Decreasing the Mona Lisa Effect in Robot Gaze

**Background:** When left unattended, robot abuse is inevitable. In 2018, Marynel Vazquez and her lab conducted a study on bystander interventions during robot abuse. They found that humans were more likely to intervene and stop robot abuse, when the robot responded to the abuse with human-like “emotions”. Bystander intervention was less likely when the robot did not react to the abuse. This means that the more “emotional” a robot reacts, the more likely it is to be treated humanely. A robot’s “emotional” connection with a human can also lead to a variety of other long-term benefits. Upon further research we’ve learned that a lot of human emotions are conveyed through the eyes (ie; eye contact, eye expressions, etc.). Thus, this project is focused on creating a package that will universally make robot gaze more human-like.

**Abstract:** We hypothesize that the way gaze is rendered by a robot with a screen face needs to change as a function of the expressions that it renders to be considered appropriate by users. We also hypothesize that when multiple people
interact with a robot with a screen face, they maybe perceive different gaze
directions due to the mona lisa effect. In order to combat this effect
I have been working on a package that allows people to more easily calibrate the
representation of a robot's gaze. In order to develop this package, I built on editing,
streamlining and adding to a package originally developed by Marynel Vazquez. I
created a series of launch of files and calibration tools that allow users to easily
implement our package in their own labs. I also created a gaze rendering, script
that adjusts a robot's gaze based off of user game-pad input that will be tested next
semester.

**Purpose:** To develop a process through which gaze can be easily calibrated for a
robot or virtual character with a face rendered on a screen. This will allow any
party interested in studying human-robot interaction to eliminate the Mona Lisa
Effect from their test results.

**Project Origins:** This package is built off of a set of processing eyes developed by
Marynel Vazquez and Neha Govil. Originally the eyes were hard-coded to work
accurately only with a laptop computer. They were also hard-coded to move based
off the coordinates produced by a face-detection package.
**Procedure:** In order to create a package that could be universal across robot set-ups, I worked on a series of camera calibration documentation and scripts. First, we defined the camera needed to run this project as a stereo camera. In our lab, I use a ZED stereo camera, however the tools included in the Mona Lisa package will work for any stereo camera. I created package documentation that includes instructions for how to retrieve calibration data from the camera, turn it into a yaml file and what to name it in order to work with our package. The package also includes the calibration data we used for the specific camera setup we had in our lab. I then created an image-rendering script that takes information from the calibration yaml file, and uses it to merge both the left-side raw camera image and the right-side raw camera image into one joint image.

The next thing I worked on was create a universal makefile that allows for the image-rendering script to connect with both the pre-existing gaze-rendering script on any computer setup. Then, I worked on a script that gathers user-input from an XBox controller. I modified the gaze-rendering node to allow the robot’s eyes to be controlled by user-input as opposed to by face-detection. The reason I did this is so that throughout the next semester, I can study the best location for a robot to render it’s gaze relative to a human’s face in order to convey attention. I plan to allow users to stand on a specific point relative to the robot and adjust the
robot’s gaze until they feel as though they are making eye-contact. I will collect data from this experiment with the intention of writing a script that will render a robot’s gaze to a spot relative to a human’s face, that will decrease the Mona Lisa Effect and eventually allow humans to better connect with the robot.

**Next Steps:** After my tests are conducted next semester, we will have an accurate gaze-rendering package that eliminates the Mona Lisa Effect. Then, I will thoroughly test it more and make sure that the documentation is easy-to-read and follow.