Co-funded by the
Erasmus+ Programme
of the European Union

HOLOMAKERS PROJECT

Motivating secondary school students towards STEM careers through hologram making and innovative virtual image processing practices with direct links to current research and laboratory practices

Erasmus+ KA2 2017-1-PL01-KA201-038420

Activity 3

Oxymoronic Sentences

Description for teachers

Est. Duration	Minimum 10 hours
Equipment needed	PC, Octave Software
Links to external files	No links
Learning objectives	Get familiar with the procedures of producing computer generated holograms Understand how to re-construct holographic interface pattern Enhance creativity and problem solving skills Practice collaborative and team working skills
Preparation needed	Understanding of STEAM approach Basic principles of optics

Description of the activity

This activity focuses on the artistic research according to STEAM educational approach to learning Science, Technology, Engineering, and Mathematics (STEM) using ART as access points to guide student creativity rethinking science based principles. This approach encourage inquiry, dialogue, and critical thinking. The activity aims to teach students to think critically and use engineering or technology in imaginative designs, approaching creatively to real-world problems while building on students' mathematics and science knowledge. STEAM programs add ART to STEM curriculum by exploring science through creativity. The end results are students who take thoughtful risks, engage in experiential learning, persist in problem-solving, embrace collaboration, and work through the creative process while learning science and mathematics.

The activity starts involving students thinking about the meaning of Holographic picture, promoting their reflection on the fact that it does not exist itself as it is a lights illusion.

The idea is to think about what we cannot see about the micro cosmos, what we cannot see exists or not?

From this point of view the intention is to explore the opportunities offered by the Octave software to create our own reality, understanding how science, engineering and mathematics can support us creating what we imagine. Using Octave and Fourier transform, we can create a diffraction pattern that is a computer-generated hologram, enhancing the reflection on the possibility to create imagines that do not exist in the real world, but in our imagination. A possible way to see this process is using letters and words, creating oxymoronic sentences (Ex: “I’m always in the place where I don’t have to be”) in an artistic way to make students reflect about what is there and what is not there.

Step 1: Meanings brainstorming

A reflection about the meaning and the creative process to create a hologram, brainstorming on possible sentences that create this kind of path. Sentences will be decided with students to find best way to match ideas, meanings, and their representation; like cosmos and micro cosmos, visible and invisible thing. The selected words will be developed then digitally developed.

Example of hologram in art:

Salvador Dalí “Alice Cooper’s Brain” (1973)

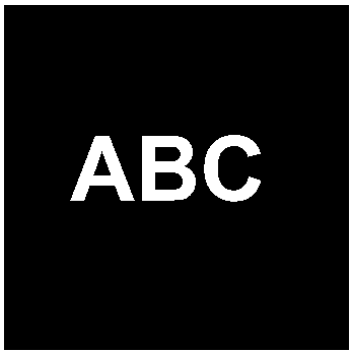
Step 2: **Creating Computer Generated Hologram (CGH)**

Applying an iterative algorithm in Octave the chosen sentence is digitally transformed into diffraction pattern, which can then be reconstructed either on the computer or fabricated and reconstructed with a laser light (in this activity we will use only computer to reconstruct a hologram).

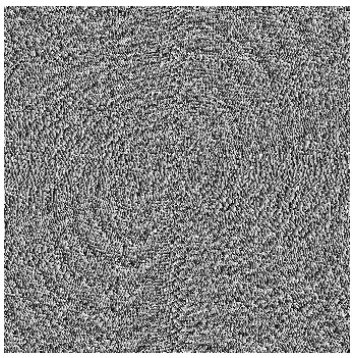
Letters and the corresponding diffraction pattern (Computer Generated Hologram)

Step 3: Reconstruction

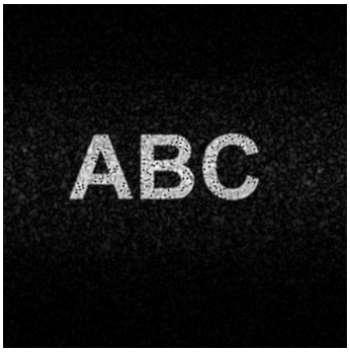
Obtained in Step 2 pattern will be reconstructed using a computer. Reconstructed image is a very good approximation of the designed one (see images below).



Designed image



Diffraction pattern (CGH)



Reconstructed image

Step 4: Installation

Students will use the generated patterned letters to develop an artwork installation, creatively representing the process and the difference between physical and imaginary, coded and visualized. The final artwork will describe the meaning of scientific, artistic and physics.

Declaration

This document has been prepared in the context of the HOLOMAKERS project. Where other published and unpublished source materials have been used, these have been acknowledged.

Copyright

Funding Disclaimer

This project has been funded with support from the European Commission. This communication reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Declaration

This document has been prepared in the context of the HOLOMAKERS project. Where other published and unpublished source materials have been used, these have been acknowledged.

Copyright

© Copyright 2017 - 2019 the HOLOMAKERS Consortium

All rights reserved.

Funding Disclaimer

This project has been funded with support from the European Commission. This communication reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.