

*Through the Lens* is an interactive hybrid instrument that puts a digital animation and a physical drawing into a single space. By placing an OLED transparent display on top of a drawn piece of paper, the device displays a digital interaction between an animation on the screen and the sketched pattern. The goal of this project is focused on understanding the possibilities and the limitations of the technology allowed by the organic light-emitting diode (OLED) display in order to create applications that are interesting, educational, and entertaining.

I decided to work on this project because I am interested in exploring the field of augmented reality that bridges the gap between the physical and the digital world. Upon researching relevant projects, I was inspired by *Glassified* – a project by the Fluid Interfaces Group at the MIT Media Lab. I was drawn by their effective execution of giving value to an everyday object, e.g. a ruler, by augmenting relevant information on the OLED transparent display. My project is a replication of their project, where I made a similar prototype in order to understand the basic working of this new technology. Upon receiving the microgrant from the Frank-Ratchye Fund for Art @ the Frontier (FRFAF) and advice from Anirudh Sharma who was the main contributor of *Glassified*, I successfully built a working model of this hybrid instrument.

OLED or Organic Light Emitting Diode is composed of a series of organic thin films placing between two conductors, and emits light in response to an electrical current. Since it does not require a backlight like a regular LED, an OLED display is thinner, lighter and more flexible. The 4D Systems OLED transparent display that I used has a two-inch diagonal displaying size, with 128 x 160 resolution, and an ability to display full color images, animations, and video clips. It also has other specifications that are useful for other projects, but not explored in this specific one.

The user is asked to sketch on a piece of paper, and then place the device on top of it and observe the interaction between the digital animation and the non-digital sketch. The instrument is supposed to be intuitive and user-friendly. I hoped for the prototype to involve as little wiring as possible, but upon making it I soon realized that my approach involves more than just a paper, a pen, the OLED transparent display, and a computer. I used a Wacom tablet and a Wacom's Inkling Pen to capture the pen stroke data in real-time. This adds another layer of complexity to the portability of the device. A Wacom's Inkling pen is a pressure-sensitive pen, a combination between a ballpoint and a digital pen, that can convert physical sketches into digital output. The pen stroke data is then sent to Processing using a library that allows easy communication between Processing and the Wacom tablet. For a proof of concept, I coded a Processing sketch where a ball bounces against horizontal boundaries through a collision detection function. The position of the ball is then sent to 4D Systems Workshop, an integrated development environment for 4D Systems OLED displays, through serial communication, where the animation is displayed on the screen.

I encountered some technical challenges along the way, which took me longer than anticipated to figure out the working of the display itself. Within the project timeline, I was unable to create many interesting applications. For future implementation, aside from creating applications based on the existing prototype, I plan to capture the sketch through other means. Examples of possibilities are through attaching a webcam to the device and calculating the sketch using computer vision, using a motion sensor pen, and using a conductive ink pen that turns a sketch into a sensor. However, I managed to create a demonstration to illustrate the working of the system, where I gained a basic understanding of the instrument and I believe is a great starting point for further exploration.