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INTERACTIVE INSTALLATION OF 3D ZOETROPE CONTROLLED BY ARDUINO

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Introduction

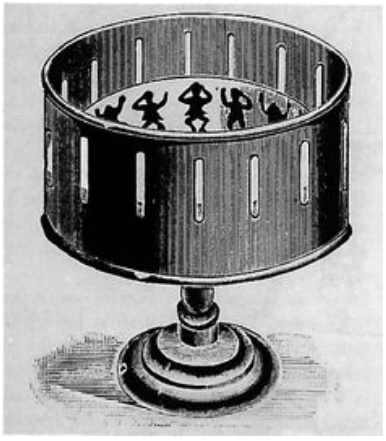
The sense of sight is one of the most important, because thanks to it we can perceive absolutely our surroundings and save everything we see as mental images. It is normal to trust what our eyes perceive, but sometimes we may be victims of numerous effects of optical illusions. In this work, we are going to focus on an effect that emits a series of flashes, that is used in the production of cartoons and that plays with the phases of movement in objects or characters, this is the stroboscopic effect [1-3]. The project consists of the design and creation of a 3D Zoetrope on a rotating platform, as well as the development and programming of a stroboscope in Arduino that will allow us to demonstrate this effect in its maximum splendor.

The work **aim** is to disseminate and demonstrate that science, technology and art can be combined to highlight an optical effect, by merging stroboscopic concepts, retinal persistence and also rotating platforms, visual effects similar to stop motion animation.

Project development

Zoetrope a 19th-century optical toy consisting of a cylinder with a series of pictures on the inner surface that, when viewed through slits with the cylinder rotating, give an impression of continuous motion. Zoetrope has evolved over time, more and more details were added, that made it easier to use [4]. In the following figures you can see how this artifact has changed. As can be seen in pic. 1, its first version was created in 1834, which was composed of a cylindrical drum, inside which and with the same perimeter a band of paper is placed with images sometimes printed or drawn that putting into action the object gives that sensation of moving.

The biggest difference between pic. 1 and pic. 2 is simply the mechanism of rotation. Since in the original version it could be moved only manually with the user's hands and in the 1867 version (when it was patented) a rope was attached for mechanical rotation to make it easier to use. Finally, in pic. 3 you can find our proposal - version 2020. Our design a little different from the traditional one but contains the same principles. The idea of its creation rises from an investigation regarding the evolution of animation, where it was mentioned that the Zoetrope was one of the forerunners of cinema, then we investigated the principles and was started to think about 3D version and how implement it [5]. The fascination for this device was so great that the decision to create a version controlled by Arduino was made.



Picture 1 – Zootrope 1834 Original version created by William George Horner

Picture 2 – Zootrope 1867 Improved and patented version By W.E. Lincoln Toy

Picture 3 – Zootrope 3D version 2020

Tests

It began with the programming of one of the most important parts, that is the strobe light, in this case Arduino was used for programming and giving it the indications of the frequency of the flashes. To focus the lighting and appreciate the entire Zoetrope from a higher angle, the Led and a Li-po Technology battery as a power supply source and a voltage converter to transform and regulate the energy to prevent others from components will be damaged were used. A potentiometer was added which provides a transformation in the frequency of the light,

which the user can modulate, either so that it is appreciated faster or slower, as well as the direction of rotation. At the bottom, a small fan motor was used and adapted so that this allowed us to have the swivel base without stopping the rotation as in the other versions. To make the structure, it was thought to make a box that blocked the greatest amount of external light except the front one, so that the strobe light is more optimally appreciated and is not damaged by external agents. Finally, what we will call "the heart of the project" - the protoboard and electronic components and devices were connected as well as proper code was developed. The fan was tested and verified that organically it did that it was instructed to do, but for this it was necessary to disassemble part of it. When we realized that it was working correctly, we started with the design on a PCB board and it was printed.

Implementation and use

The project will serve to motivate new generations to carry out technological projects, making use of the tools that we have at hand today thanks to technological innovations, but without neglecting the old instruments that were precursors of this technologies. In this case, an entertainment devise from 1834 was interpreted and brought to 2020 by means of an installation, that allows the user to manipulate the speed of the strobe light by means of a potentiometer and thus observe different speeds and directions that cannot be appreciated with a traditional Zoetrope.

Conclusions

This project will help to share knowledge about the history of animation and the antique gadgets that were precursors of the devices we observe today in cinema. Also, it serves as a reflection on how nowadays we do not stop to think about the technology behind the objects that we use, about how they were made and how their design process was. All this process of Zoetrope recreation will help to get closer to a historical period of 1800 and highlight the scientific trigger of that time.

During the process of planning, designing, programming of Arduino in the project we have been able to see how the work was changing, evolving and taking shape until it resulted in a device. Zoetrope is a fundamental tool to understand how optical advances could be implement at this time and how moving images work.

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