

# Gesture Recognition

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# Problem Statement

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Our focus is to enable a user to command Cozmo using hand gestures. In particular, Cozmo will be able to turn to an area the user is pointing towards.

# Approach

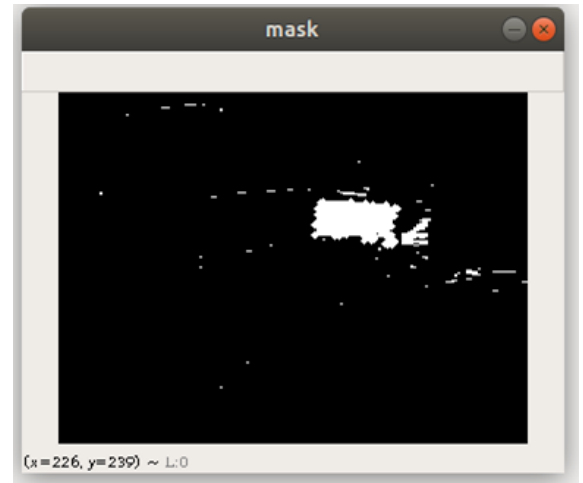
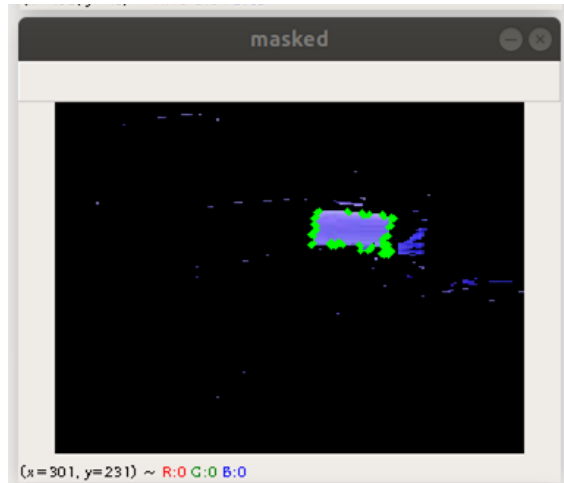
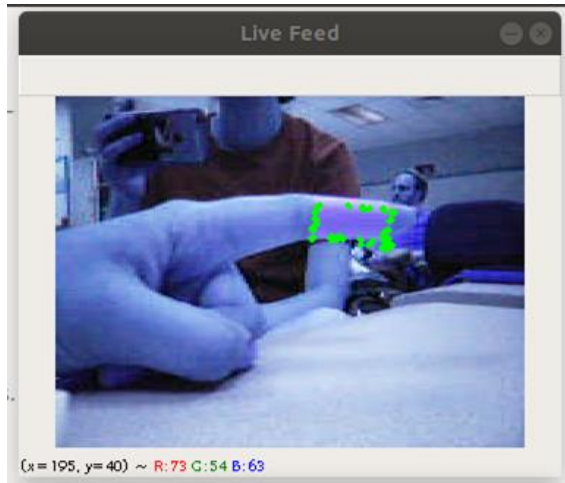
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Using transfer learning, we taught a neural net how to distinguish pictures with hands from those without.

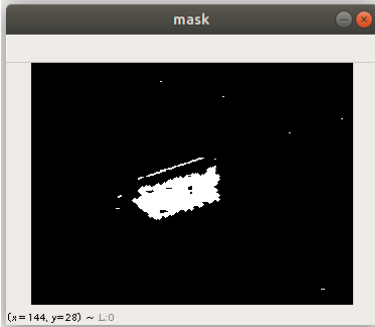
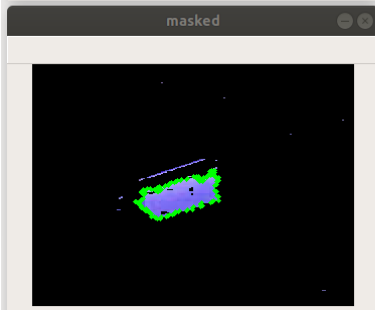
Once Cozmo recognizes that the hand gesture is a point, he identifies where the fingertip is, and based on this, decides where to turn.

To find the fingertip, we filter out the pink post-it that the user is wearing and calculate the centroid to turn in that direction.

Demo



Filtering Out the Centroid of Hot Pink Post-It



```
The_Loc_View_Search_Terminal
In manage_image_opr38
Number of contours:38
Index of largest contour:15
Centroid : (113, 25)
In manage_image_opr31
Number of contours:31
Index of largest contour:4
Centroid : (25, 77)
In manage_image_opr41
Number of contours:41
Index of largest contour:4
Centroid : (25, 77)
In manage_image_opr32
Number of contours:32
Index of largest contour:17
Centroid : (261, 75)
In manage_image_opr35
Number of contours:35
Index of largest contour:17
Centroid : (261, 75)
In manage_image_opr17
Number of contours:17
Index of largest contour:6
Centroid : (102, 98)
In manage_image_opr23
Number of contours:23
Index of largest contour:6
Centroid : (101, 97)
In manage_image_opr31
Number of contours:31
Index of largest contour:23
Centroid : (215, 104)
In manage_image_opr33
Number of contours:33
Index of largest contour:22
Centroid : (215, 104)
In manage_image_opr3
Number of contours:3
Index of largest contour:1
Centroid : (197, 29)
In manage_image_opr3
Number of contours:3
Index of largest contour:1
Centroid : (197, 29)
In manage_image_opr39
Number of contours:39
Index of largest contour:9
Centroid : (130, 77)
In manage_image_opr45
Number of contours:45
Index of largest contour:9
Centroid : (131, 77)
In manage_image_opr19
Number of contours:19
```

# Cozmo In Action



Cozmo In Action

# Conclusion



# Results

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Cozmo can recognize when there is a hand, and when the hand is pointing.

He is a little inconsistent, but this could be solved by having a larger, more comprehensive dataset.

We discovered that hot pink is the easiest to filter out by color on Cozmo's camera and works extremely well as an indicator.

# Future Work

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Future work might include making Cozmo decide which object the user is pointing at when there are two or more objects in frame.

Another possible extension would be to integrate this feature into cozmo-tools.