

# Cozmo to Create Snapchat Filters

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Cognitive Robotics 15-494  
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# Our Goals

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Extending the capabilities of **Cozmo's face objects** and incorporate visuals

Combining **DALLE's image generation** with **Cozmo's facial detection**

Using **OpenCV** to perform image segmentation

Overlaying filter in real-time

DALL-E: GPT-3 trained deep learning models to generate images from text descriptions

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Cozmo SDK face object:  
Sequence of tuples (x,y) for eyes,  
nose, mouth positions

# FSM & Approach

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Enable color camera viewer



Prompt user to pick **location** of filter  
[Mouth/eyes/head]



Prompt user to describe the **filter** they want



Used **DALLE 2**'s API to generate image from text description

"Eyes"

Example

"Sunglasses"

Example



256 x 256

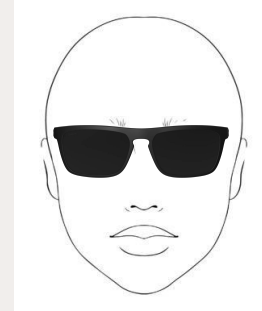
Example

# FSM & Approach

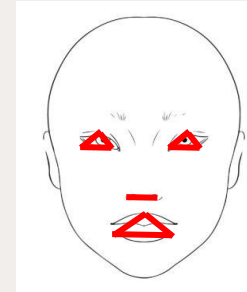


Segment object in the filter using Connected Components & Masking in OpenCV

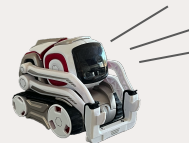
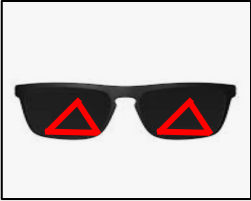
Overlay image onto face using SDK face coordinates



Determine coordinates of Cozmo SDK mouth, eyes, nose objects



Resize object in filter according to the sizes of [Mouth/Eyes/Head]



In user\_annotate: facial feature tracking and overlaying filter on camera-viewer in real-time.

# FSM & Approach



```
cv.threshold  
cv.connectedComponents  
mask = cv.bitwise_or(sunglasses,  
face)
```

Segment object in the filter using Connected Components & Masking in OpenCV

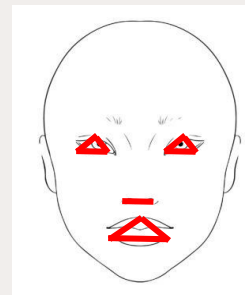
Overlay image onto face using SDK face coordinates



x position: face\_x - image\_x  
y position: face\_y - image\_y

Resize object in filter according to the sizes of [Mouth/Eyes/Head]

Determine coordinates of Cozmo SDK mouth, eyes, nose objects



From sequence of tuples (x,y) for eyes, extract min\_x, max\_x, min\_y, max\_y



```
dim = scale * (eyes_width,  
eyes_height)
```

```
cv.resize(sunglasses, dim,  
interpolation)
```

In user\_annotate: facial feature tracking and overlaying filter on camera-viewer in real-time.



# Results

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**Successfully overlays, moves, and resizes with face movement**

**Successfully overlay one filter after another while changing face part**

**Examples include:**

- Lipstick on mouth
- Sunglasses on eyes
- Hats on head

**Most interesting aspects:**

- Scale according to body parts
  - Scale lipstick according to size of mouth but sunglasses according scale factor
- Customize filter by specifying shape and color in DALLE prompt

**Filters are limited by DALLE's image generation**

Link to video demos: [Full Demo](#) | [Mouth Demo](#) | [Eyes Demo](#) | [Head demo](#)

# Extending

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- Automatically know which face part to paste image
  - Ex. sunglasses -> eyes, lipstick -> mouth
- Wider variety of filter placements such as on nose, cheeks, neck
- Overlaying multiple filter objects simultaneously