

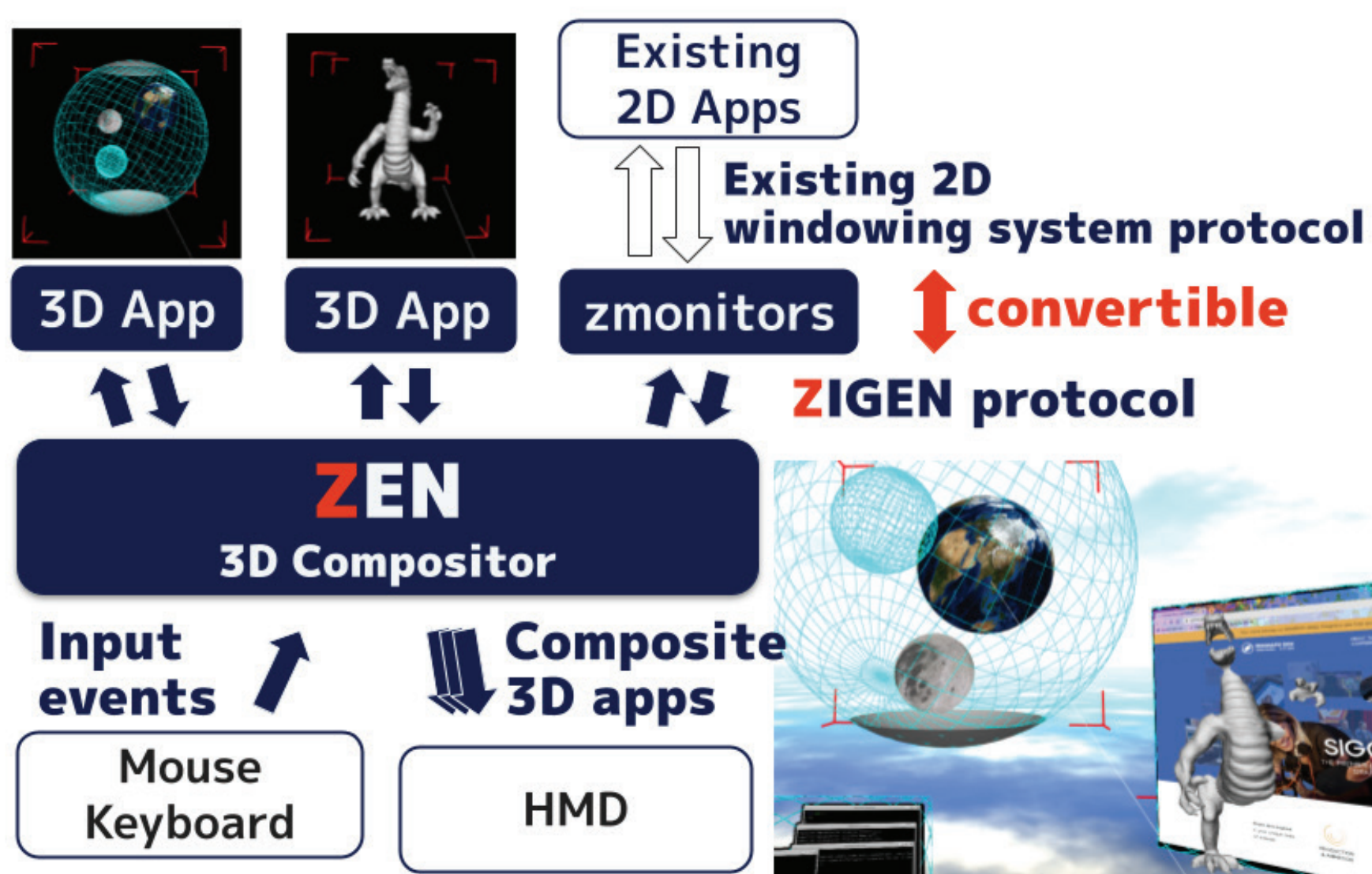
ZIGEN: A WINDOWING SYSTEM ENABLING MULTITASKING AMONG 3D AND 2D APPLICATIONS IN IMMERSIVE ENVIRONMENTS

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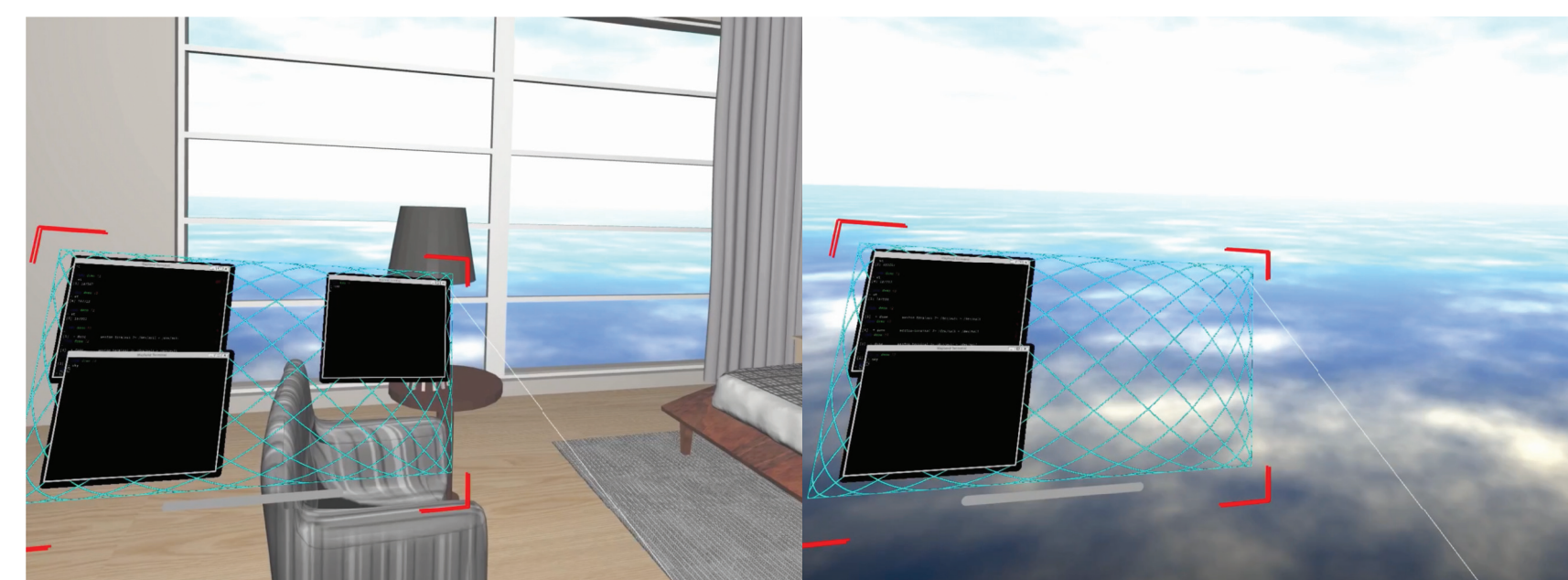
PROBLEM

- Windowing systems make the 2D desktop environment a sophisticated multitasking space by providing multiple applications as a overlapping windows, abstracting input event and defining input focus, drag-and-drop, etc.
- In current immersive 3D user interfaces, basically one main application dominates a user's entire field of view, and we cannot install multiple applications of the user's choice and use them simultaneously to create the user's own 3D workspace.

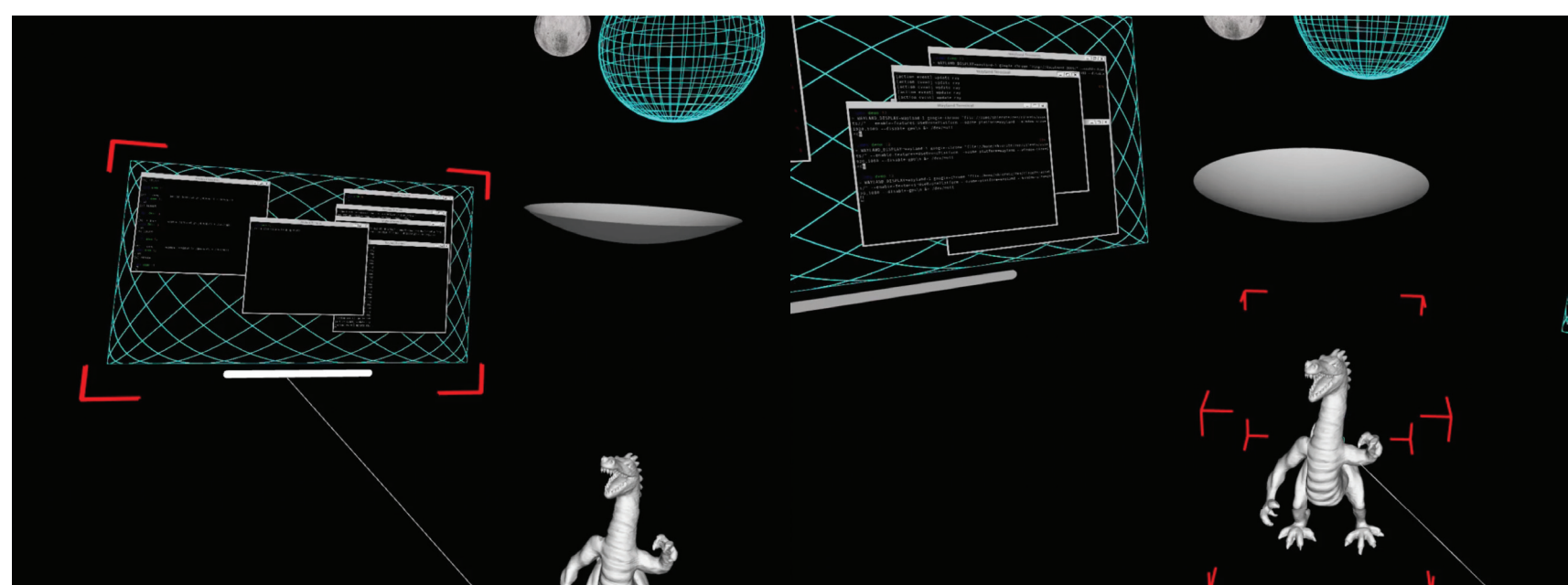
METHOD



RESULTS



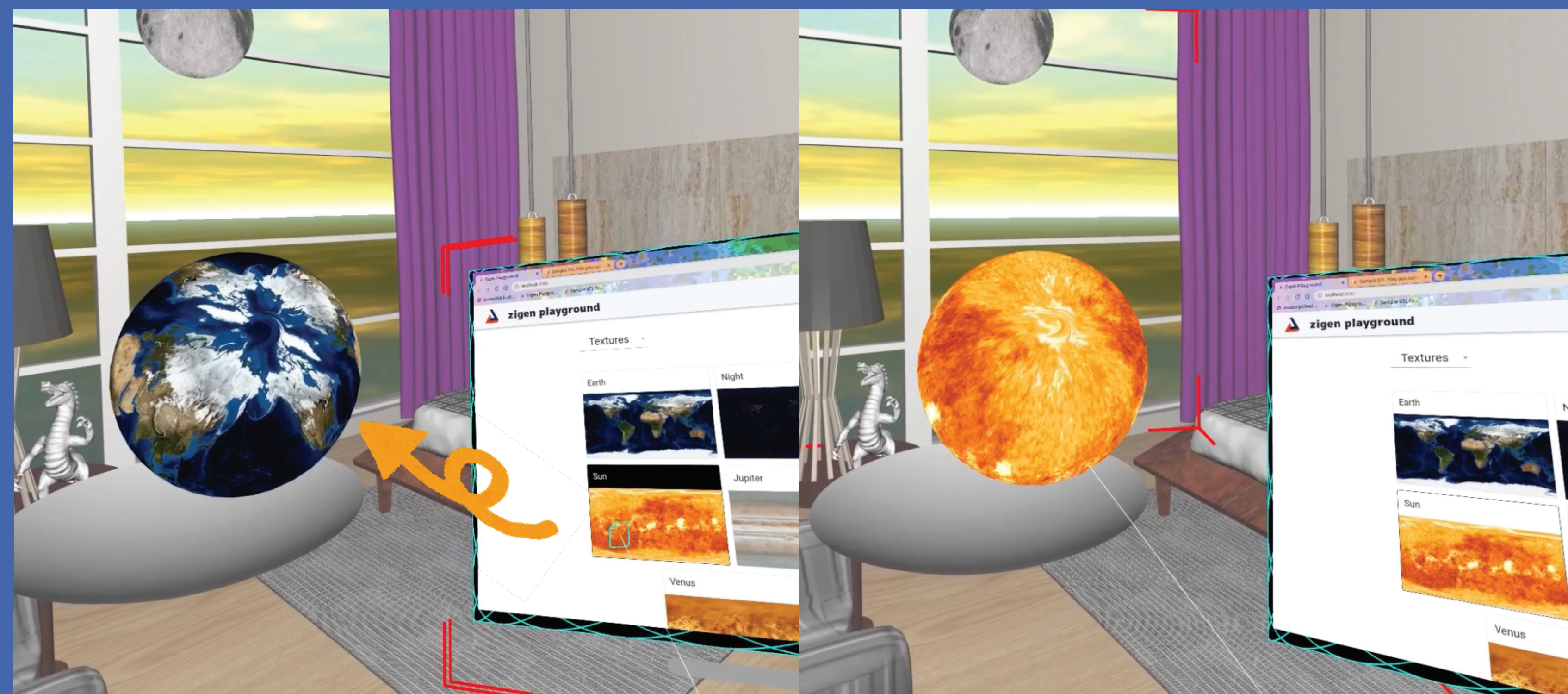
Launch/Kill each application as a single process.



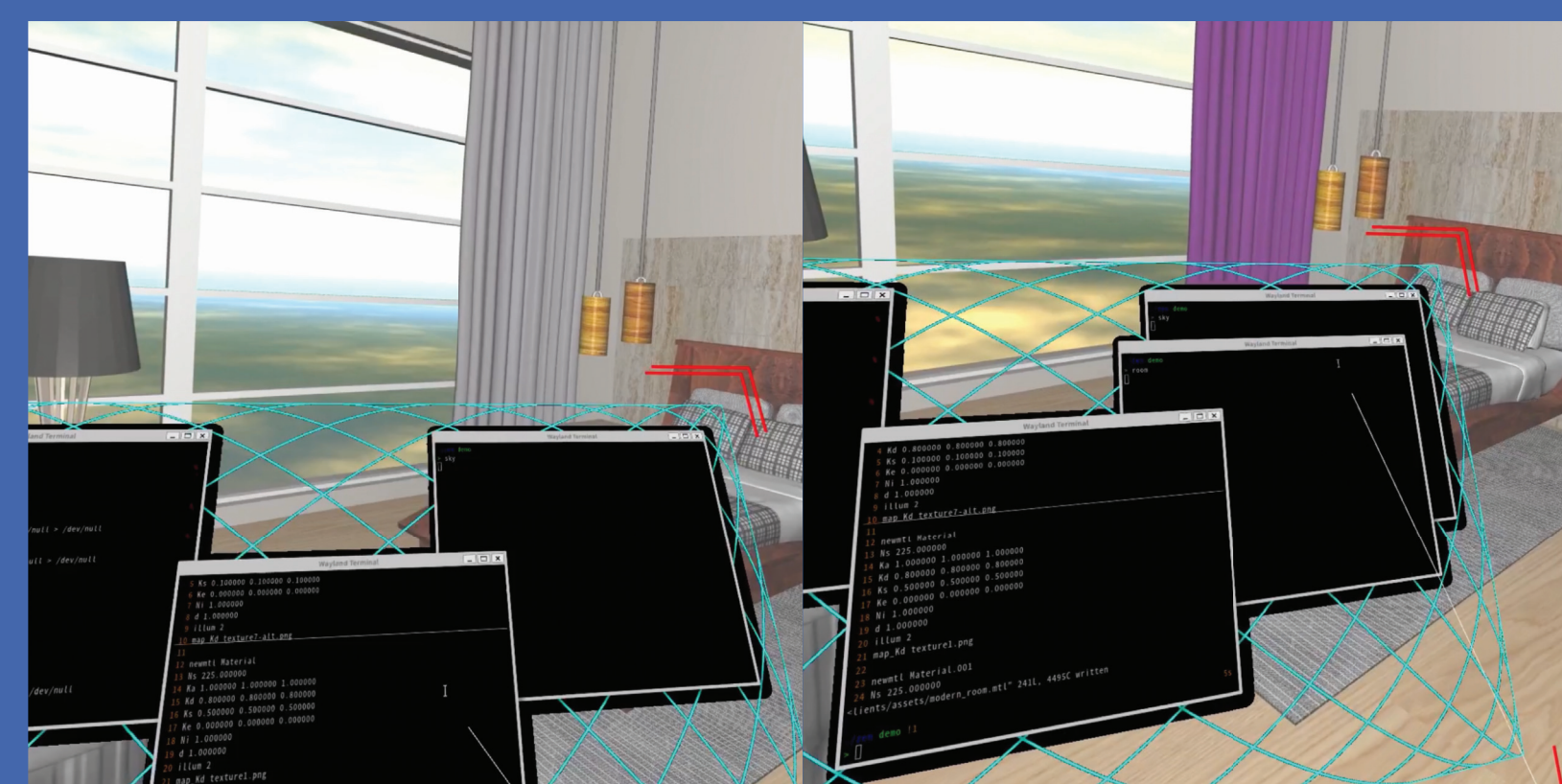
Only focussed 3D application receives input events.

- Reduction of communications with applications
- Optimization of computational resources

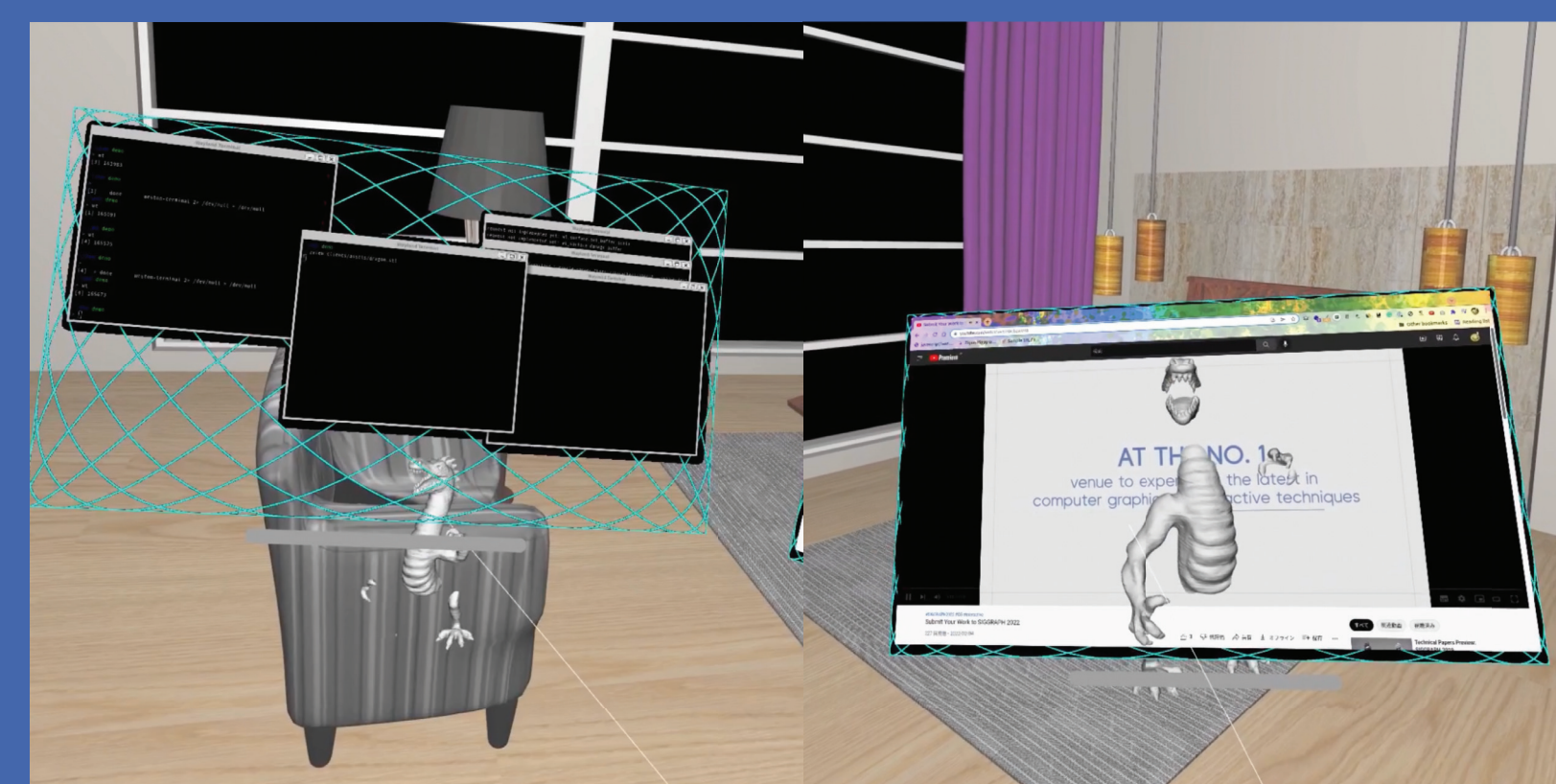
WINDOWING SYSTEM FOR MULTIPLE 3D APPLICATIONS AND EXISTING 2D APPLICATIONS MAKES MULTITASKING MORE PRACTICAL



“Drag-and-drop” between 2D and 3D applications.



Rebuild 3D application without leaving 3D space.



Composite multiple applications in 3D space.

OUR APPROACH

- Redefine a 3D windowing system protocol based on Wayland protocol, and implement a 3D display server, to provide event transmission from input devices to focussed applications, multi-application rendering composition, etc.
- Design the protocol following the OpenGL API that passes vertex buffers, shaders, and other parameters, and make applications independent of the model-view-projection matrix, to reduce communications for rendering and render frozen applications.
- Place a 2D display server between 2D applications and the 3D display server, which enables drag-and-drop between 2D and 3D applications, optimization of computational resources, and frame synchronization with head-mounted displays.

RELATED WORK

- Forrest[1] extended windowing systems to three dimensions to absorb the differences among various virtual reality devices, yet he did not deal with data transfer between applications.
- OpenXR's overlay feature[2] allows auxiliary applications to be displayed together with the main application, yet it does not provide a mechanism for assigning input events to multiple applications without conflicts, nor for transferring data between applications.

REFERENCES

- Forrest F. Reiling.2014. Toward General Purpose 3D User Interfaces: Extending Windowing Systems to Three Dimensions.
- The Khronos Group Inc.Accessed February 22, 2022. The OpenXR Specification - Version 1.0.22.

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FULL PAPER



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DEMO VIDEO

