

HALO HOLOGRAM HARDWARE

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Abstract. Our task, which we focused on, is to design and create a device that would be able to display the image of the called party in the room with the appropriate software and give us the impression that the called party is in the room with us for better communication.

Keywords: Atmel, wood, Components, LED strip, HALL-effect sensor, small rotate engine

1 Introduction

Since the beginning of time, mankind has always cared about social contact and mutual communication. This is also the case today, when we are living in times full of modern technology and the age of social networks. However, times have changed and people are more preoccupied and often do not have time to meet in person. So how to improve mutual communication and the enjoyment of this communication for people? In the current pandemic situation, it is even more complicated and therefore the topic of communication with the use of hologram is much more relevant than ever before.

2 Ideas Of Holograms And Our Choose

Firstly, it is necessary to specify task itself, and what kind of scene we are expecting. Under the term halo hologram, we can imagine a device that will display a person face. This device could be used in organizing of corporate meetings or in the educational process of teaching lectures and conferences. At the beginning it was important to think about the very concept of Halo hologram. There are many possibilities of realizing hologram which we had successively analysed and evaluated.

First concept of the hologram was creating holographic pyramid in which the hologram itself would be projected. Holographic pyramid works on the principle of composing 4 projected images together. This solution is suitable for small meetings, but not for large conferences as it would be necessary to create wide- ranging holographic pyramids for large lecture halls.

The second option would be to create a projection bust. The bust would be placed in front of the black screen/ background and would be equipped with motors for its mobility. An image from projectors mounted in front of the busts at an angle of 60

degrees would be projected on the bust. However, this is not the right solution for creating a hologram, since it is a projection on a 3D model.

The last concept which we had analysed was creating a holographic fan. Under this term we can imagine circle filled with Led lights that is driven with a high-speed motor. The rotation of this circle with the motor led to the result of the creation of the image on the surface of the circle. We think this solution is suitable/applicable. Whether for use in the commercial or different sector, and it is possible to create this device from light materials in the various sizes needed for projections.

3 Hardware Realization Schema

Let's proceed to the actual implementation. At the beginning it was necessary to realize, how to construct halo hologram itself. It was essential to set apart its main parts. We can divide them into three parts, which are projectional, functional and processional. The last part is represented by the microcomputer which is processing data received from networks and prepares for display. Functional part, which is responsible for the movement of projection part, is build-up from the construction, in which the projection part is mounted, and also the motor responsible for its rotation. Projectional part consist of the circle fitted with led *lights*, which is rotated at a high speed and displays an image processed by microcomputer. This image is giving impressions of 3D model thanks to all the parts working together, so that in the microcomputer is program adjusted for rotation of the motor, which rotates LED – band, which creates halo hologram image itself.

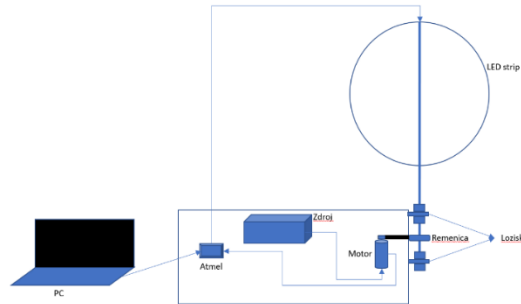


Figure 1: Schema of hologram

4 Building Hardware Realization

After analysing the problem, we started to construct halo hologram itself. Proportion of the circle on which we will install led strip, is going to be 32 cm. This circle is *fitted* with the SK9822 LED lights, which is controlled by SPI. 12V motor which rotates the circle itself is disposing with hall effect sensor, which is important for the image synchronization.

As a source of our hologram, we used old computer source from which we used voltages of 12V and 5V.

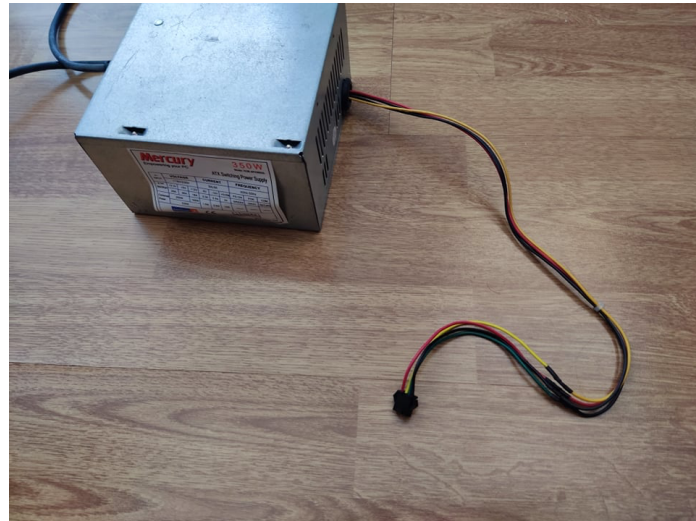


Figure 2: Source

Structure of hologram was made from the wood because of its great availability and workability. The structure was assembled and it's holding on with the help of wooden pegs and glue. In the lower part is located a hole for a bearing, under which is also located smaller hole for a cables

We used motor, we mentioned before, with a voltage of 12V for the drive. To transfer the driving power from the motor to the display circle, we used machine-made 45 teeth Gear wheel which is connected by the drive belt to the motor, on which we also have machine-made gear wheel, with whom we achieved a 3:1 transfer.

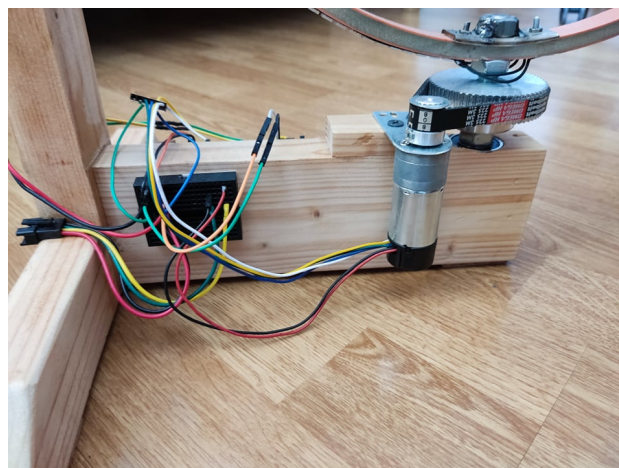


Figure 3: Drive system

The ring itself is made from PVC pipe which is attached to the threaded rod. The top mount is designed for the faster removing. On the circle is fitted Led light which has 65 led lights for a semicircle. The lead from led lights consists of 4 cables but 5V and GND is duplicated so we had 6 cables connected from the above through slip ring.



Figure 4: Detail of the upper mounting

We put the connections on the breadboard into separate lines, which we had divided according to their usefulness. On the construction itself is settled microprocessor Atmel, which controls the imaging functions for our hologram. In the end, we did not use the Hall effect sensor, which we considered essential at the beginning, because it did not provide sufficient information in interruptions, because these information were overlapped. We also connect an LCD display to our hologram, to solve the problem with Hall effect sensors. In the end we solve synchronization trough method of timing.

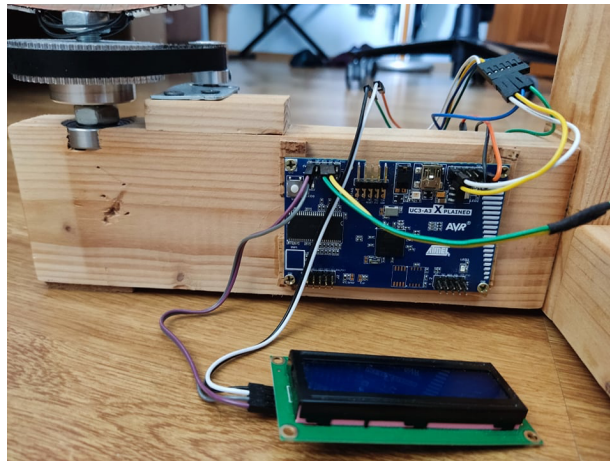


Figure 5: Atmel and LCD display

5 Result

If we were to evaluate the results obtained in this project, we can say, that we managed to construct a Halo hologram, on which we can project the image. Of course, nothing is perfect, and there is always a space for improvements, even with this project. If we were to mention some of them, it would be, for example, an improvement of the engine, because it does not have adjustable speed and also is very noisy. Another example could be the installation of a lights with a higher density of diode lights. We also managed to configure USB on baudrate 128 000, but it was not sufficient for live video transmission, so it is necessary to solve this issue with another solution. For example it could be solved by the improvement of the control microprocessor, which could have built in components like WiFi module. This improvement from Atmel can be, for example Raspberry Pi. But if we are looking at the assignment, we can say that we have fulfilled it, even though the Halo Hologram set by us is considered only as a rough concept and an introduction to the issue itself.

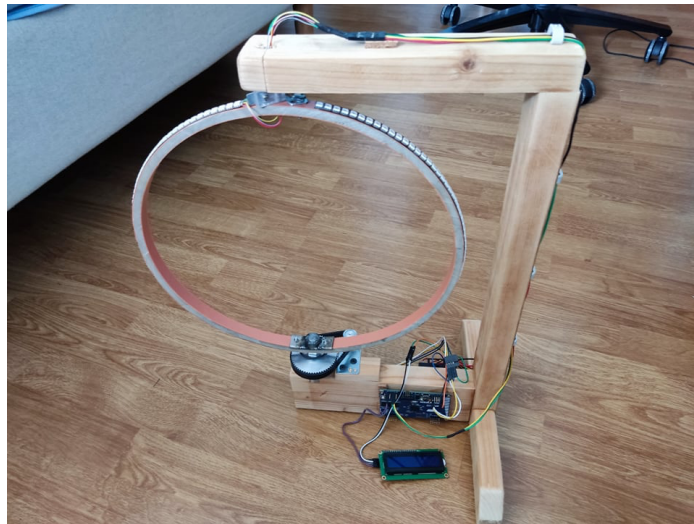


Figure 6: Image of the whole hologram

6 Conclusion

In conclusion, we would like to add that our halo hologram is really only the primitive prototype and there is always a space for improvements and innovations. To mention just a few, it is for example tensioning mechanism between motor and threaded rod of the ring.

Further, implementation of hall effect sensors for synchronization of the speed of the display circle, installation of an LED lights with a larger number of diodes, more suitable motor for this type of project. But in the end, we managed to create a rough foundation, a rough foundation stone for the development of a halo hologram. With our

knowledge about the initial prototype, we can further build, refine and modernize further development steps at our university.

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