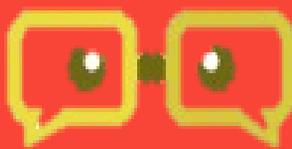
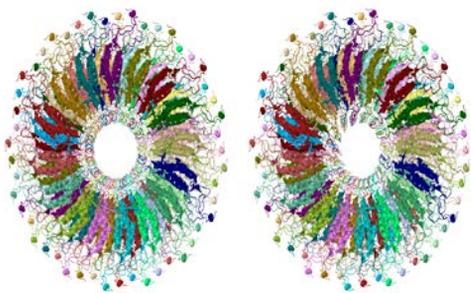


3DCam

FUNWITHOPTICS KIT



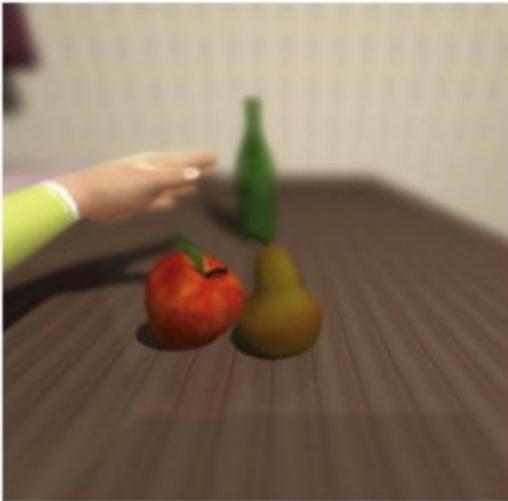
FunWithOptics

Optical principle

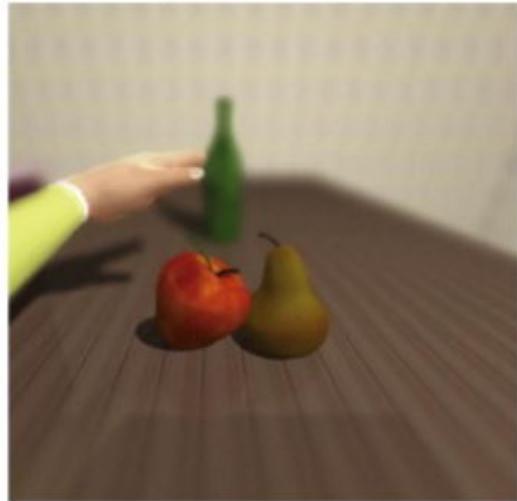
Perception of 3D

The eyes are separated by just enough distance so each eye sees from a slightly different vantage point. Each eye captures its own view and the two separate images are sent on to the brain for processing. When the two images arrive simultaneously the brain puts them together into one 3D picture. The mind combines the two images by matching up the similarities and adding in the small differences. The small differences between the two images add up to a big difference in the final picture! The combined image is more than the sum of its parts. It is a three dimensional *stereo* picture.

Right eye's image



Left eye's image



Seeing 3D from 2D Pictures

Real world is a 3D world which are eyes can perceive as 3D. However, virtual worlds are shown as 2D pictures with depth information shown as cues. In order to see 2D pictures in 3D , first there is a need to capture two images from two different perspectives as our eyes would do. Next we need to show the left picture to the left eye and right pictures to the right eye. Taking two pictures for two different viewpoints are relatively straightforward and the 3DCam can livestreams this in small package.

Next to show the left image to the left eye and right image to the right eye. 3D movies use Polarised light to achieve this. The left picture is polarised in one direction while the right picture is polarised in a perpendicular direction. By using appropriate glasses, this two images are seen by the appropriate eye to give the 3D effect. A simpler way but one which is limited to a single user is the use the now common VR (Virtual Reality) glasses. The Google Cardboard is used here but any other glasses will suffice. The left and right pictures are displayed side by side on monitor (such as your Smartphone) and when placed in the Google Cardboard 3D images are streamed live.

Experiment Setup



Procedure

1. Launch Skype in both the host computer and client smartphone
2. Run 3DCam on host computer
3. The default display shown by 3DCam is the side by side display
4. Start the screen-sharing mode in Skype
5. Attach the phone to the Google Cardboard
6. You should now be able to see live 3d
7. Press Esc to quit

Experiments

1. At what distance do we see best 3D effect?
2. Does background have any effect on the depth visualization?
3. Does lighting have any effect on depth visualization?
4. Chat with your friend through Skype 3D for about 10 mins and see if there are any effects.
5. Can this method be used to measure the depth of the object like the DepthCam?

Discussion

Discussion and Additional Projects

1. Do you experience headache after this experiment? Why do you think you do (or do not).
2. How does the distance between the 3DCam and the position of the person affect the 3D effect? What is the relationship of distance and 3D effect?
3. What other applications can you think of for the 3DCam?
4. What are other forms of 3D display and types of 3D glasses?
5. We can see 3D pictures without 3D glasses. This is called “free viewing”. How can we do this for virtual pictures? (Hint: Holography, Lenticular screen)
6. Is it possible to see in 3D with just one eye?
7. A project to extend the 3DCam for Virtual Reality or Augmented Reality Experimentation. Develop methodology, application and testing.

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Seeing in 3D with one just eye

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DepthCam



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