THESIS:

Exploration of Complex Multidimensional HCI (Human to Computer Interaction) Methods

PRESENTED BY BILL PHAN

ART470 THESIS
PORTLAND STATE UNIVERSITY
LEADING PROFESSOR MEREDITH JAMES

OBJECTIVES & GOALS;

To develop an interactive system using non-traditional technologies to help aid in data visualizations for use in scientific and medical industries as well as for educational laboratory and classroom purposes.

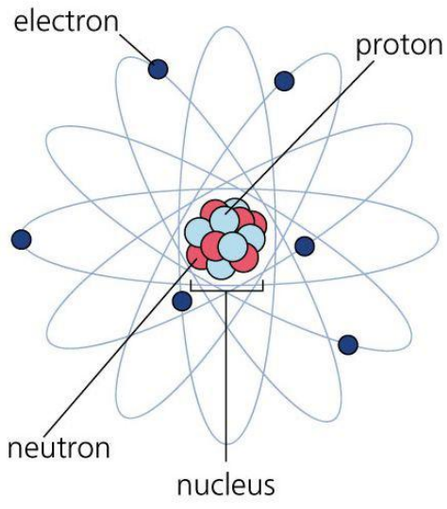
CONCEPT & RESEARCH

PARTICLE & QUANTUM PHYSICS

AUGMENTED REALITY (AR) TECHNOLOGY

X: PARTICLE & QUANTUM PHYSICS

- Particle physics is a field of study that explores the nature of subatomic elements.
- It is still understood in a very two dimensional framework.
- Quantum Theory is in actuality a multidimensional field of study.
- Breaking free of current technology limitations could allow for greater and more interactive data visualization.



Bohr’s Standard Model

Y: AUGMENTED REALITY (AR) TECHNOLOGY

- An augmented reality system essentially supplements the real world with virtual (computer- generated) objects that appear to coexist in the same space as real world reality. (Azuma, 2001).

- In order for something to be AR it must combine real and virtual objects in a real time environment. It must also run interactively with a viewer and registers and aligns real and virtual objects with each other.

REFERENCE: AZUMA, R., BAILLOT, Y., & BEHRINGER, R. (2001) RECENT ADVANCES IN AUGMENTED REALITY.

CONCEPT & RESEARCH

X: PARTICLE & QUANTUM PHYSICS

+

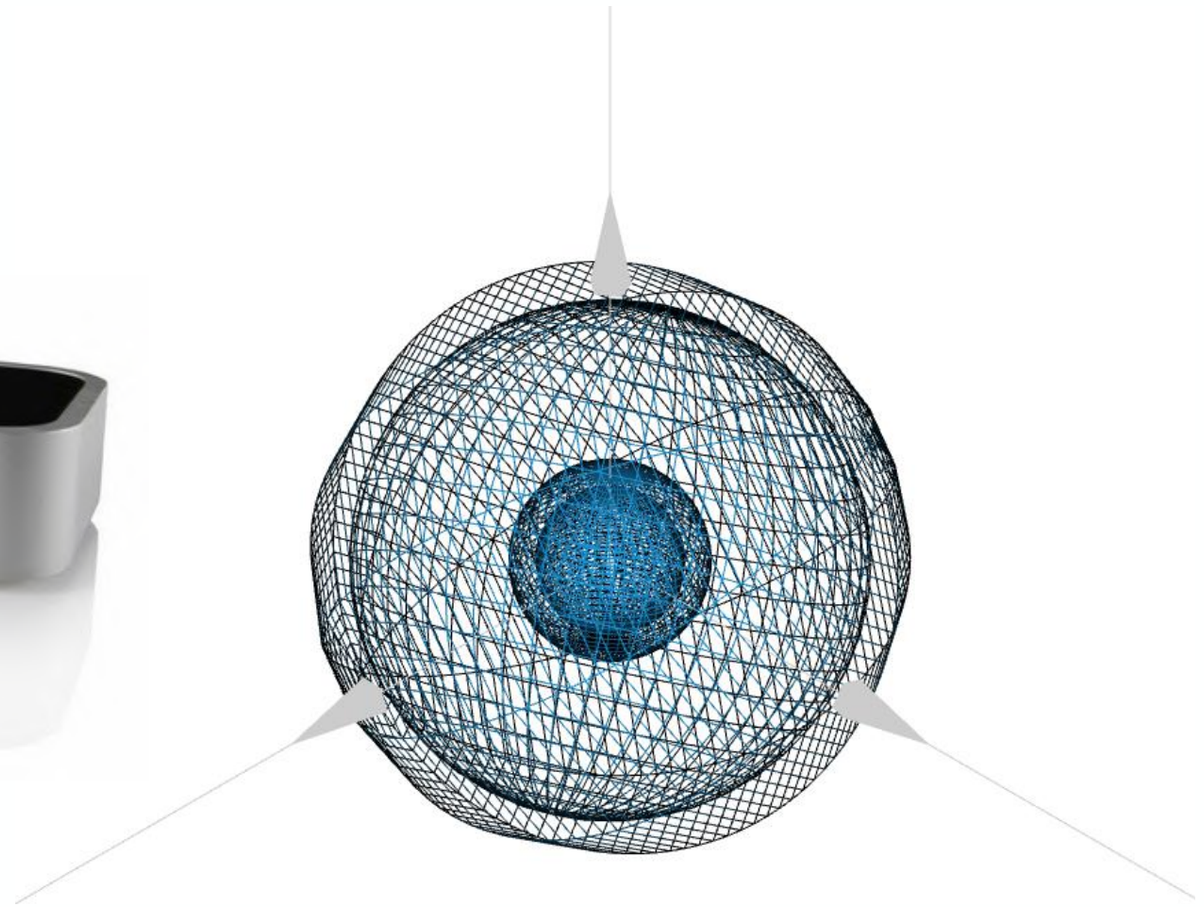
Y: AUGMENTED REALITY (AR) TECHNOLOGY

X + Y = An Interactive Atomic Model

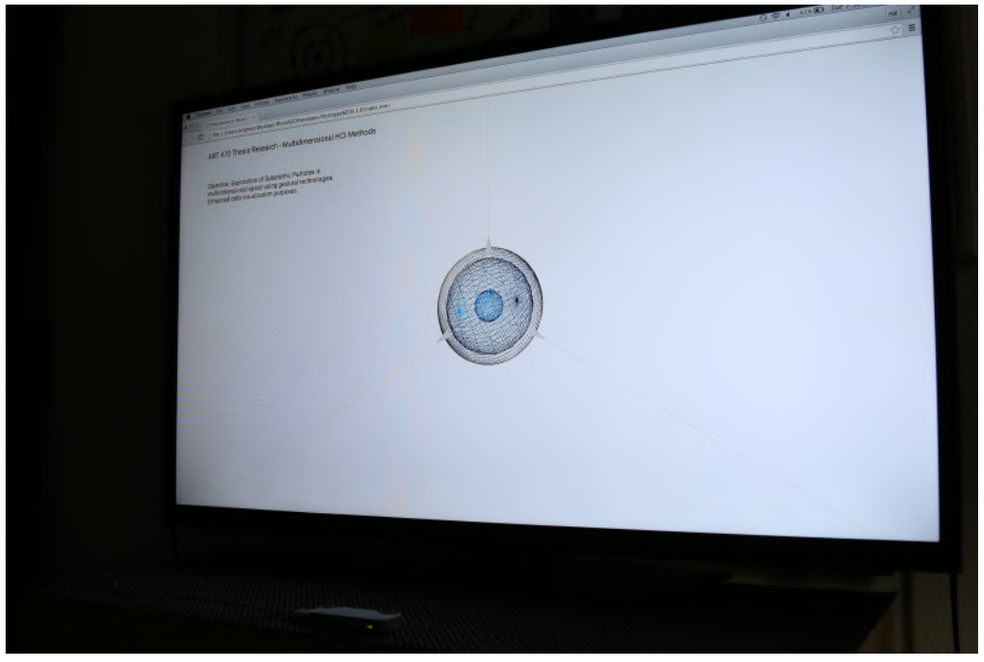
REFERENCE: AZUMA, R., BAILLOT, Y., & BEHRINGER, R. (2001) RECENT ADVANCES IN AUGMENTED REALITY.

PROTOTYPE & PROOF OF CONCEPT

Developed an in-browser software with Javascript integrating the Leap Motion Sensor hardware and Three.JS modeling framework for model construction.

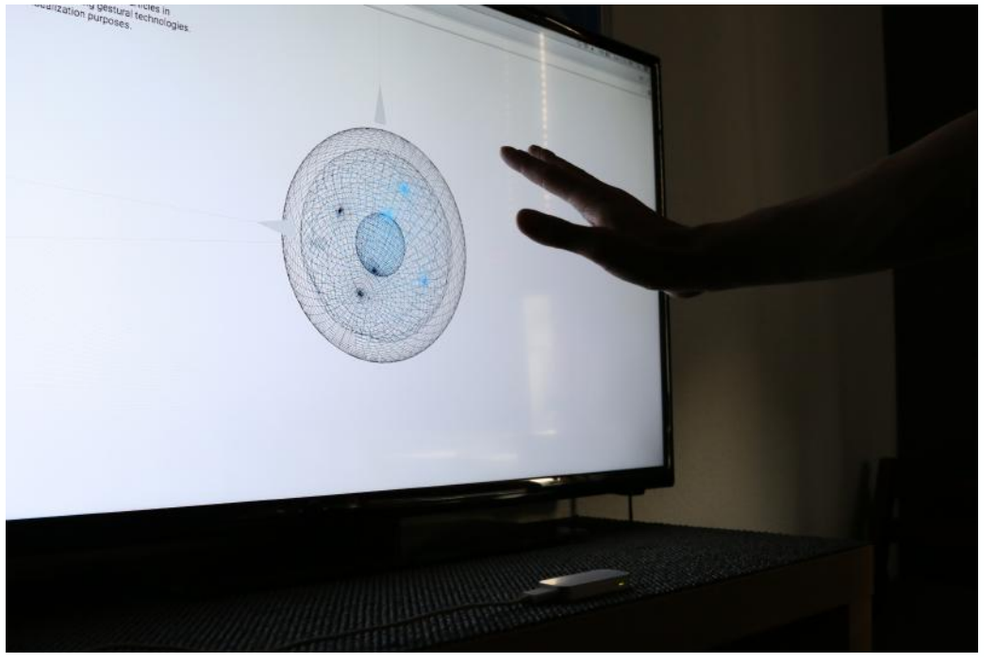


TINKERING | PROTOTYPING | EXPERIMENTATION

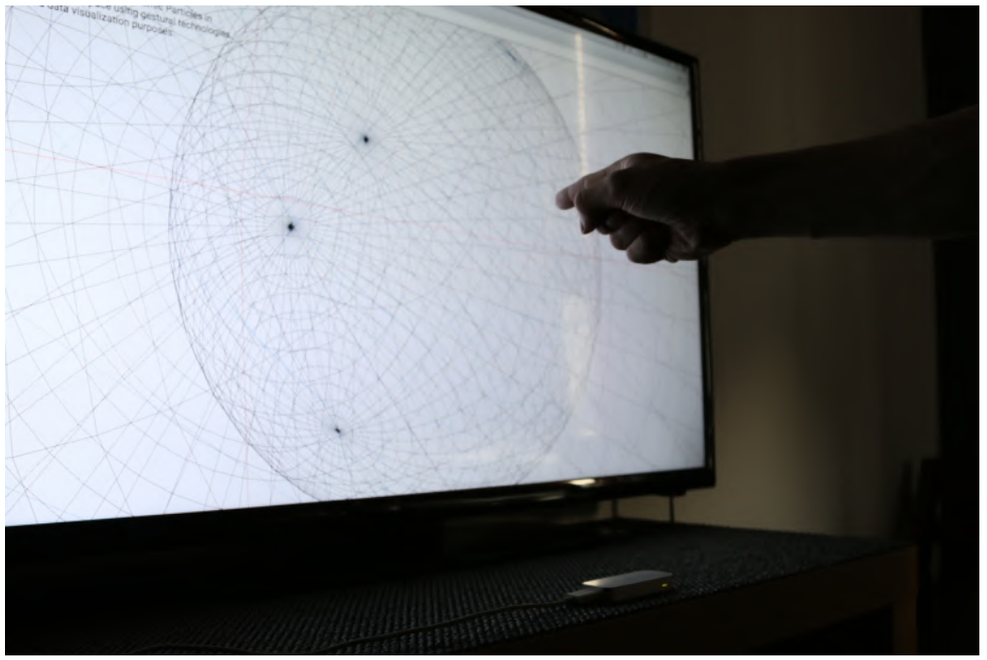


Pre-Beta In-Browser Development

Leap Motion Sensor Connectivity



Motion Integration Test #1



Motion Integration Test #2

Mounted Pico Projector & Motion Sensor

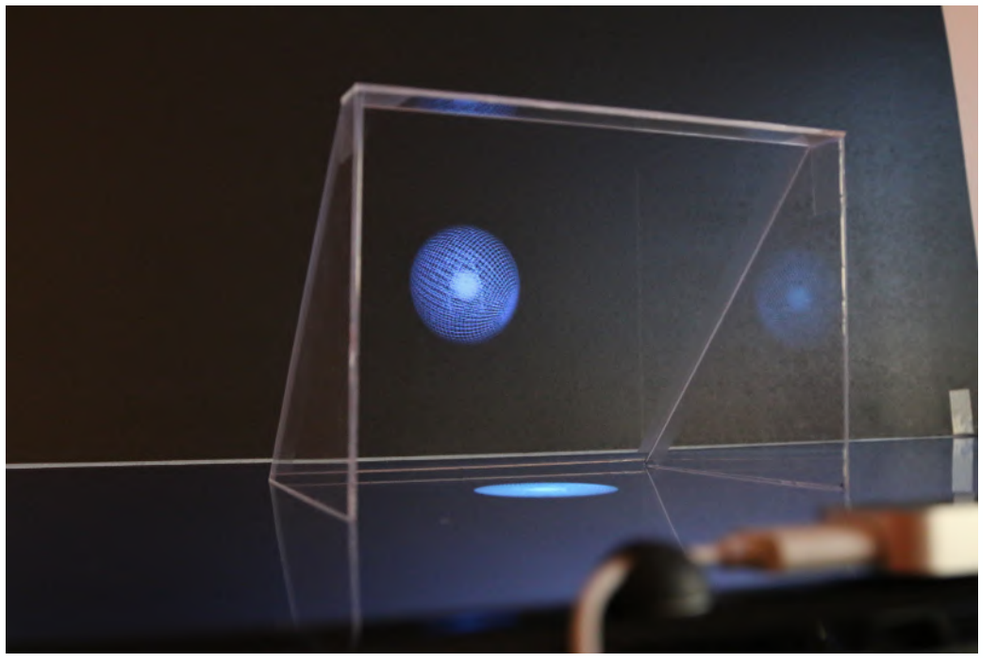
Experimental Projection on Glass Sheet

Experimental Projection on Frosted Glass

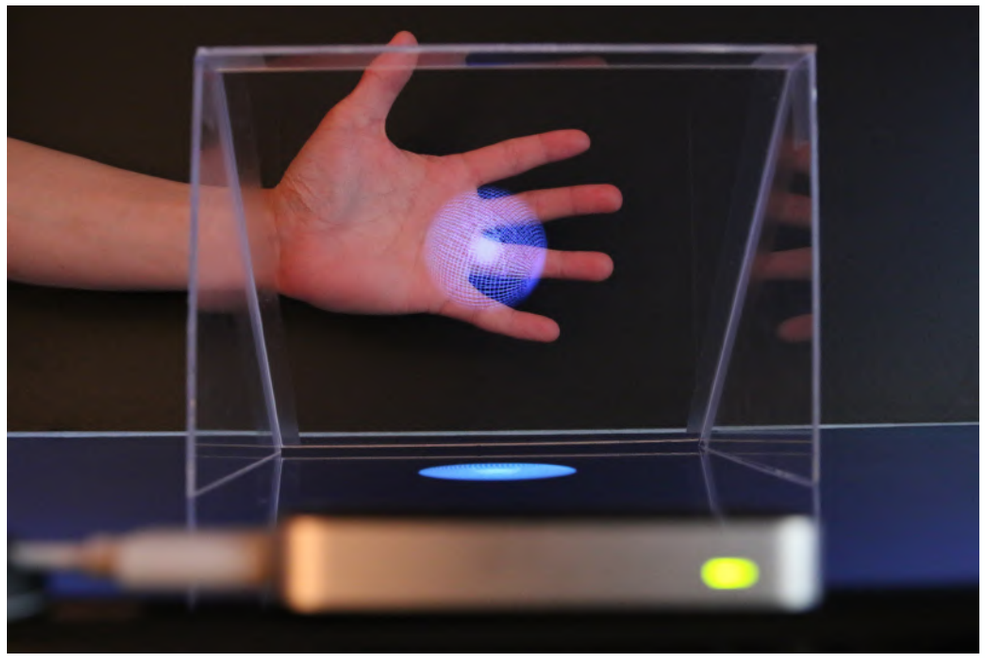
Result; Limited Visibility

Polycarbonate Refraction Test #1

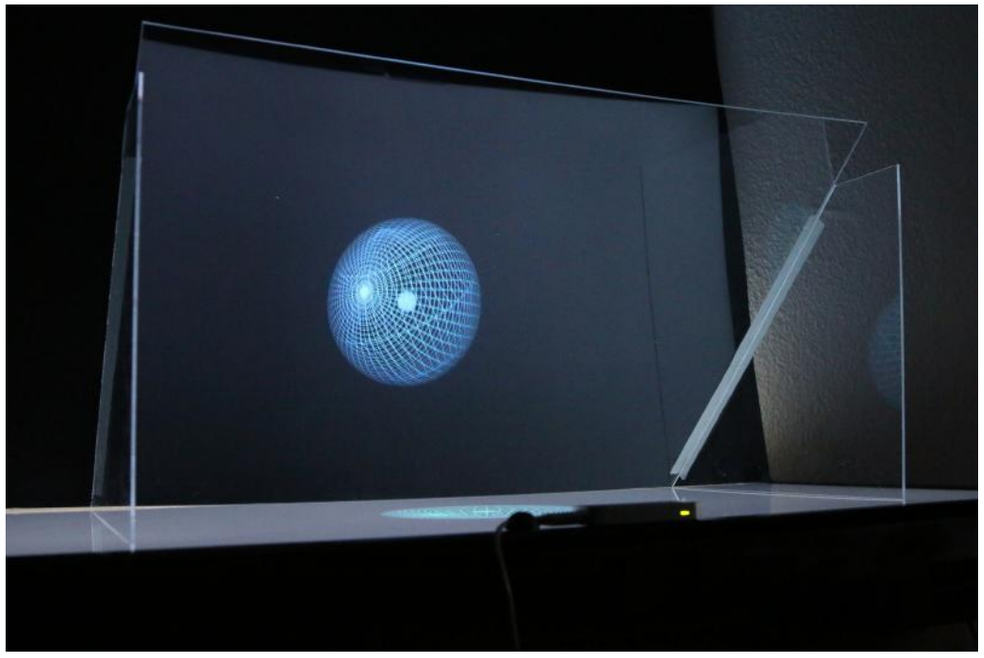
Refraction Test Results



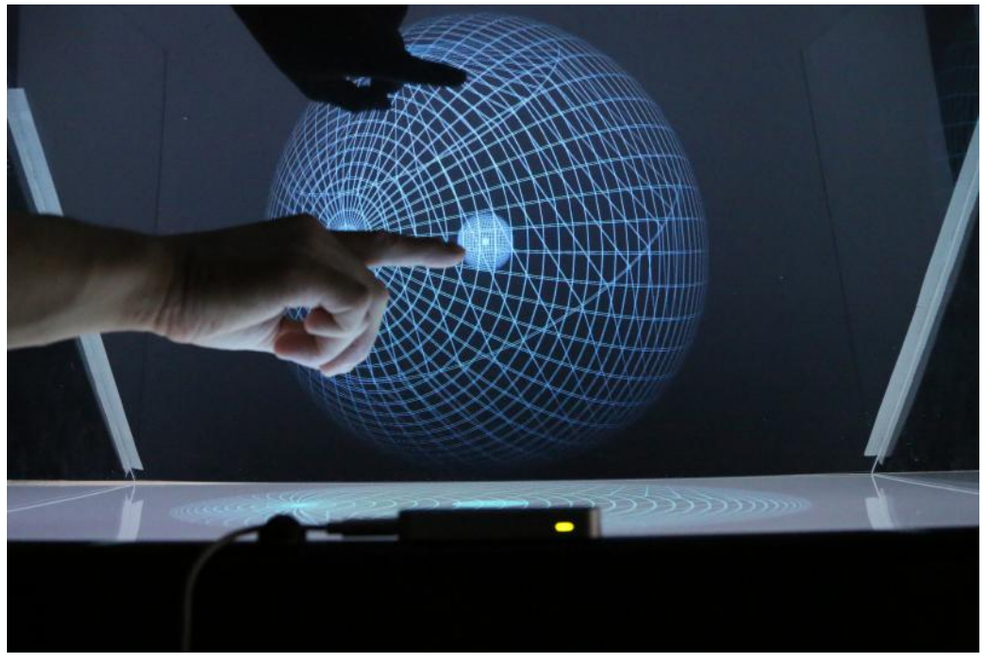
Polycarbonate Build V.1.0 (Small Scale)



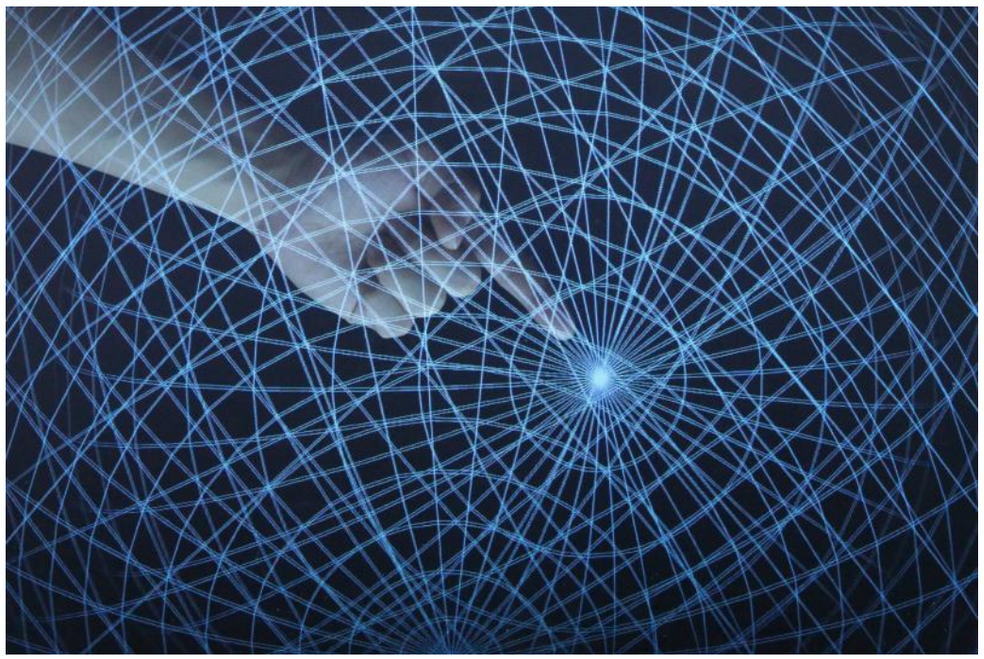
Polycarbonate Build V.1.0 (Small Scale) Result



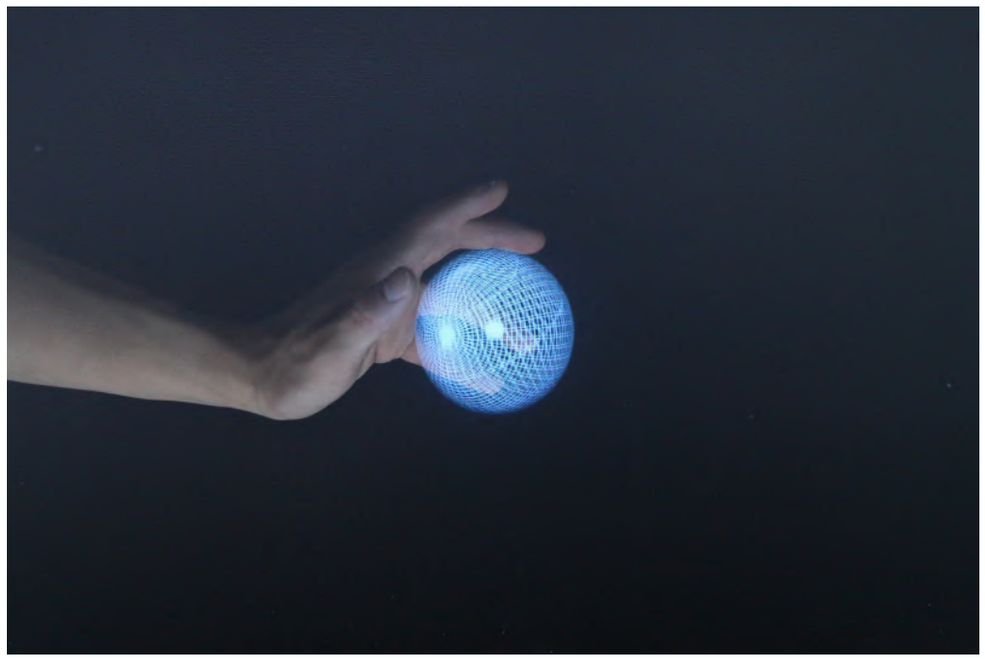
Polycarbonate Build V.2.0 (Large Scale)



V.2.0 Refraction Result



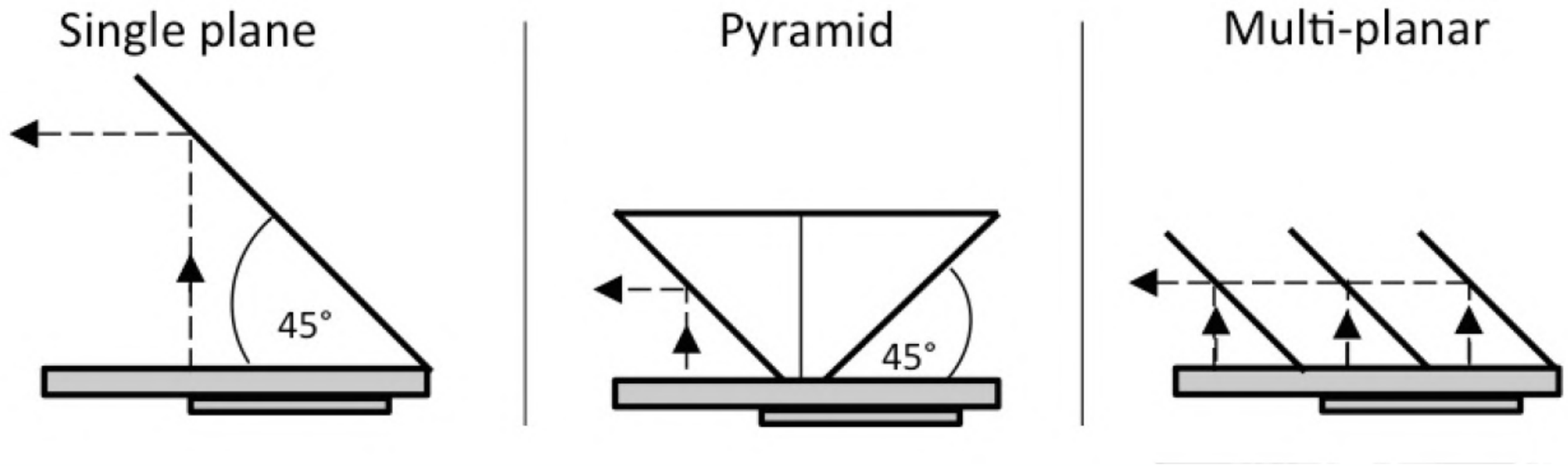
Transparency Effectiveness Test



100% Functionality Achieved (Beta V.0.9)

THEORY & CONCEPT;

Using a light refraction technique called Pepper’s Ghost. Angular reflective frame at 45° angle over a projected surface creates effect in what seems like open space.



DRAWBACKS & ROADBLOCKS;

- Lack of technological resources and equipment.
- Use of augmented reality & holographic displays are currently underdeveloped.
- Single perspective visibility and size restrictions.
- Still learning about complex development and prototyping.

CONCLUSION;

The concept of augmented reality using motion sensor technology and projection mapping techniques can be applied to particle physics (or any other branch of science) to explore what could not be ordinarily explored through traditional means of interacting with a computer system.

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