

Holograms

Ver.2

The Big Idea

For Leaders Only

- Humans can't see around bends, so assume that objects they see are right in front of them, even if it's only a reflection.
- Humans sense the distance to an object using focus & eye angle
- We can make an image appear to float in space by using a partial reflector, of an object that is some distance away from the reflector.

Intro + Holograms (3 min)

Introduce yourselves

Observe Commercial Holograms

How does our brain decide that something has depth?

- Eg. shading, colors, turn the hologram and see behind etc.

How do you make something look 3D on a 2D surface?

- Eg. Art/drawing

How does a hologram show depth differently than art (paintings etc.)?

Focal Distance + Eye-Crossing (6 min)

Remember to give instructions FIRST before they start.

Parents First (2min)

Hold ruler to nose

- Focus on sticker #1, then sticker #2
- Kids – make observations:
 - What happens to parent's eyes
 - Can you see both dowels *clearly* at the same time?
 - Bonus Q: How many dowels do you see when looking at Sticker #1?

Switch roles (kids hold ruler) (2min)

Make observations/ask questions as group (2min)

Eye angle for near/far object

- Double vision for object you're Not looking at

Focus: One object sharp, other is blurry

- Telescope, binoculars, microscope – you turn a knob if object is blurry
- Focusing these devices is Analogous to focusing your Eyes

Mirrors

Redo focus experiment (2min)

Hold mirror at end of ruler, and redo the focus/cross-eye experiment, but this time looking at the objects in the mirror (#3, #4)

Observations/questions (2min)

- Are you focusing on the mirror itself?
 - Answer: You're looking “through” the mirror.
- While looking at LAST sticker, how far do you think you're looking?
- While looking at the LAST pen, How many pens do you see?
- Eye parallax (going cross-eyed) causes closer pens to be doubled!

Smartphone Hologram (2min)

Leaders – show projector on their smartphones

- Holapex > Videos > Butterfly
- Turn off the lights
- Hold the Projector square with the phone
- Walk around class
- Hold at eye level
- Within ~4 feet of each observer

Hands-On

Smartphone Hologram (10 min)

Hologram Projector

- 1) Printouts on Transparency
- 2) Scissors
- 3) Tape

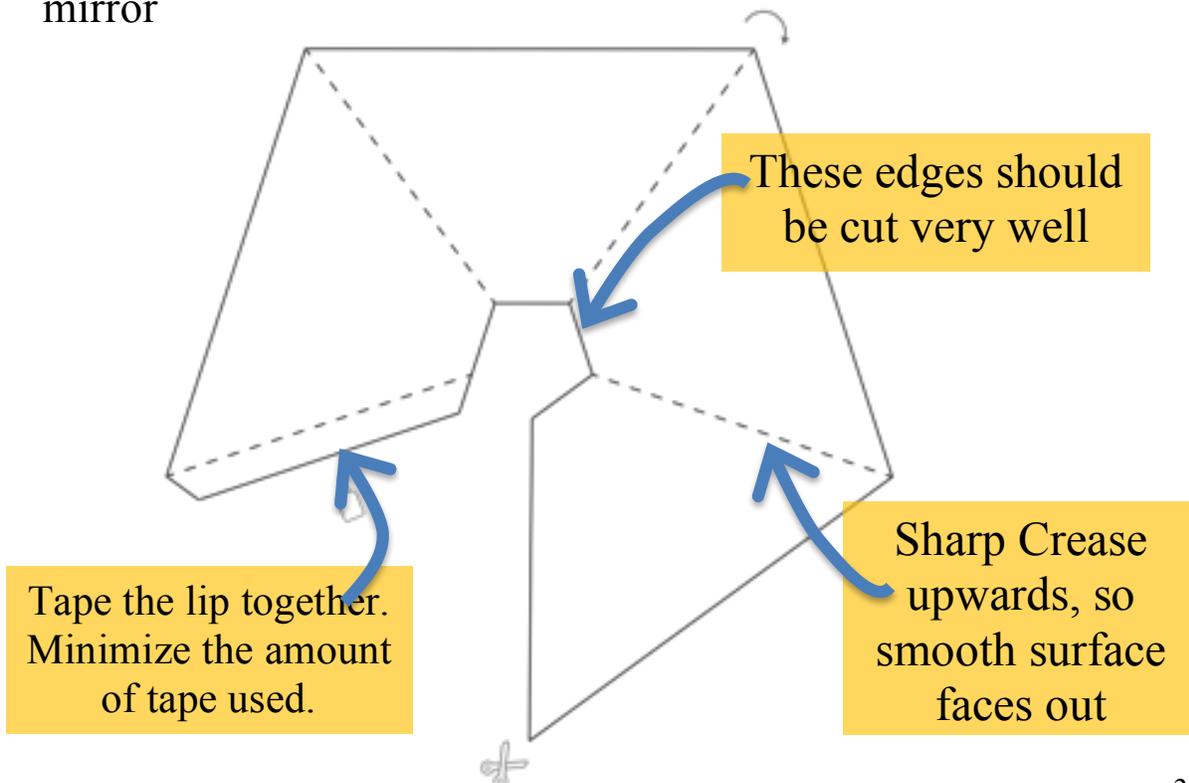


Cut out the template on the transparency, fold and tape together

Launch the QR codes/URLs on your smartphone and test it out.

Try it with a mirror instead

Object seems to be behind the mirror – you are looking thru mirror



Hands-On

Make Your Own Hologram! (5 mins)

Materials:

- “Holapex Hologram Video Creator” smartphone application
- Black sheet or poster board
- Duct tape to secure sheet/board



Procedure:

1. Before starting the activity, leaders need to download the Holapex Hologram Video Creator app (free)
2. Secure your black background in a convenient location (one leader per station)
3. Use your phone’s camera to take a video of the student in front of the black background
4. Open the app – the first time you open it, you may need to click “see more” in the ad that pops up. It takes you to holapex.com, then you can return to the app and use it.
5. Choose “Create Video”, then choose the video you just recorded



Apple Store



Google Play

6. It will take a few moments to format the video, and then the Peppergram version will automatically start playing

7. If needed, you can use the flip button at the top left to flip the image vertically



8. Choose the “back” arrow to return to the menu 

9. There is not currently a way to save the Peppergram version of your videos

Questions to ask the students:

1. Why is the black background important for making a convincing hologram?
 - a. Transparent where the image is black!
 - b. Black = No light, won't interfere with looking thru the projector

Wrap-Up

Last 30 seconds

3D Televisions & Displays are a major research field right now! Many big TV manufacturers are working on it.

Understanding how people can be “tricked” into seeing depth is important for making Sci-Fi type 3D computers possible.

Troubleshooting / Extra Notes

- Bottom of projector should be cut out nicely and straight along lines, to make projector sit flat.
- More tips? Please email outreach@ips.ece.ucsb.edu

Classroom Preparation

on FUSE day

A. Distribute to every table:

1. Rulers with dowels/stickers taped on (check that the tape is OK; retape where falling apart)
2. Handheld mirrors with sharpie marks
3. Printed transparency sheets for making pyramid projectors
4. Tape & Scissors
5. Handouts with Sample holograms URLs + Instructions page (should be double-sided)

B. Room Set up:

1. Black cloths/posterboards (put up) for custom holograms

C. Instructors:

1. Make sure you have the Holapex app installed on your phone
(iOS App Store @ <https://goo.gl/CuqJCv>)
(Google Play Store @ <https://goo.gl/f6gyTe>)
2. Phone fully charged/Bring phone charger
3. Phone brightness on full
4. App loaded with video ready to show

Transition between groups:

1. Sticker on student's pass cards upon entering class
2. New Transparency Sheets
3. New Handouts as needed
4. Check Rulers/Dowels