Facial Landmark Measurement for Making Accurate Origami Masks

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Introduction

Driving factors/Motivation: In April 2020, IU Assistant Professor Jiangmei Wu developed origami versions of face masks in order to encourage more people to wear masks and provide masks that fit their facial structures so they could get masks that were snug and provided better protection.

Challenge: Use facial landmarking/computer vision to develop a geometrically shaped face mask that can be formed through origami, either personally by the user or made by Jiangmei herself

Possible solution: Use a program that measures face width and height to be able to determine the best origami mask design for each person.

Facial measurements

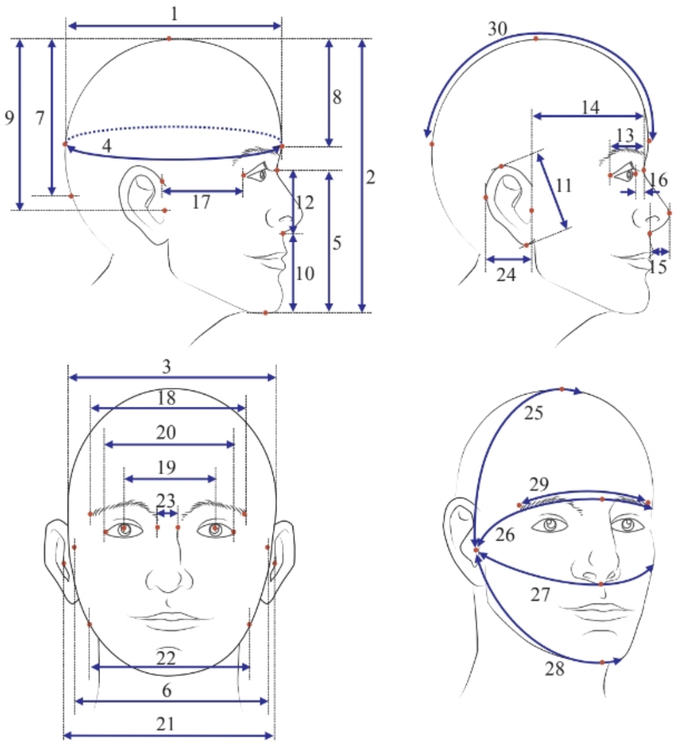
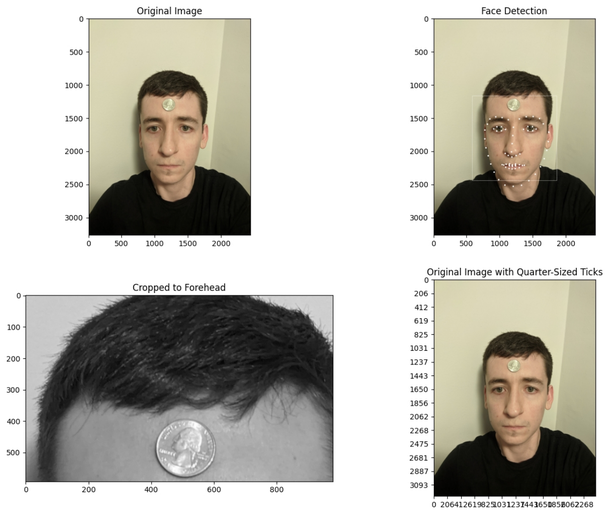


*image [2]: Show example of facial measurements and how they can be used to determine a size of a face mask

Research Findings



Why the Quarter?

- One of the biggest problems to overcome in computer vision is determining the size of the objects

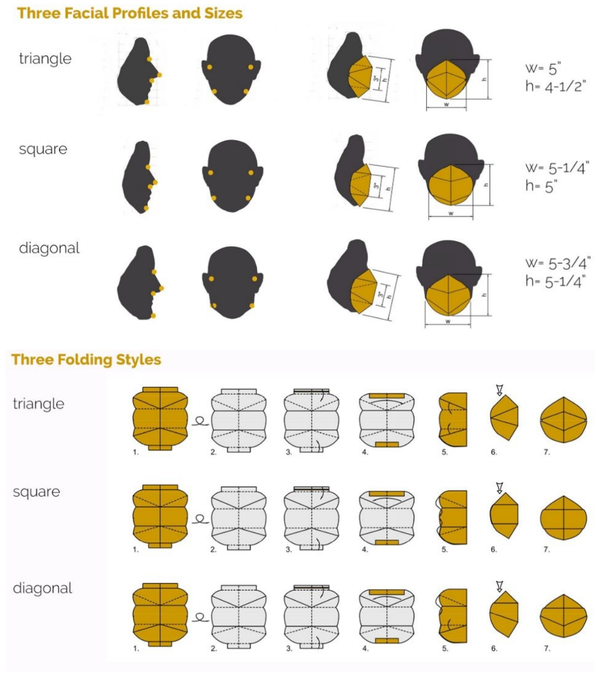
- Quarter is used as reference of known size (24.26mm Diameter)

- It is impossible to determine the size of a 3D object from a 2D image since we don't know how far away the object is from the camera

- We use a Hough Transform to detect a circle in the cropped image. Using the size of the circle, we can determine the distance between facial landmarks based on the size of the quarter in the original image.

Goal

- Using the landmarks from image [2], we will get something like this:



Detection Method:

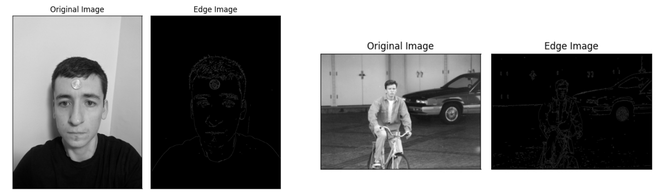


*image [1]: Provide edge detected images of the originals

- We first use a machine learning model to do facial detection, then we know where to perform facial landmark detection.

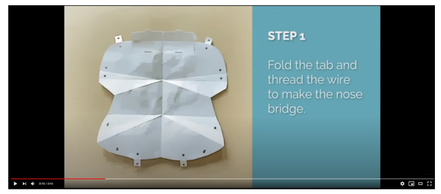
Helpful Resources

Acknowledgements/Mentions:
- David Crandall, Undergraduate research mentor

- Jiangmei Wu, Original developer, Assistant professor of design in the Eskenazi School of Art, Architecture, and Design

YouTube video that shows how to make an origami mask:

Fold-a-Face Mask: Origami Fashion for Fighting COVID-19 Virus by Jiangmei Wu



Future Work

- Since we are sure that no one wants to put a quarter on their face as reference for facial measurements, we would have to come up with a better method that puts less strain on the UI/UX side of things.

- Get the face masks tested to make sure they are safe for use and would provide protection for the user.