Mirror Fasting - *Mert Toka*
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Description:

Exploring alternative display technologies (smart mirrors) in combination with augmented reality techniques to investigate the body image – or, in this case, the lack of it. Our body image is one of the most important aspects of contemporary society, even though we explicitly try to discard it. This project aims to touch upon various concepts ranging from narcissism to self-consciousness.

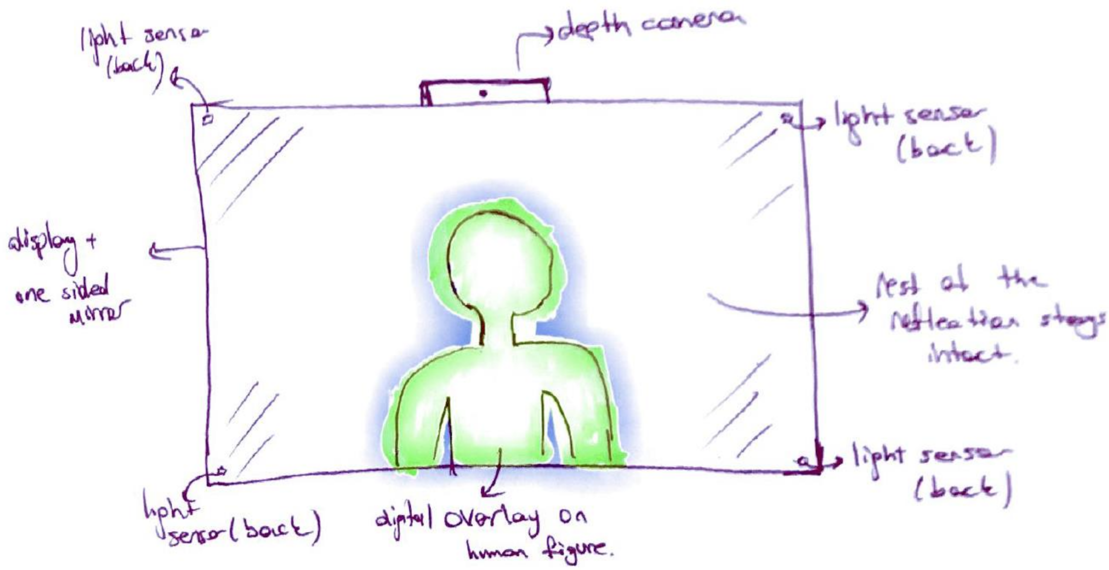

Figure 1 - Initial sketch of the proposed system

Human beings observe the outside world with their sensory organs. Each sensory mechanism provides different advantages and disadvantages, but in the general sense, we use our vision to see the world and interpret the patterns in it. The reflections we encounter in the everyday life are more than mere echoes of a couple of photons on a surface, they introduce opportunities to observe the world from a different point of view (literally our reflected position in the 3D space).

If it weren't for the reflective surfaces, we would have been aware of our physical appearance. The reflective surface of a body of water is probably our first encounter with our image, and it should be both thrilling and terrifying to analyze how we look for the first time. The mirrors have become ubiquitous and we are accustomed to check ourselves occasionally to approve our physical appearance is decent for the occasion. This project asks the question:

What happens if you investigate a perfectly functioning mirror and cannot see yourself?

Methods:

Figure 1 demonstrates a sketch of the proposed system with each of its parts. We determine the location of the human face (i.e. the eyes) in relation to the position and dimensions of the smart display. The camera space, eye space, and screen spaces are transformed appropriately. We find the closest face using the RGB image and retrieve the eye position. The eye position in the world coordinates is then reflected based on the orientation of the display. In the later stage, we intersect the display plane and a ray from the reflected eye position towards the vertices of the bounding box of the detected closest face and come up with the screen space coordinates of the detected face. Once the screen coordinates are determined, various techniques are applied to the image in the correct place to best revert the reflection on the surface.

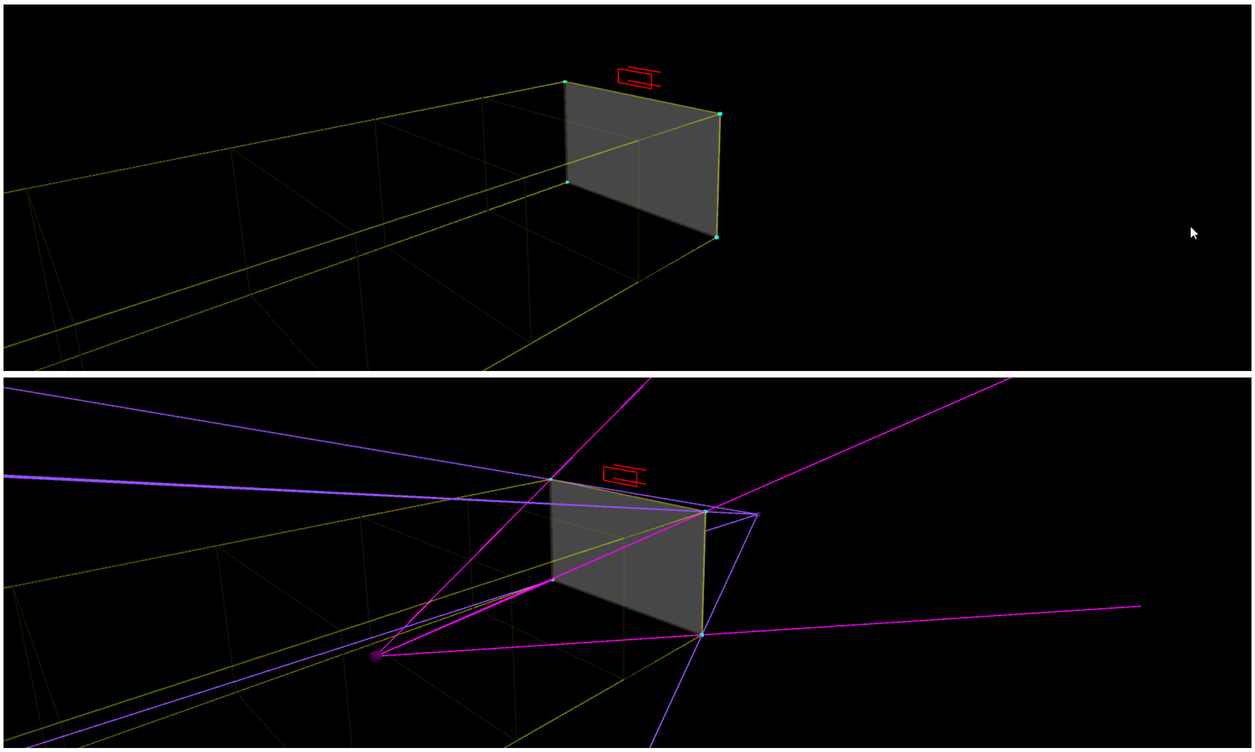

Figure 2 - (Top) The virtual display and the camera, (bottom) eye and reflected eye coordinates and their frustum

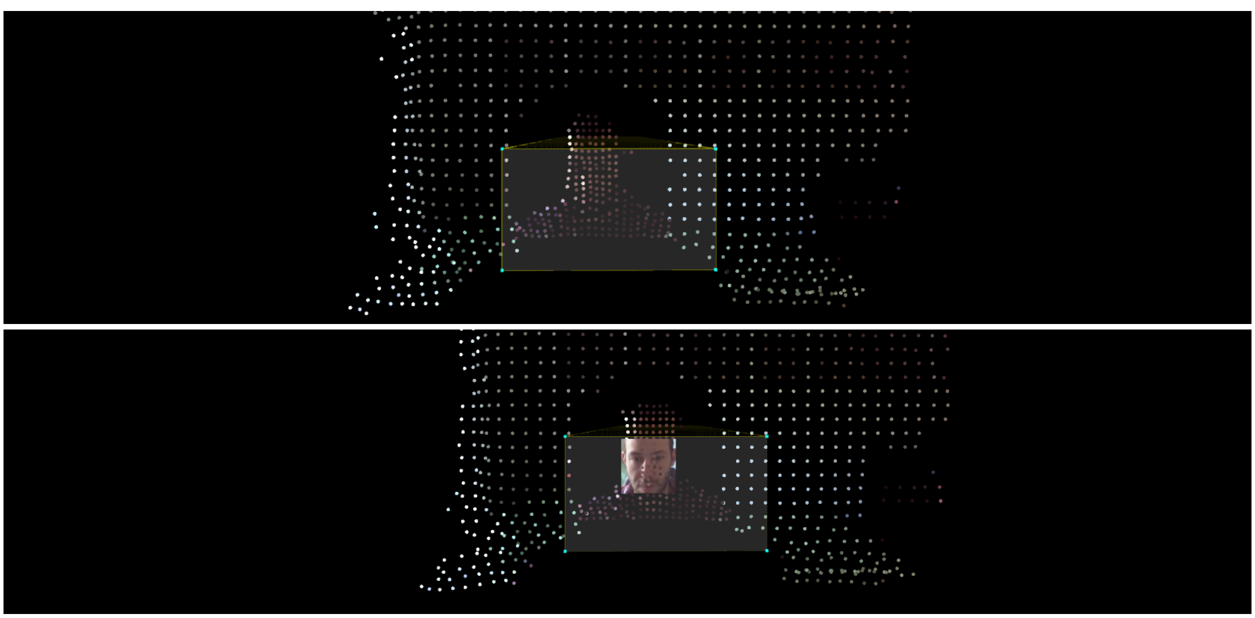

Figure 3 - (Top) Point cloud representation of the depth, (bottom) the closest face on its correct position

The Calibration:

The system needs calibration before running in each different setup. First the relative position of the depth camera (Asus Xtion 2) and the display, and the dimensions of the display needs to be estimated. For this purpose, a picture of the setup could be used in the calibration software.

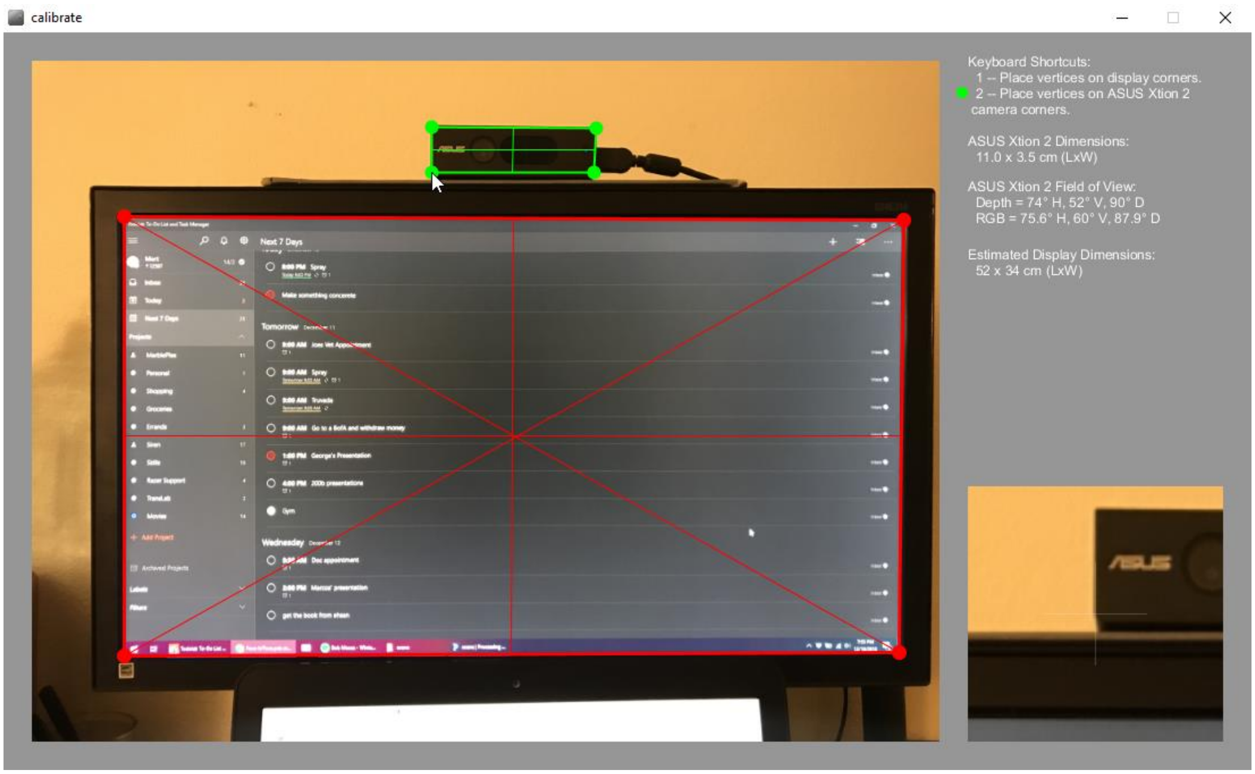

Figure 4 - Calibration software

After inputting the corners of display (in red in Figure 4), and the camera (in green), pressing ‘L’ key saves the relative position into a JSON file so that the main software can use this information.

The Setup:

The project depends on using a bright computer monitor or a TV covered with reflective film material, and a depth camera to capture depth information. For this purpose, a simple reflective film that is originally manufactured for residential window tinting is applied on an acrylic glass. I experimented with several types of acrylic glasses and reflective films and decided on the clear acrylic with full reflective film. The dry application of the film resulted terribly and using soap and water between the adhesive side of the film and acrylic has made the whole process much easier and robust.

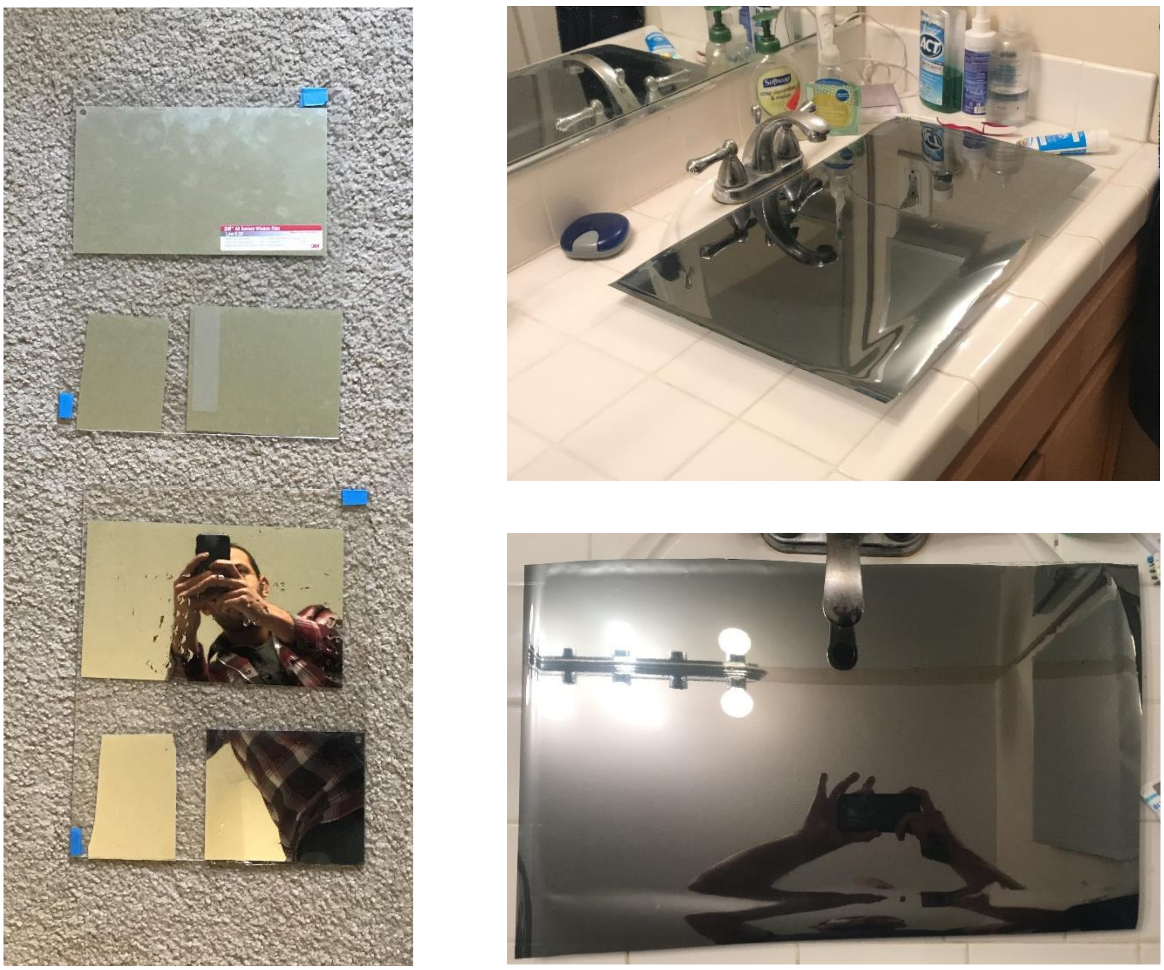

Figure 5 - (Left) Initial prototypes, (right) application of full-size acrylic

Images:

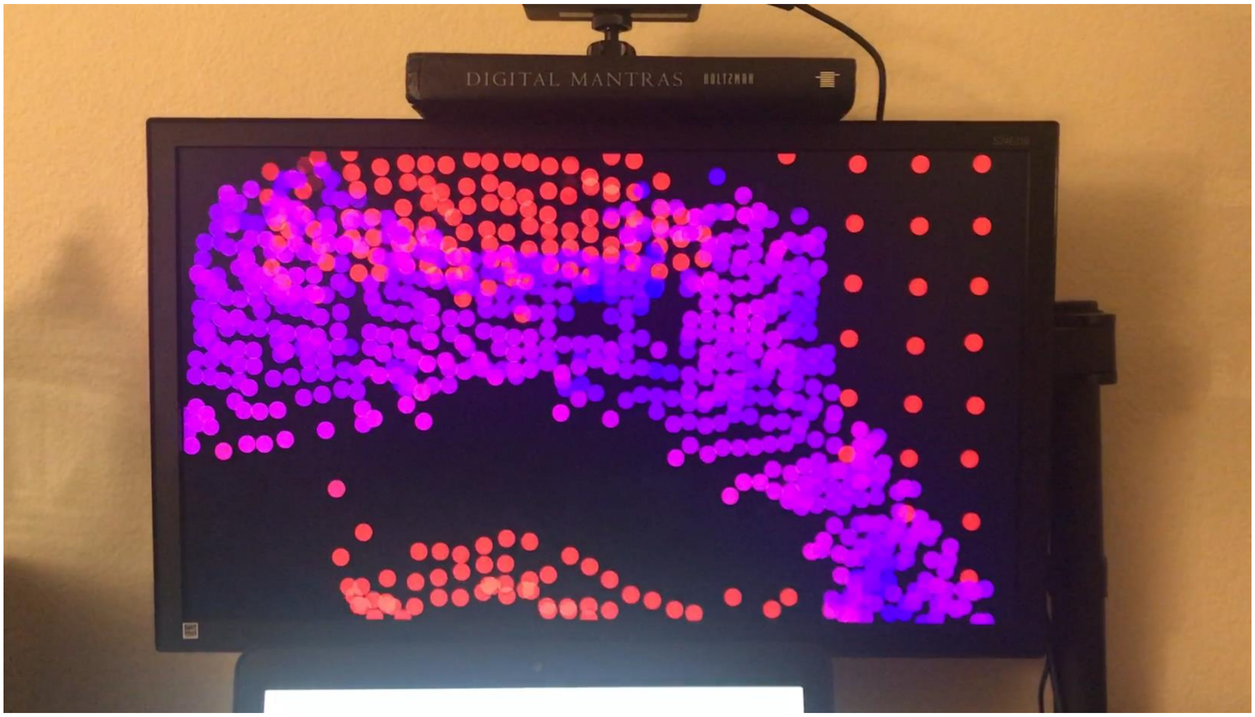

Figure 6 - Initial prototype of calibration of world coordinates with display coordinates (no reflective surface)

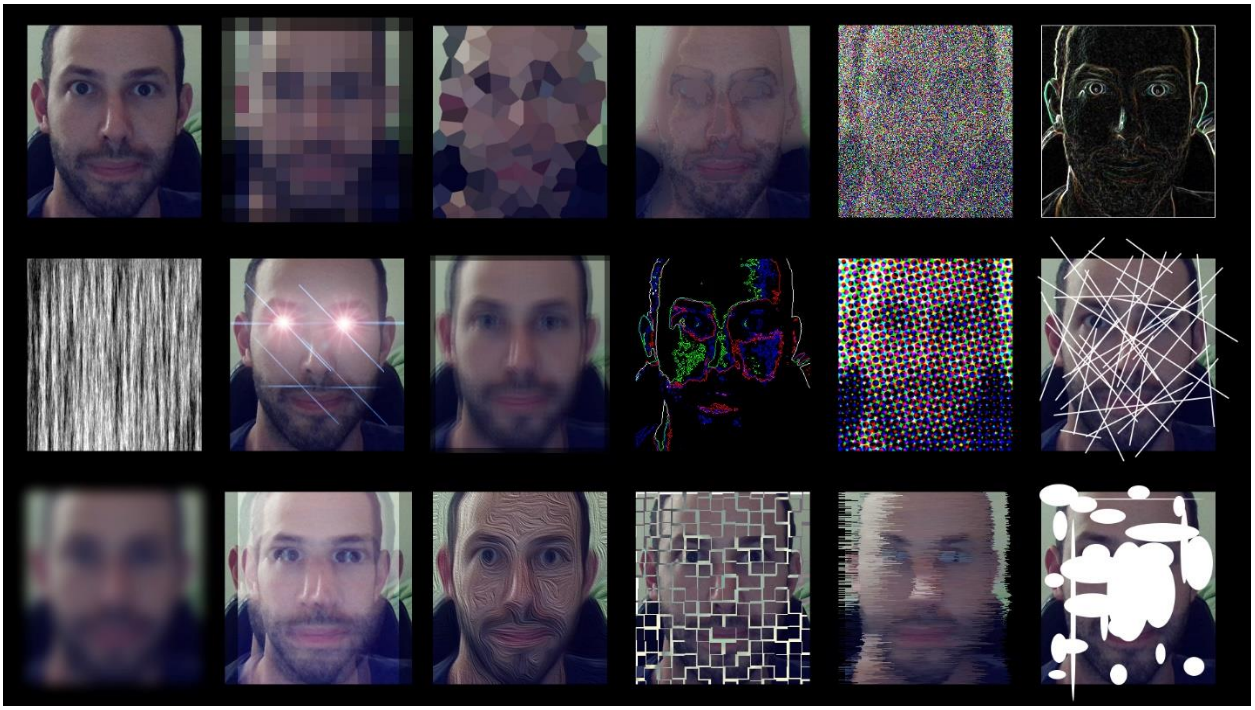

Figure 7 - Different image effects on the face image

Figure 8 - System working in a dark environment

Shortcomings / Future Work:

The initial idea of obscuring the reflection completely turned out to be heavily dependent on the light conditions of the environment and brightness of the display. In addition, determining the exact screen space position still needs some fine tuning.

As a future work, I am planning on perfecting the transformation system, building a proper casing for the installation and experimenting with more image effects to create an interesting experience out of it.

Resources / References:

- Smart Mirrors:

Smart Mirror DIY I
Smart Mirror DIY II
How to make a smart mirror with a Raspberry Pi and old monitor

- Depth Sensors:

https://en.wikipedia.org/wiki/Kinect
https://www.asus.com/3D-Sensor/Xtion-2

- Ideal Installation Display:

Samsung – The Frame
Any other bright display

- Articles:

Body Image and the Mirror: To Look or Not to Look?
https://www.huffingtonpost.com/vivian-diller-phd/mirror-fast_b_1842488.html

Does Not Looking In Mirrors Really Help Your Self-Esteem, Or Could It Hurt It? Here's What The Science Says
https://www.bustle.com/articles/72194-does-not-looking-in-mirrors-really-help-your-self-esteemor-could-it-hurt-it-heres-what

On reflection: the art and neuroscience of mirrors
http://blogs.nature.com/aviewfromthebridge/2015/11/24/on-reflection/

- Artworks:

Data Masks by Sterling Crispin
http://www.sterlingcrispin.com/data-masks.html