

# Math on a Sphere: An Interactive Exploration of 3D Surfaces for Public Audiences

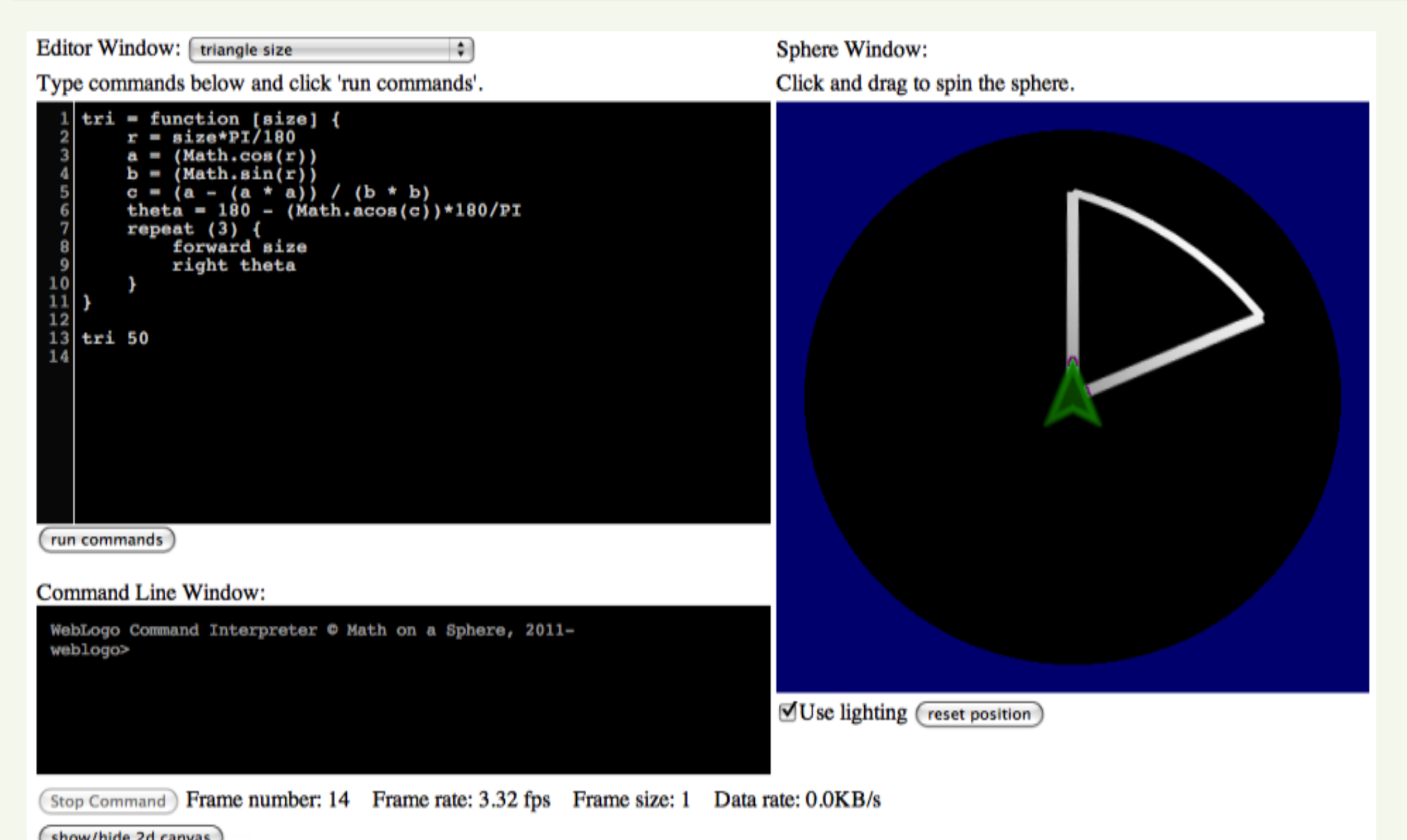
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## TARGET AUDIENCES

- Youth ages 9 -18
- Museum interns and educators
- General visiting public

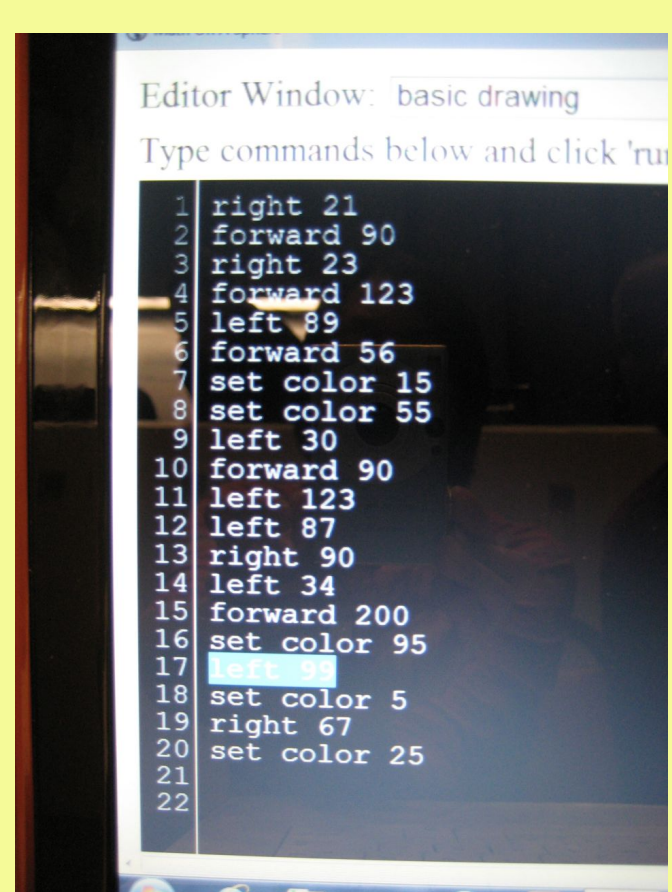
## END USER INTERFACE



## SAMPLE PROGRAMS

```
// This demonstrates how to write and call a //
function that has a single parameter.

tri = function [newcolor] {
  set color newcolor
  repeat 3 {
    forward 90
    right 90
  }
  tri "green"
}
```

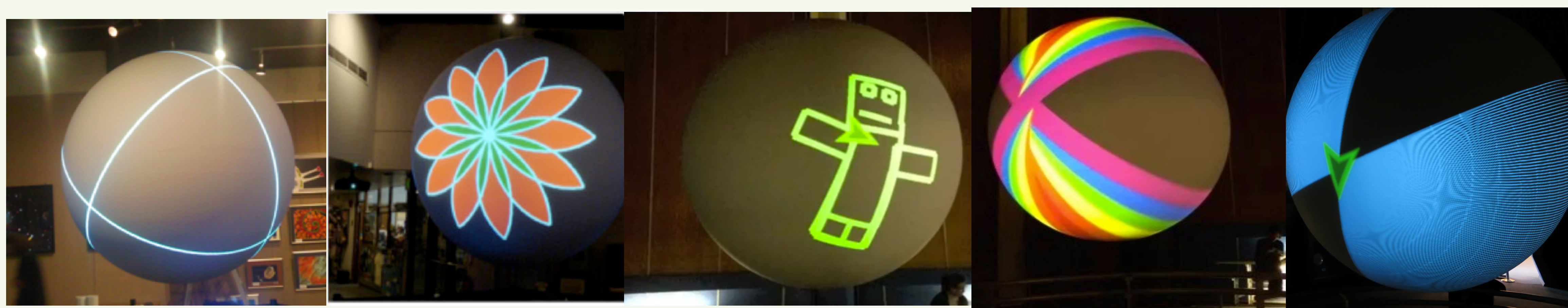


## ABSTRACT

*Math on a Sphere* is an experimental Web-based learning environment that enables children to imagine, program, and share artful designs on a public display exhibit using a large spherical projection system, the NOAA Science on a Sphere (SOS).

There are about 80 installations of the sphere in science centers, planetariums and museums world-wide. These spheres display pre-programmed science content. This project will extend the interactivity and content of the SOS with visitor-generated content. The resulting application will be available to both installed spheres and those institutions thinking about purchasing and installing the sphere display.

@Fiske Planetarium



## DELIVERABLES

- 1) A desktop toolkit - A spherical programming interface, a direction manipulation interface, and a web infrastructure.
- 2) Workshop activities for implementation in science centers and camps.
- 3) Front-end survey about potential use for MoS. N=200 (10% respondents of the 2000 institutions solicited; 50% of SoS installed or planned.)
- 4) Formative evaluation (pre-post survey, observations, interviews) of user testing. (N = 200, 100 at each site, 20 users per iteration).
- 5) Summative evaluation with target number = 100 learners, 20 families; Interview and focus group subsample of 20 learners, 5 families.

## KEY QUESTIONS

- Does the toolkit engage learners in geometric and computational ideas? Does it empower the learners/visitors to be creators, makers, and/or content developers?
- Is the model compelling to a variety of ages – does the toolkit alone or with public presentations at an SoS engage docents and visitors to be more active and interested learners? What are learners gaining from this experience?
- What is the response of the ISE field and SoS users to such a tool that allow users to have control of the display and author content for public consumption?
- What are the challenges with installing and operating a remote video camera for SoS? Does it engage youth and family audiences to participate in museum programs?
- Is the model perceived as useful and compelling to informal science institutions that have Science on a Sphere installed or planning to have installed? What are the specific opportunities and/or barriers?

@Lawrence Hall of Science

## DESIGN AFFORDANCES



design & make



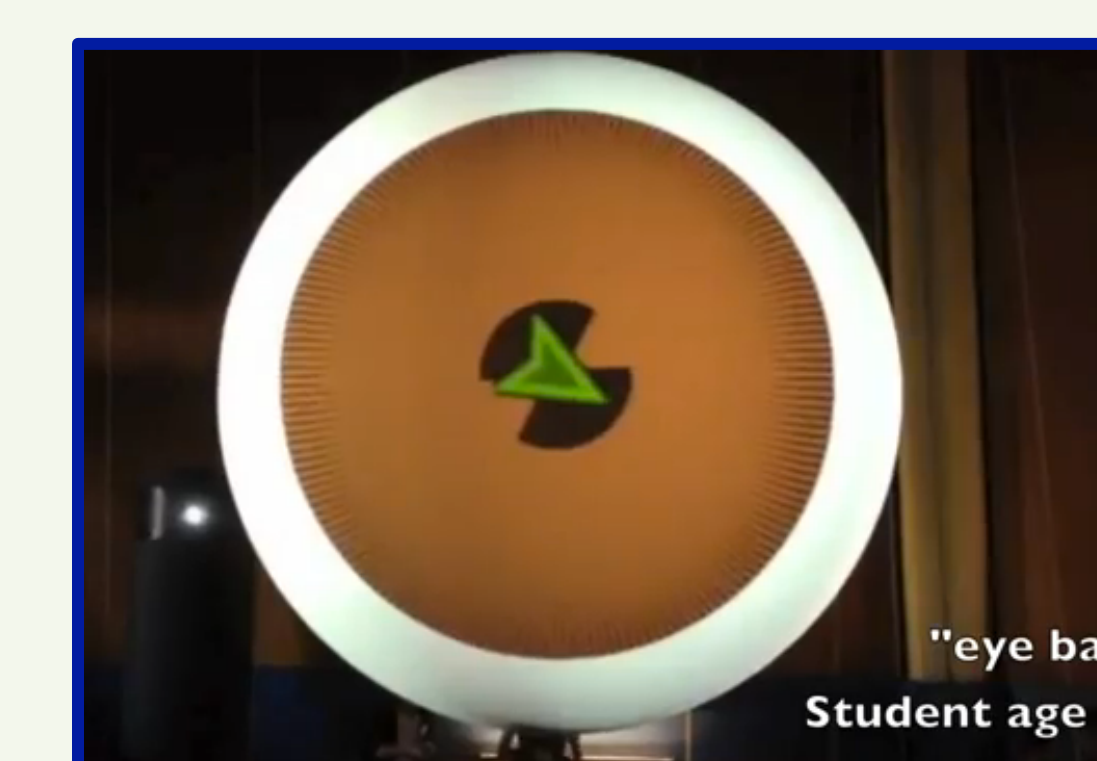
spherical geometry



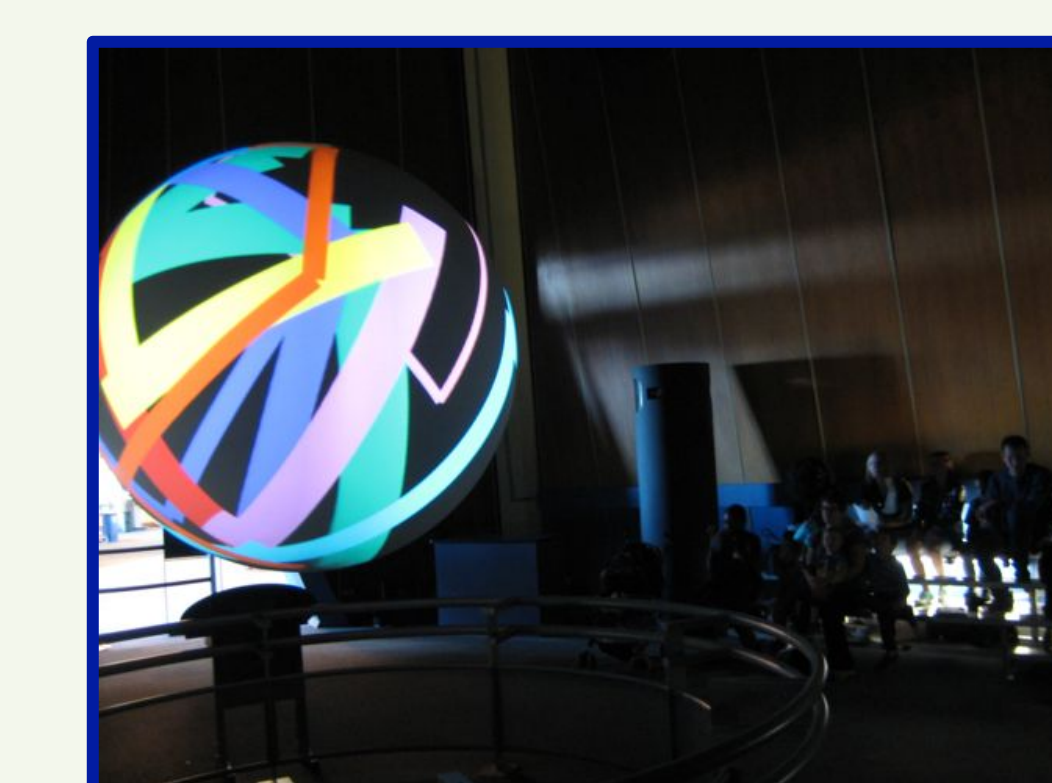
experimentation



computational thinking

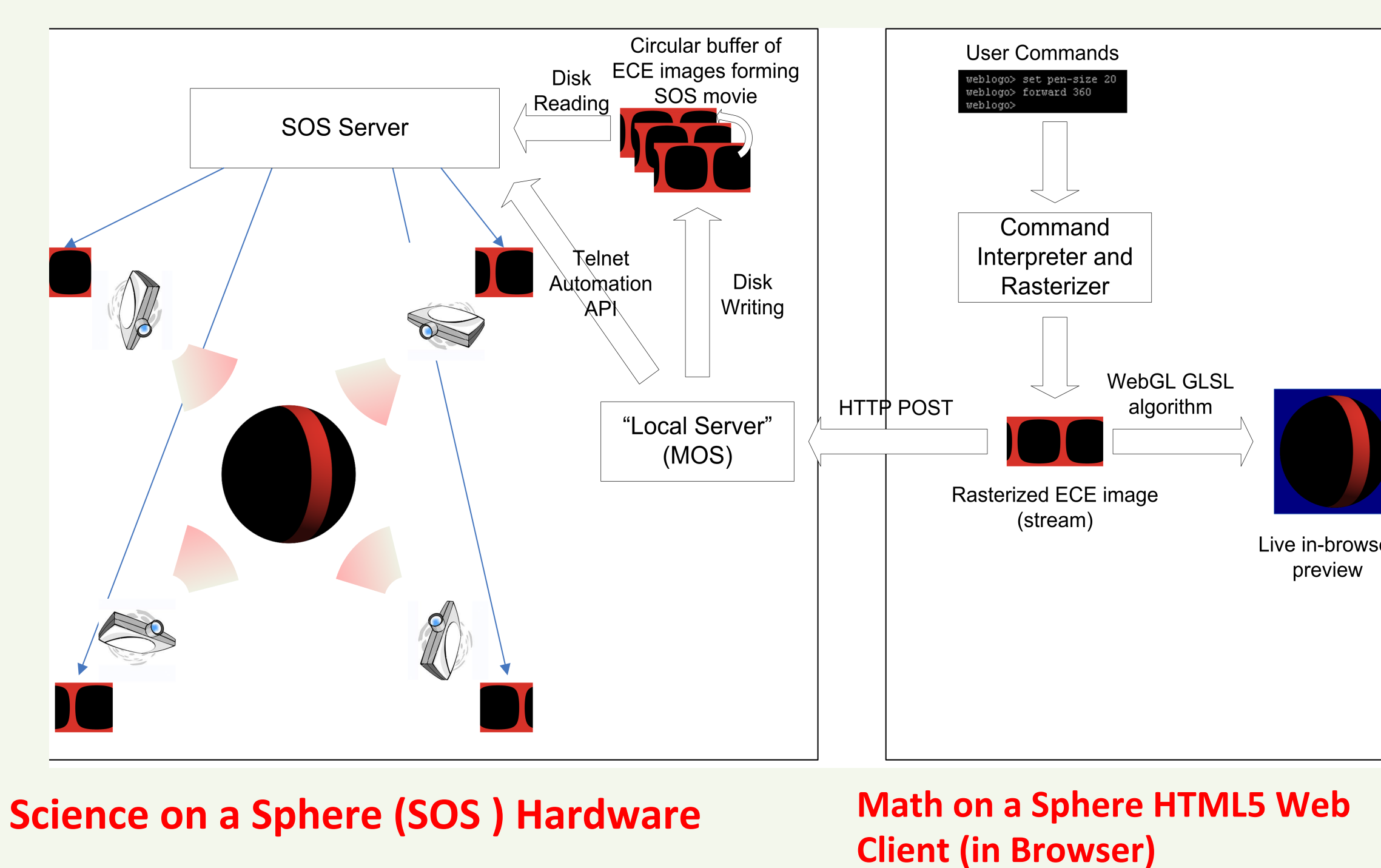


public display of learner's creativity



presentation & reflection

## MOS SYSTEM ARCHITECTURE



## BROADER IMPACTS

- To improve the profession's knowledge base on the feasibility of using large-scale, special-purpose public screens and surfaces for informal education in public programs and exhibits with audience-contributed content
- Use existing high-end visual displays, the Internet, and a novel software toolkit, informal science institutions to extend their reach to broader audiences to enable more learners to participate, contribute, and take more ownership for STEM ideas and designs found in museums and science centers.