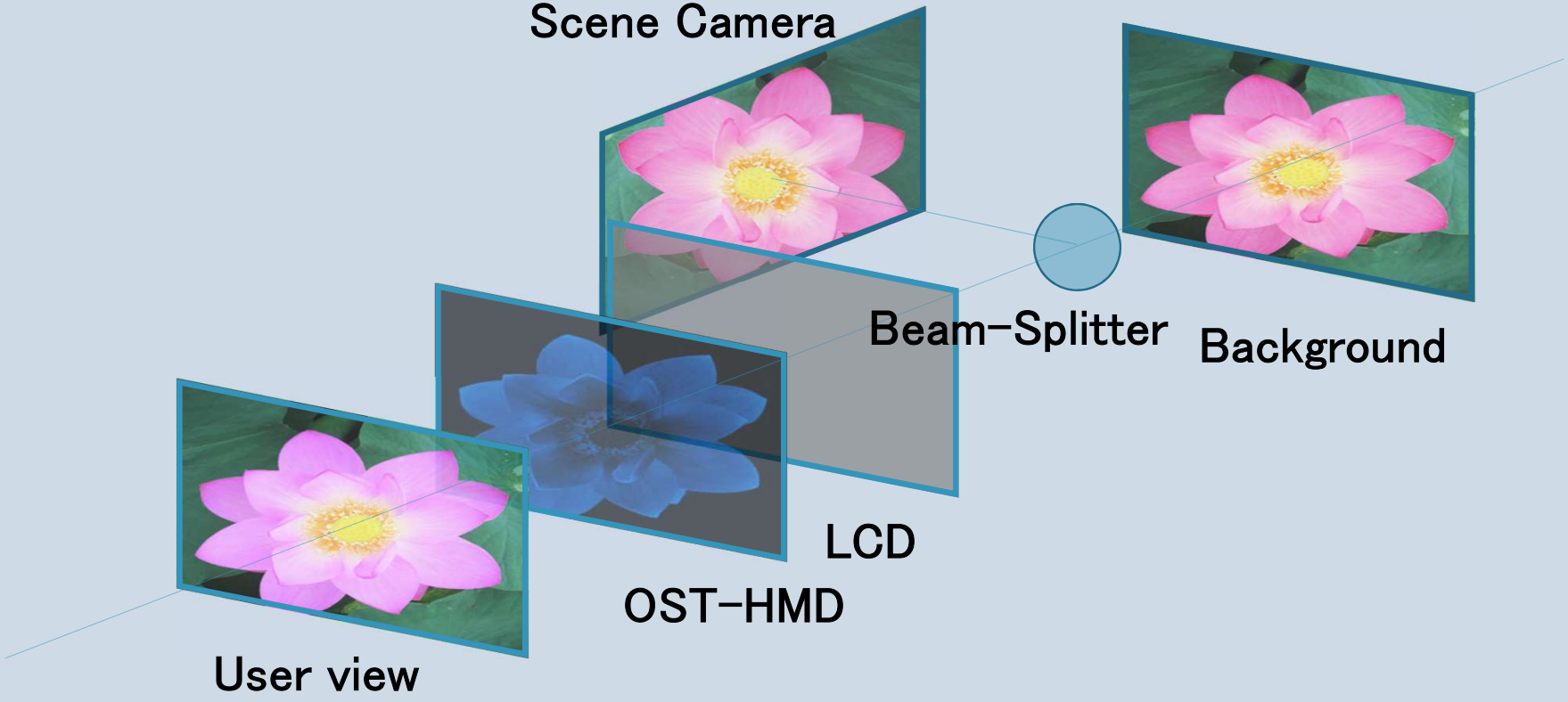

Conclusion

- We present an approach for light subtraction of OST-HMD using a transmissive LCD panel.
- A prototype system for achieving a controllable overlay to user's FoV with OST-HMD by using scene camera, user-perspective camera, and the transmissive LCD panel was implemented.
- We evaluated our method by compare with existing method.

Thank you for your attention

Miniaturization