

Lighty: A Painting Interface for Room Illumination by Robotic Light Array

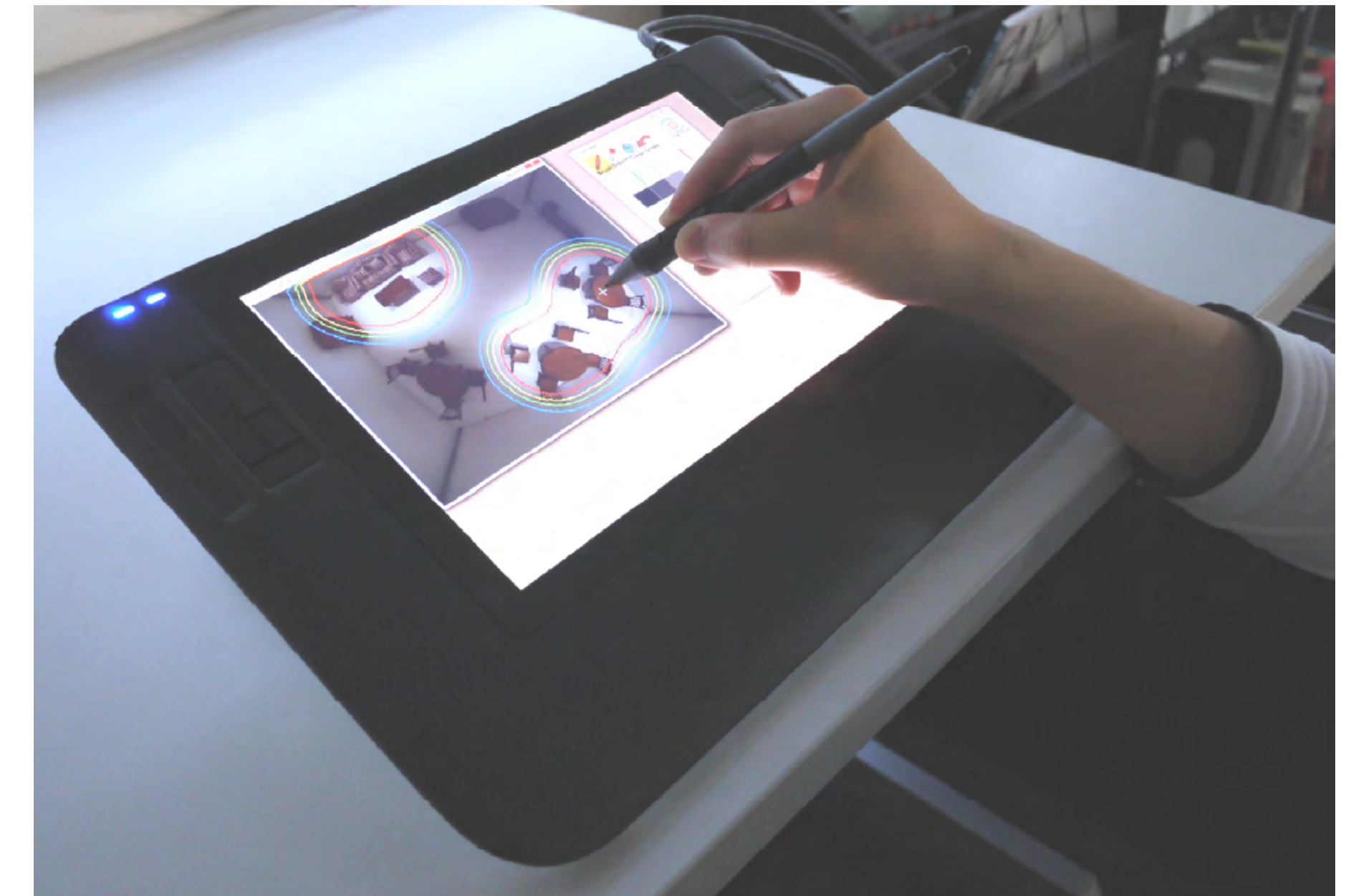
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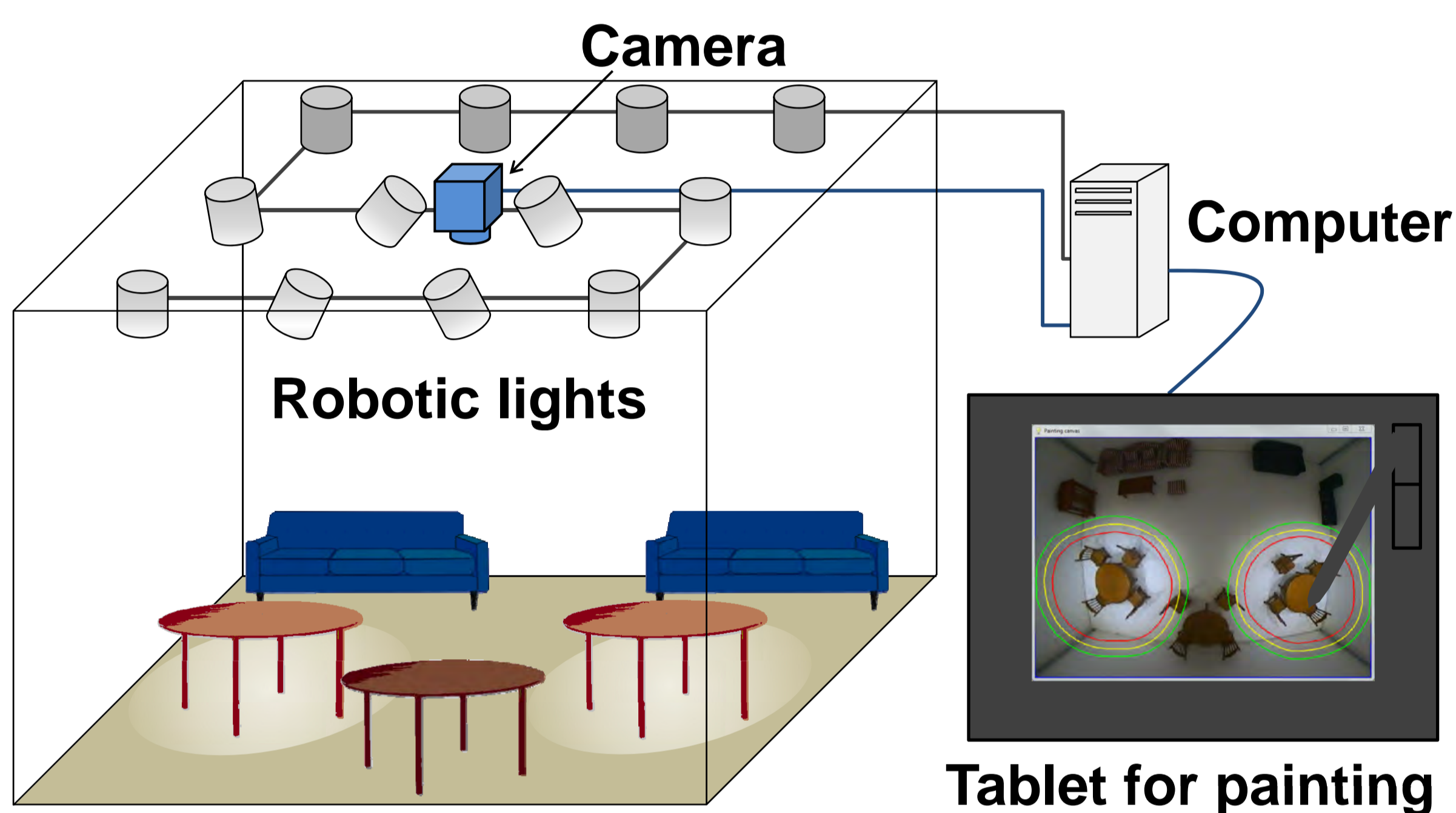
Introduction

Lighty is an AR interface that enables users to easily design an illumination distribution for a real room using an array of computer-controlled lights.

Users specify which area of the room is to be well-lit and which is to be dark by painting an illumination distribution on a tablet device displaying an image obtained by a camera mounted in the room.



System Overview



Painting interface

It allows the user to design the illumination distribution of the room by painting the desired illumination directly onto the camera image.

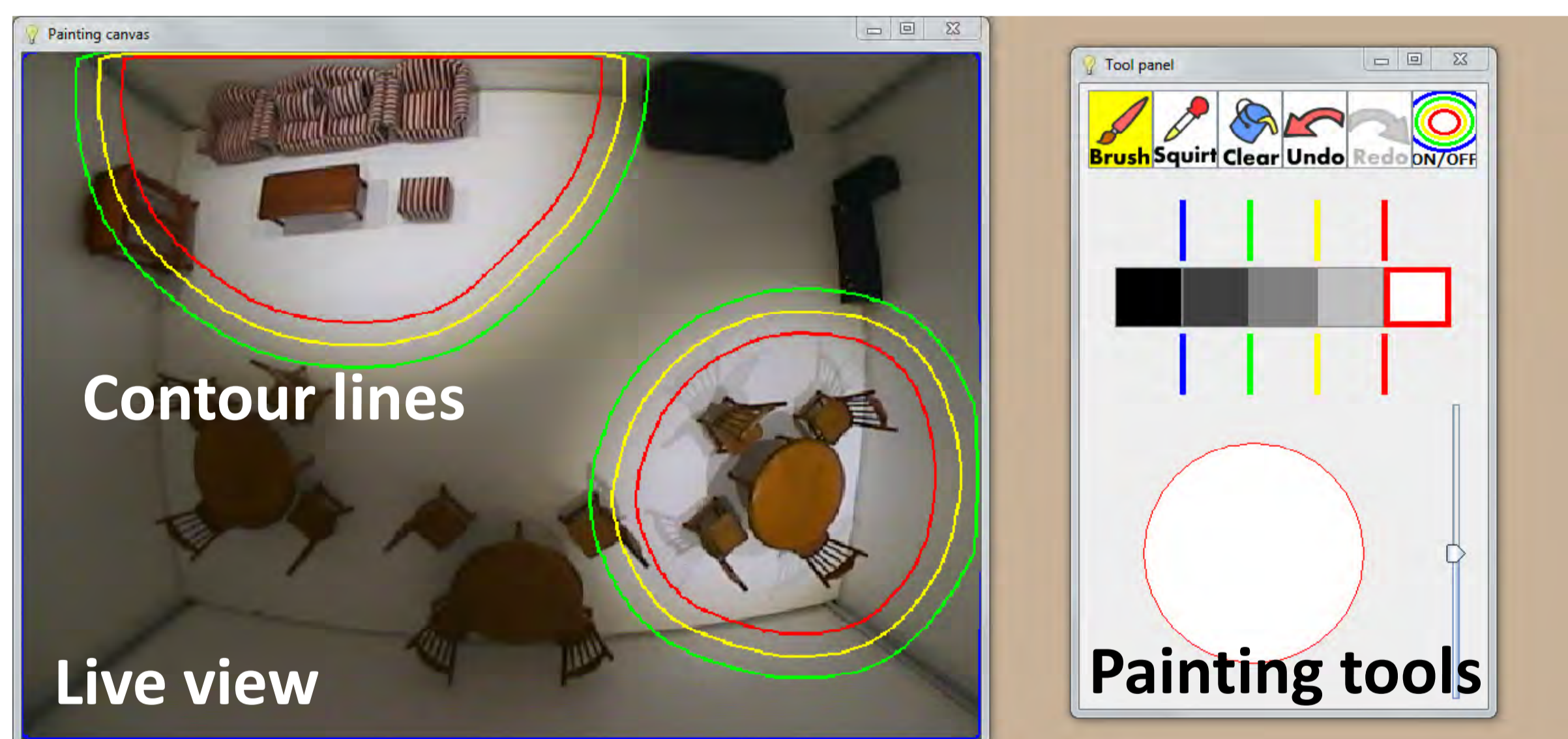
Optimization module

It interactively calculates the parameters of the lights that will satisfy the desired illumination distribution request.

Light control module

It sends the calculated parameters to the lights.

User Interface



The user specifies the desired intensity on the live view by painting.

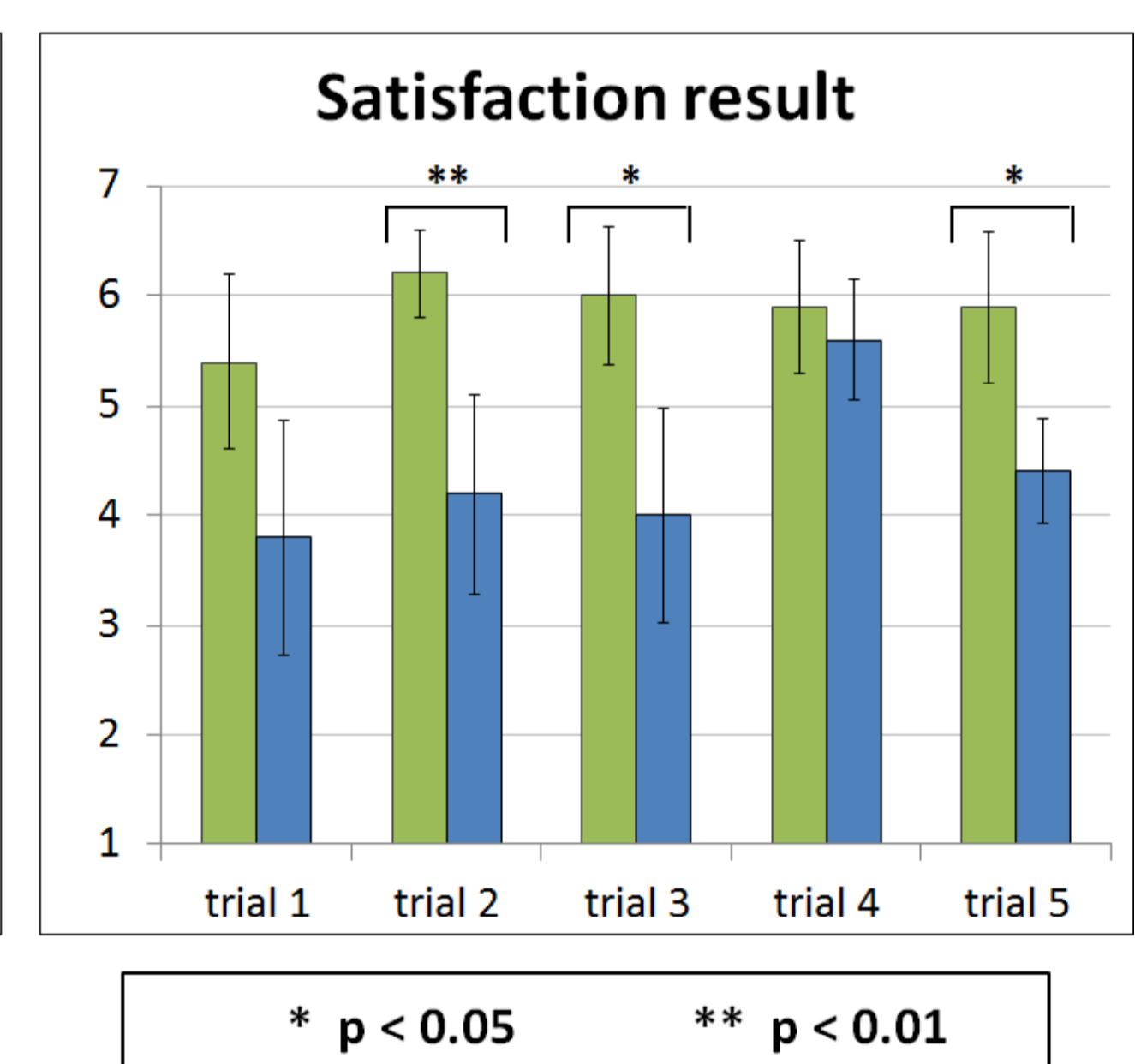
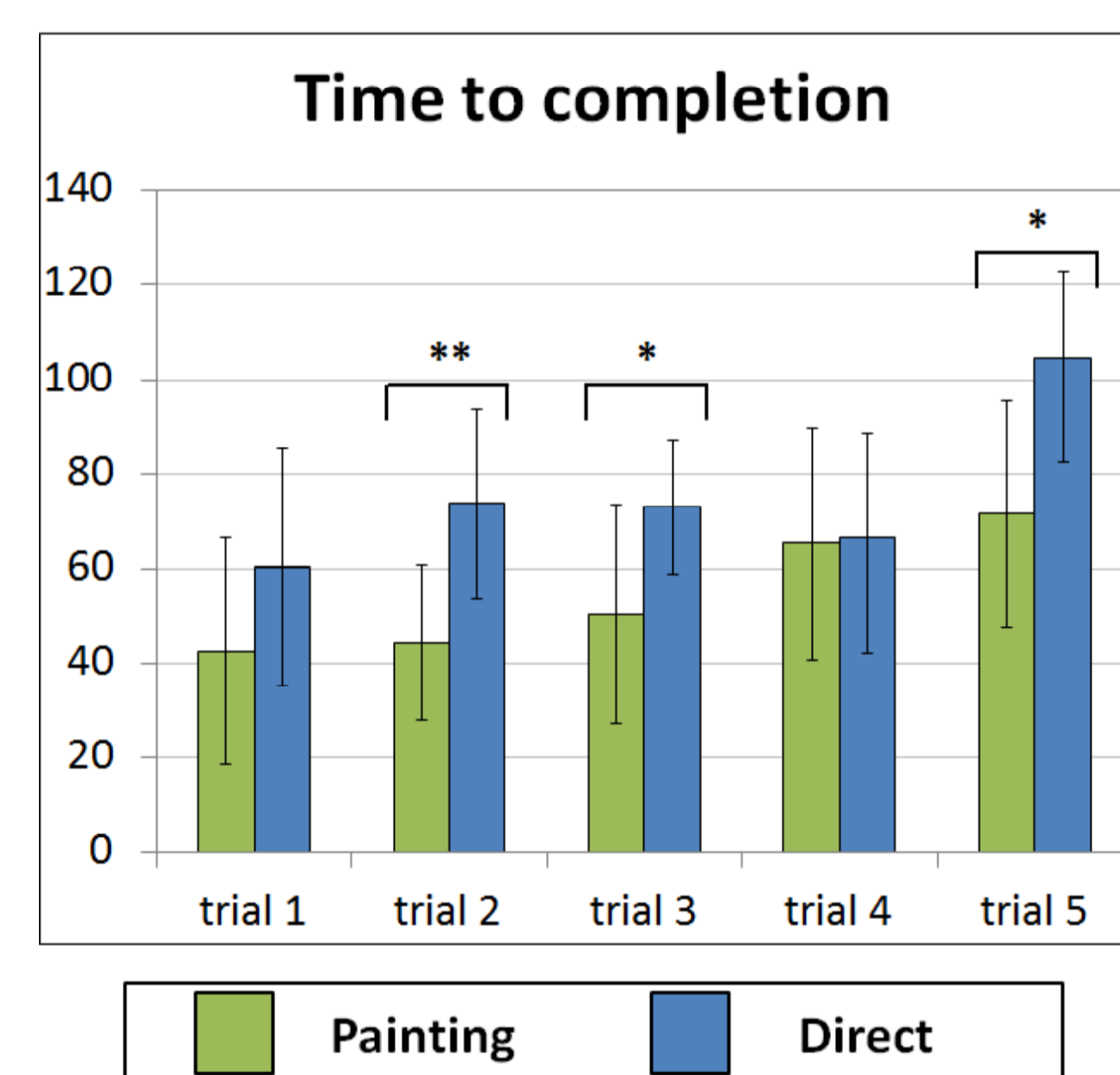
Previous painting interfaces for lighting design showed the painting canvas (target image) and illumination result separately.

In our system, both views are merged into one screen and the painting result is visualized as contour lines of the target illumination intensity overlaid on the live view.

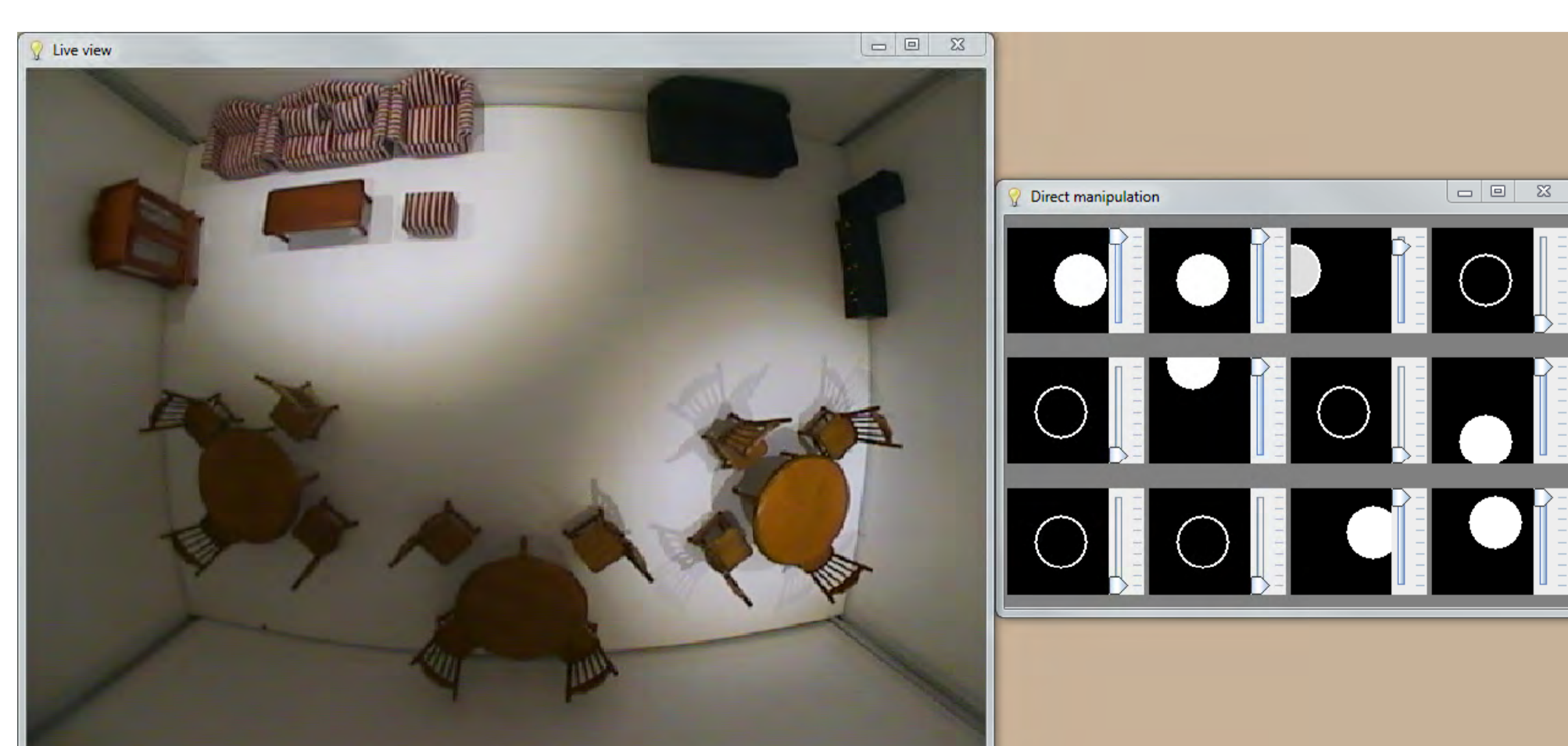
Evaluation

We built a miniature-scale experimental environment and ran a user study to compare our method with a standard direct manipulation method using widgets.

The results showed that the users preferred our method for informal light control.



Miniature-scale prototype



Direct manipulation method

Trial	Task instruction and results
Trial 1	Make the left and right circular tables brighter while keeping the remaining area the same brightness.
Trial 2	Make the center and right circular tables illuminated well. The upper left area where the sofas and cupboard exist should be darker.
Trial 3	Make the entire room brighter. However, the areas around the left circular table and upper right sofa should be dark.
Trial 4	Make the left side of the room bright and the right side dark, gradually changing the brightness in the middle.
Trial 5	Make the upper right sofa bright and radially decrease the brightness around the sofa.

Task instruction and results