

# Hand and finger detection using OpenCV

*By*

*Russell Mohammed*

## لكل اصم... انتم انا

ما زلتَ طلبون الجناح، حماري الطموح، قادر على اداء اشير المباني والاصروح، اري الكوك  
حولي بوضوح، انتفس الصعداء، وارفع راسي بشوخ، ما دمت اري واشعر، اخطط  
وافكر، اسعي للنجم، انا مل واطمح، اصارع الصم باهمة، سعي للوصول الى القمة، انا  
كانوا يخشونكم سمعي لما يقولون، فما سعي للمكتم من فهمي باشاراس اصبغة واخرى  
وصفية، فابن دورهم من تعلم لغتي، وابتن سعيهم ليتمكنوا من فهمي

# languages of the deaf

## What is deaf person?



























Deaf person is mentally retarded is the only deaf (unable to hearing) and sometimes used the term "deaf and dumb" wrong as the default for the existence of two separate types of disability - the inability to hear and an inability to speak - However, the inability to speak clearly is a direct result of the design. So the sound is not who will miss him but the information and communication provided by this

sound.

## sign language

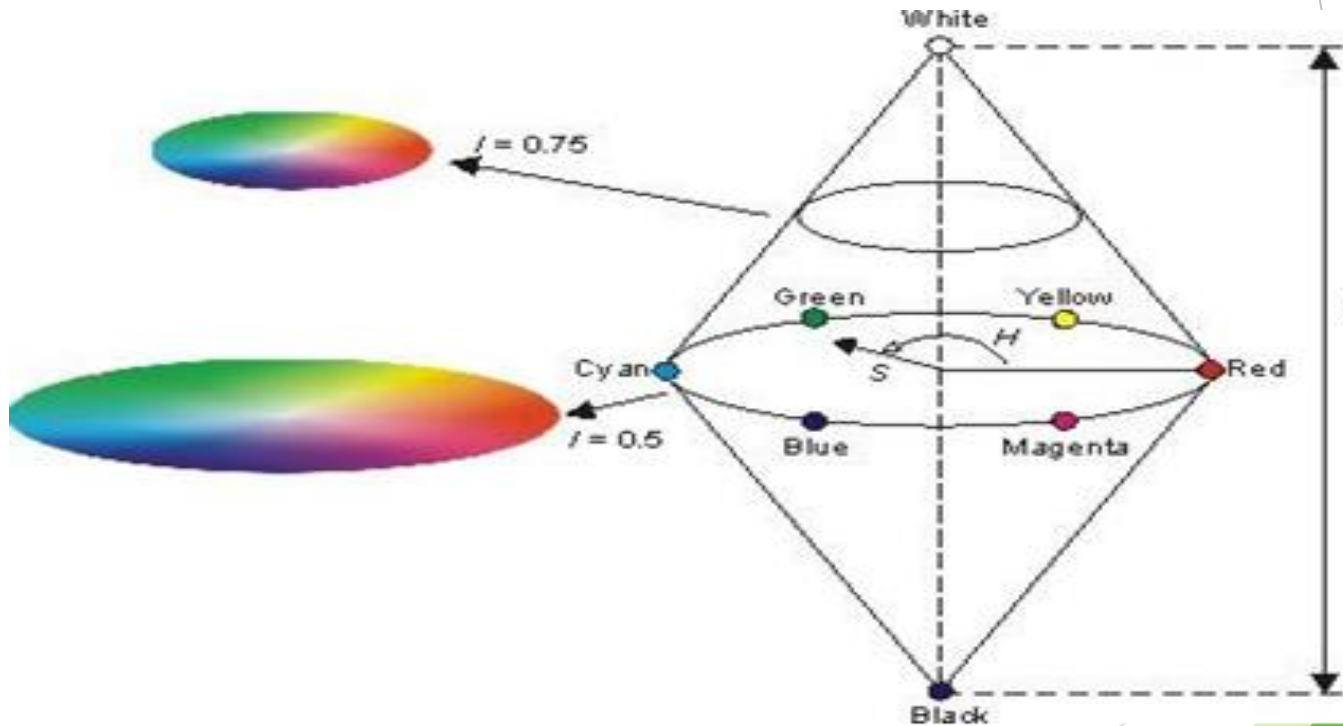
Know sign language as a set of visual symbols used in an orderly hand of words or concepts or ideas language. It is expressed in sign language or formed, by linking the signal and its significance in the spoken language. In sign language, the movements of hands to replace the spoken word, as well as give facial expressions and body movements of the visible signs replace the voice of expression.

# languages of the deaf

<b>A</b>  <b>a</b>	<b>B</b>  <b>b</b>	<b>C</b>  <b>c</b>	<b>D</b>  <b>d</b>	<b>E</b>  <b>e</b>	<b>F</b>  <b>f</b>
<b>G</b>  <b>g</b>	<b>H</b>  <b>h</b>	<b>I</b>  <b>i</b>	<b>J</b>  <b>j</b>	<b>K</b>  <b>k</b>	<b>L</b>  <b>l</b>
<b>M</b>  <b>m</b>	<b>N</b>  <b>n</b>	<b>O</b>  <b>o</b>	<b>P</b>  <b>p</b>	<b>Q</b>  <b>q</b>	<b>R</b>  <b>r</b>
<b>S</b>  <b>s</b>	<b>T</b>  <b>t</b>	<b>U</b>  <b>u</b>	<b>V</b>  <b>v</b>	<b>W</b>  <b>w</b>	<b>X</b>  <b>x</b>
<b>Y</b>  <b>y</b>	<b>Z</b>  <b>z</b>				

# Step one

*Skin color detection using HSV (hue saturation value) color space*



## Step one

### *Skin color detection using HSV color space*



(a)



(b)

Step two

## *Morphology Processing*



(a)



(b)



(c)



Step three

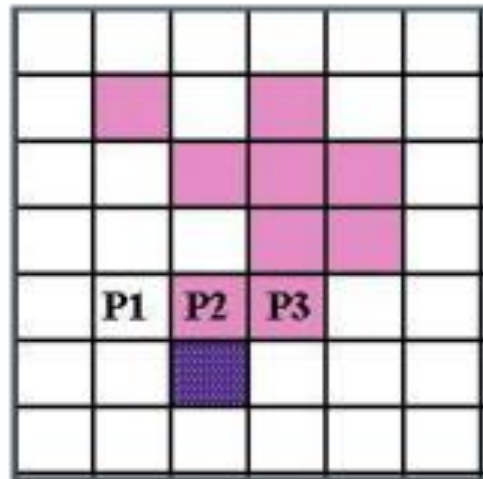
## *Contour Finding*





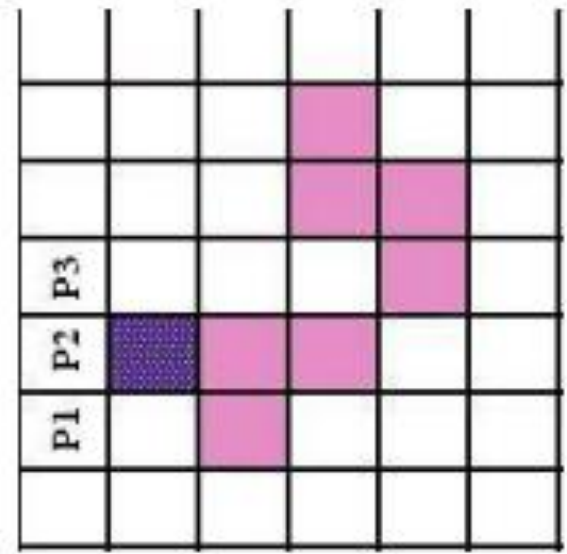
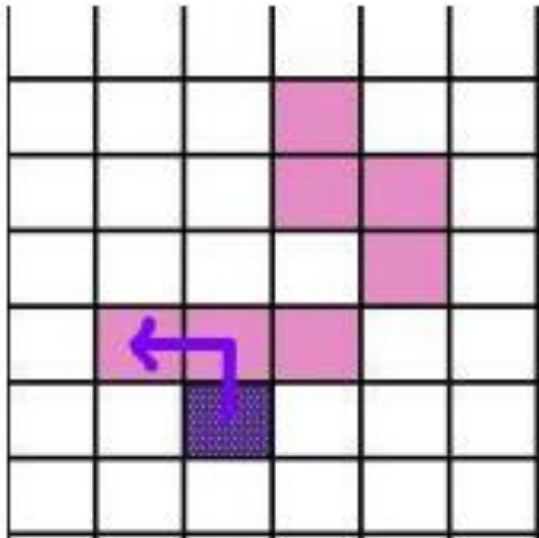
# Contour Finding

## *Pavlidis Algorithm*



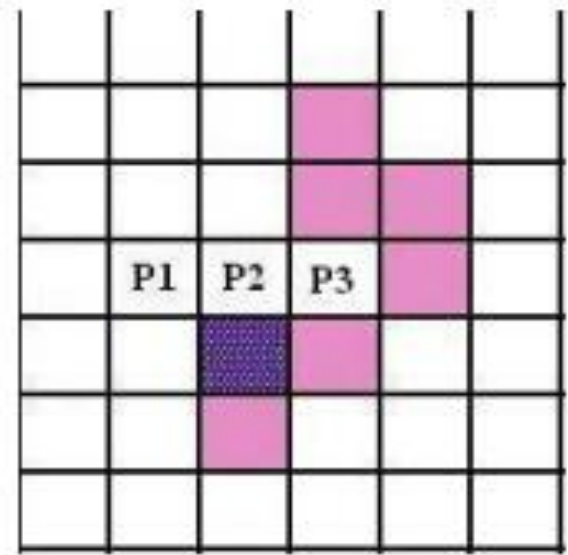
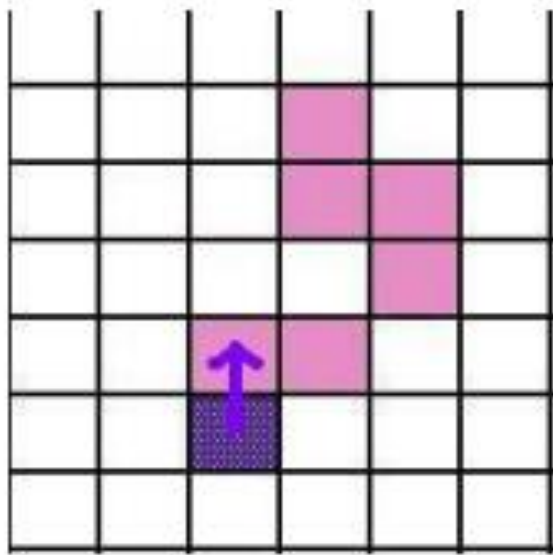
# Contour Finding

## Pavlidis Algorithm



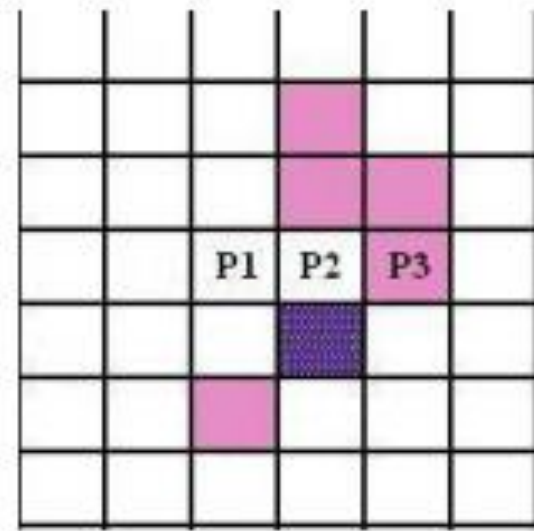
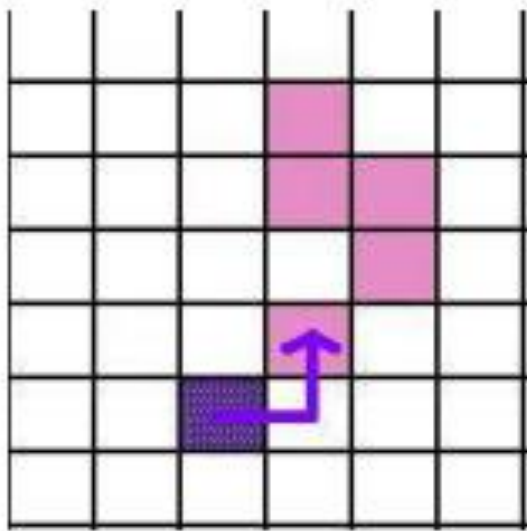
# Contour Finding

## Pavlidis Algorithm



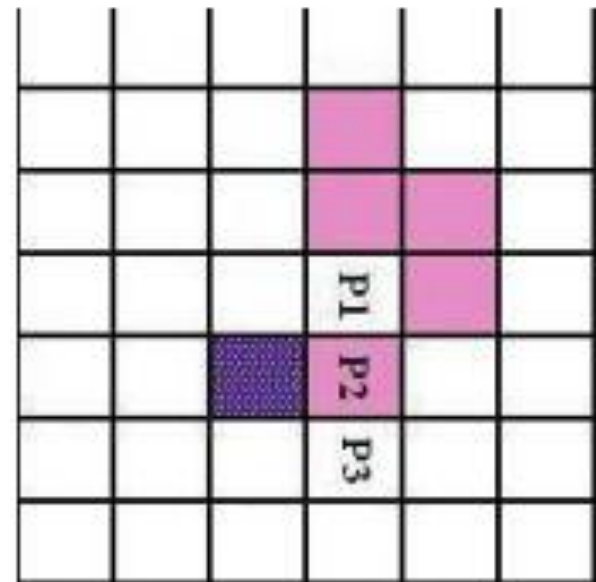
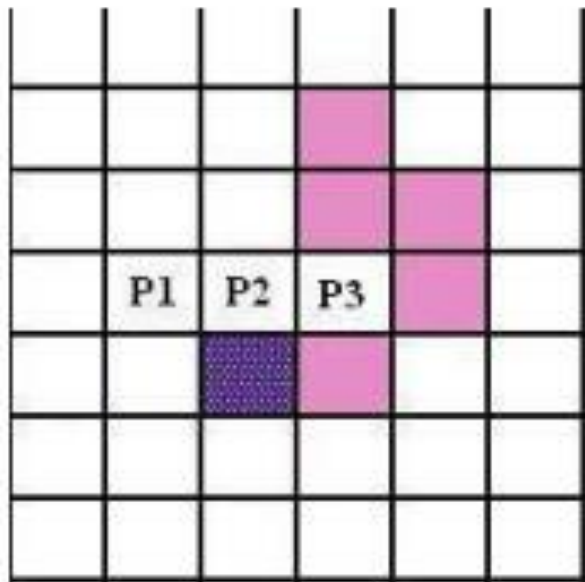
# Contour Finding

## Pavlidis Algorithm



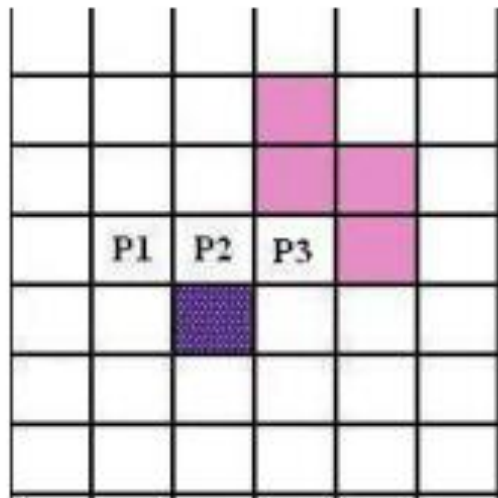
# Contour Finding

## Pavlidis Algorithm

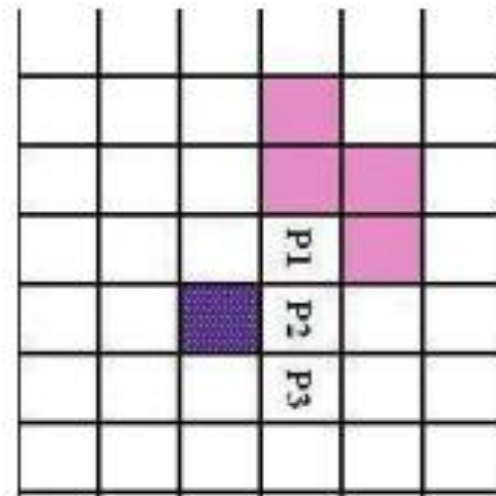


# Contour Finding

## Pavlidis Algorithm



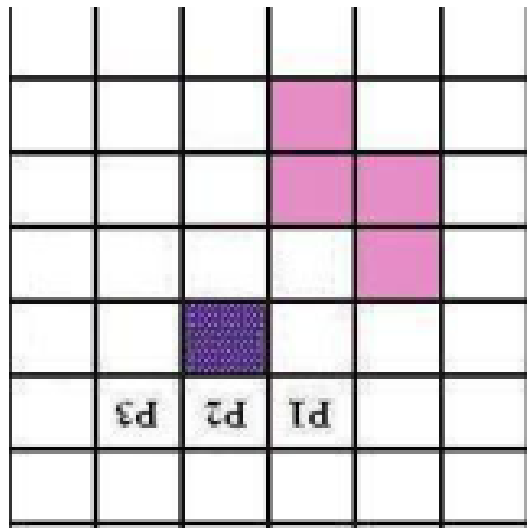
(a)



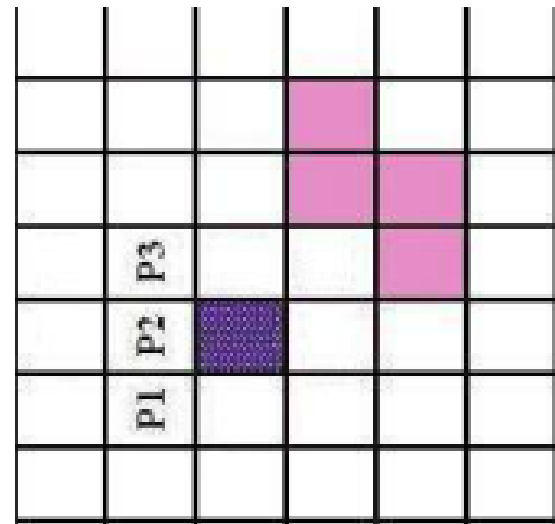
(b)

# Contour Finding

## Pavlidis Algorithm



(c)



(d)



# Contour Finding

## Pavlidis Algorithm



(a)



(b)



(c)

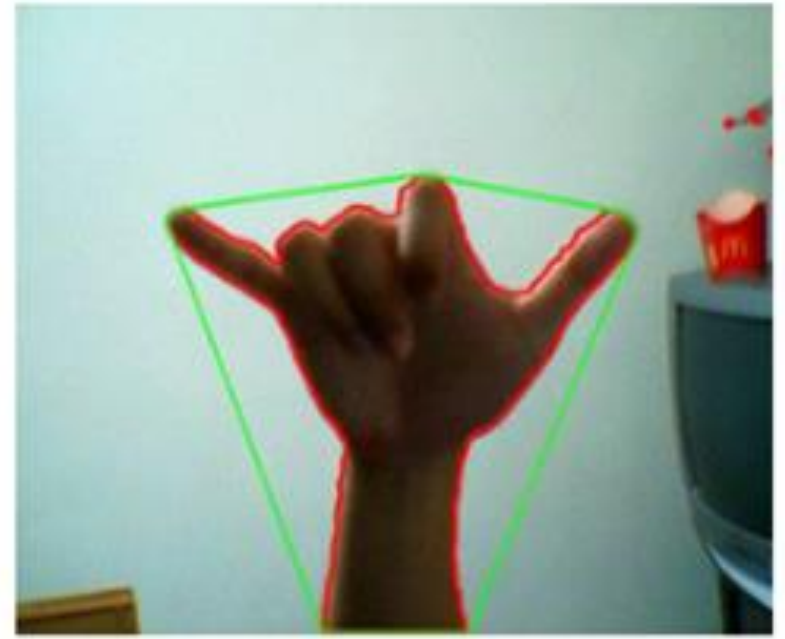
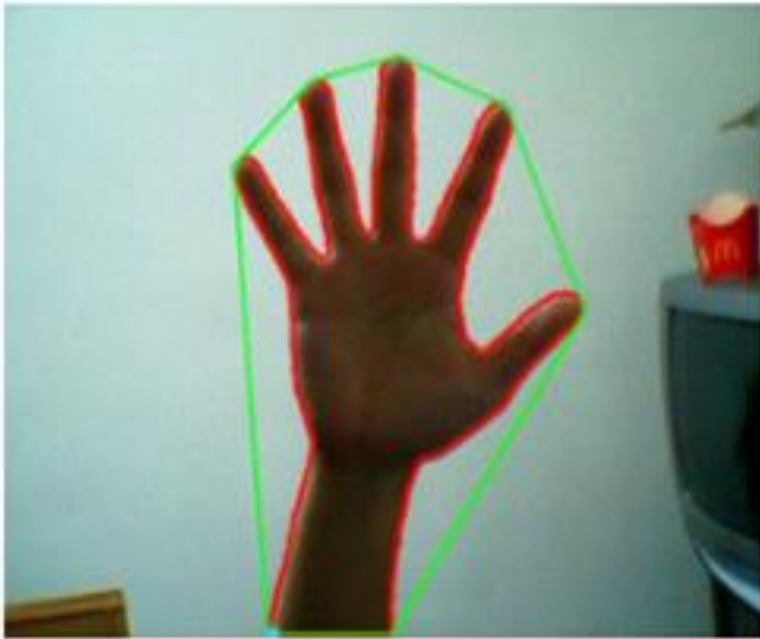
*(a) input binary image (b) Contours (c) select the longest contour*

Step four

## *Convex Hull*

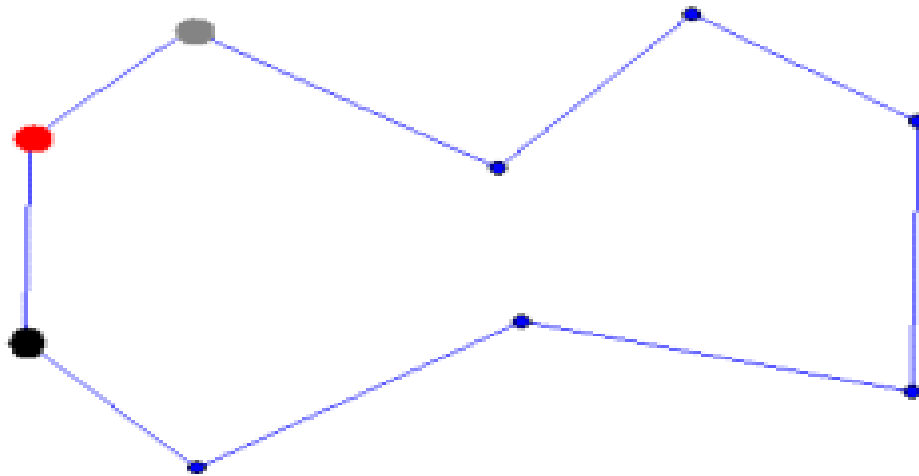
# Convex Hull

*Finding Convex Hull by Three-Coin Algorithm*



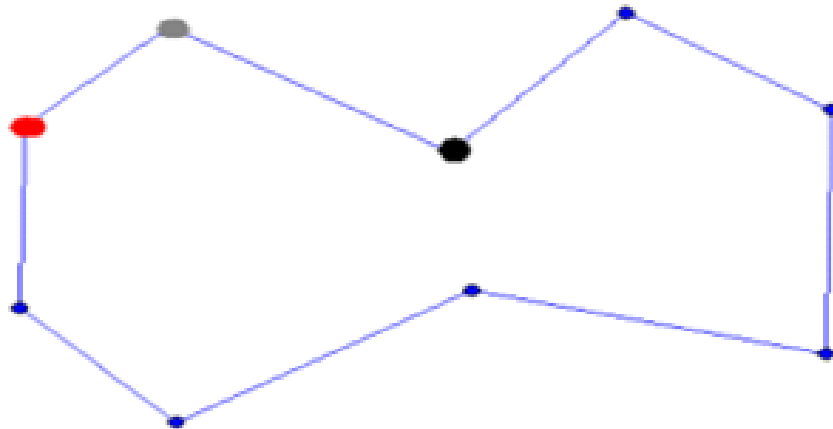
## Step of *Three-Coin Algorithm*

*First of all, we choose a point to be the starting point, mark this point as a black coin. The starting point must be a convex vertex. We can choose the point which is the left most. The point after black point will be marked as a red coin. The point after the red coin will be marked as grey point. We also called them end coin, middle coin and front coin according to their order and regardless of*



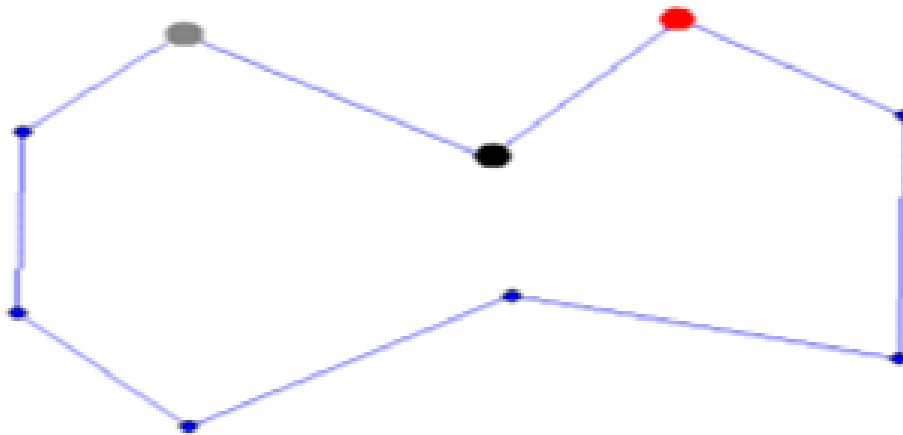
## Step of *Three-Coin Algorithm*

*Let's check the path from the end coin (currently the black coin) to the middle coin (currently the red coin), then arrive the front coin (currently the grey coin). The path forms a right turn. Whenever encounter a right turn, move the coin at the end coin to the point next to the front point. So we have the black coin as front coin while the grey coin is the middle coin and red coin turns out to be the end coin.*



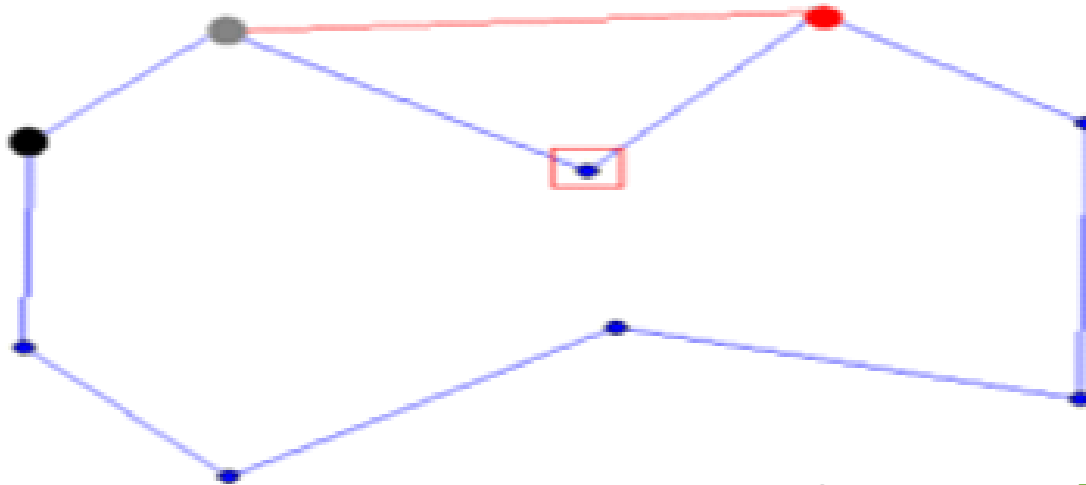
## Steep of *Three-Coin Algorithm*

*Once again, we check the path of the three coins. It forms a right turn again. So we move the end coin to the point next to the front coin. The front coin is now the red coin while the middle is the black point and the grey point become the end coin.*



## Step of *Three-Coin Algorithm*

*We check the path of the three coins, this time it forms a left turn. Whenever we encounter a left turn, we should delete the point where the current middle coin stands on, and then move the middle coin to the point before the end point (currently the grey point). Right now, our front coin remains the same (the red coin). But the middle coin has been changed to the grey coin and the black coin is the end coin.*

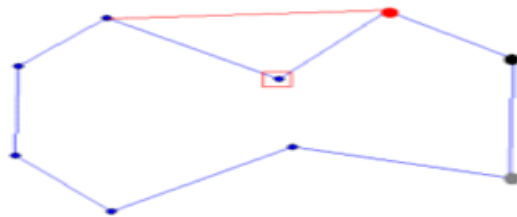




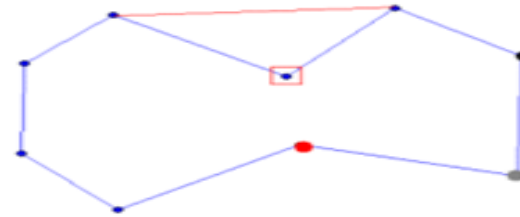


## Steep of *Three-Coin Algorithm*

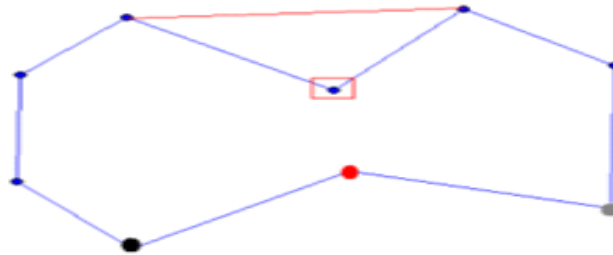
*It forms a right turn again. So we move the end coin to the point next to the front coin. Previous step still forms a right turn, so we do the same procedure again. Still makes a right turn, so we do the same procedure.*



(a)



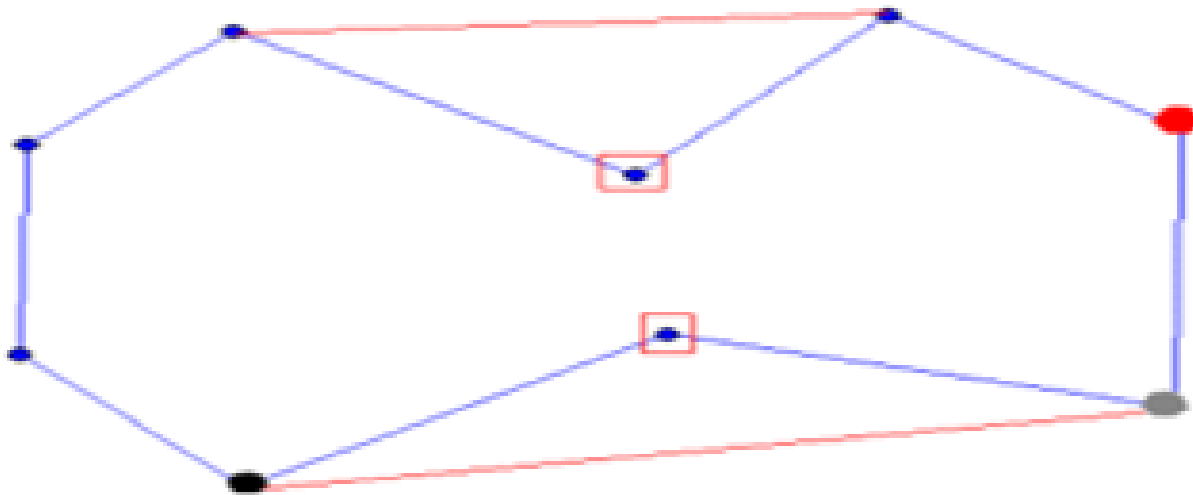
(b)



(c)

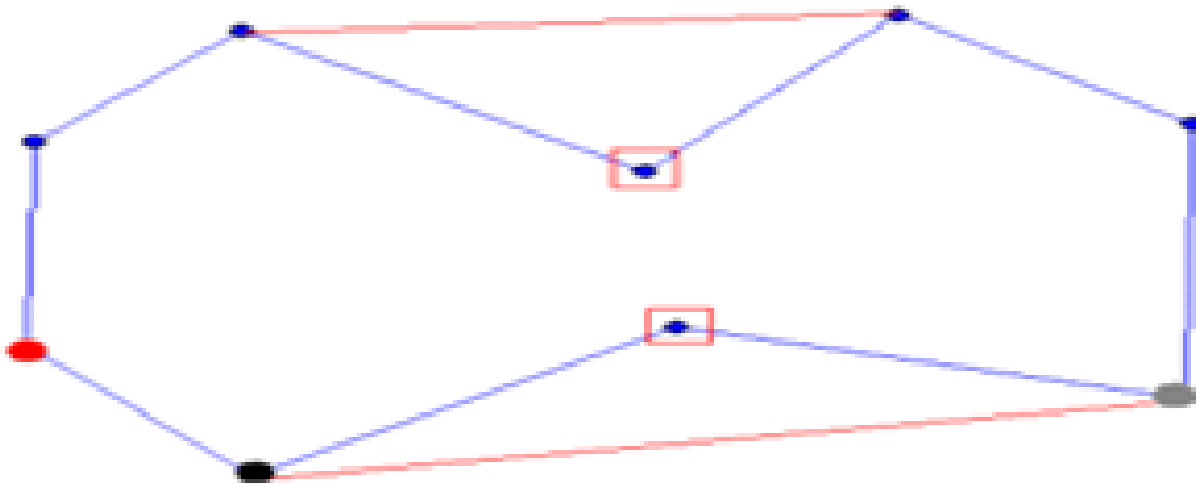
## Steep of *Three-Coin Algorithm*

*Finally the coins form a left turn. We delete the point where the middle coin stands on right now (currently the red coin). And we move the middle coin to the point before the end coin (currently the grey coin).*



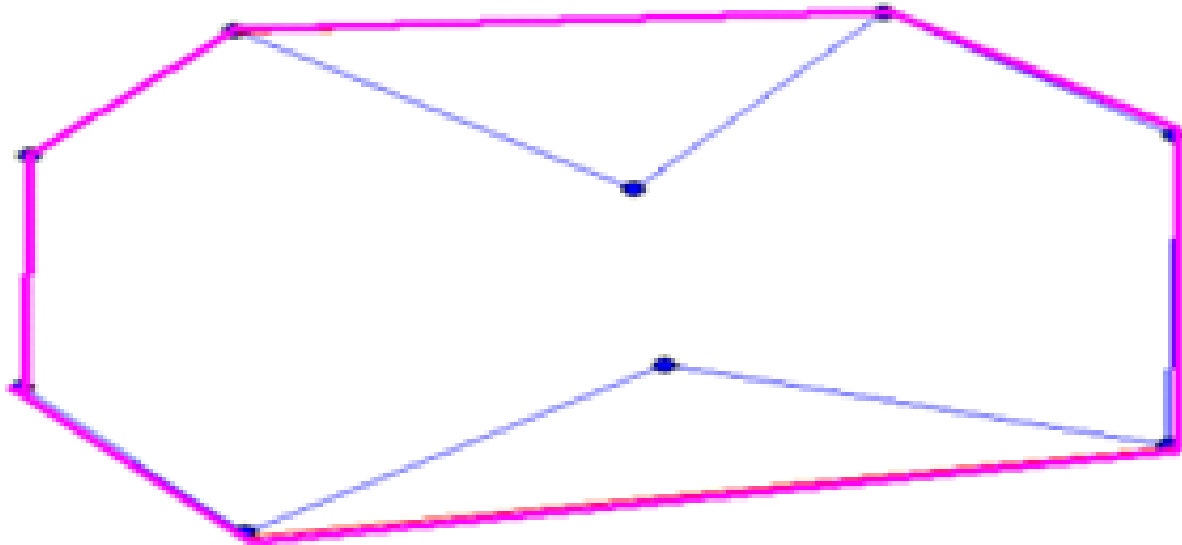
## Steep of *Three-Coin Algorithm*

*It forms a right turn. As we move the end coin to the point next to the front coin, we find out that it comes back to the starting point. Therefore, the whole procedure will be terminated.*

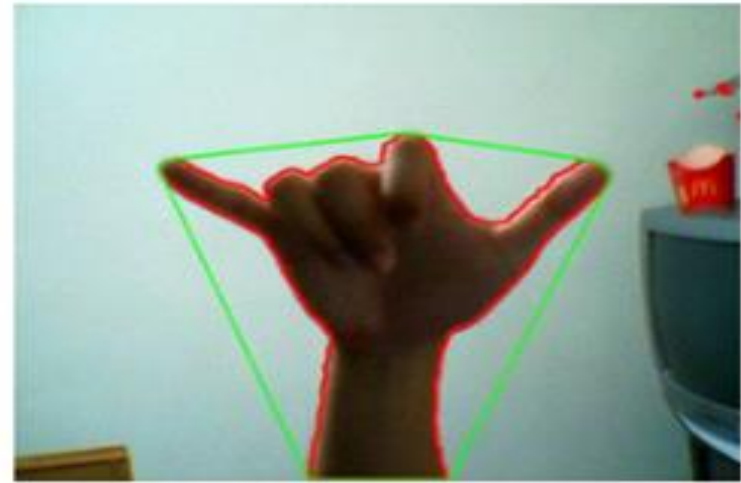
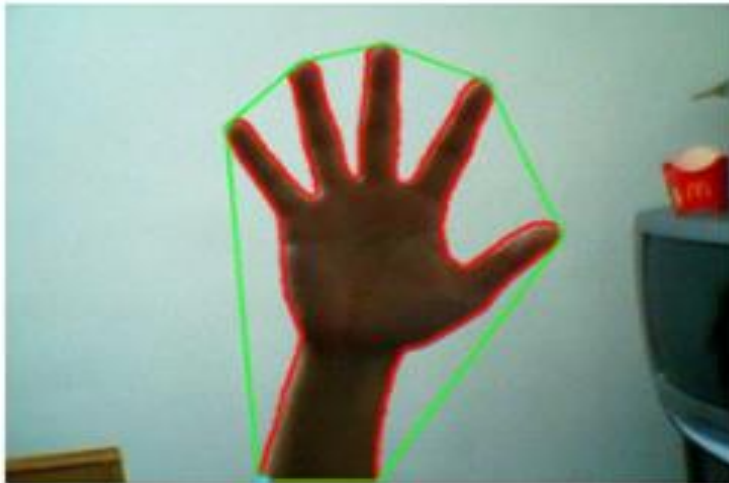


## Step of *Three-Coin Algorithm*

*Link all the remained points. We got the convex hull of the set of points as shown in figure*



## Result of *Three-Coin Algorithm*



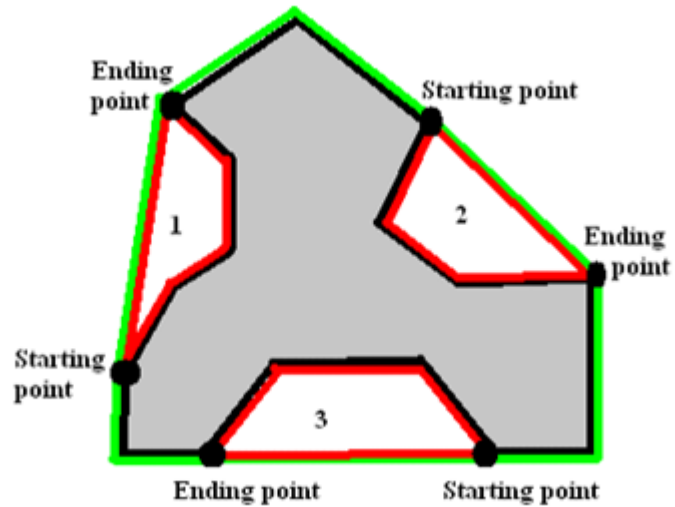
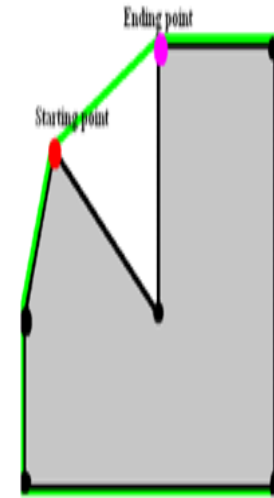
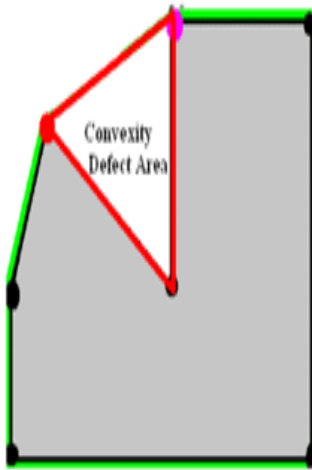
Step five

## ***Convexity Defect***

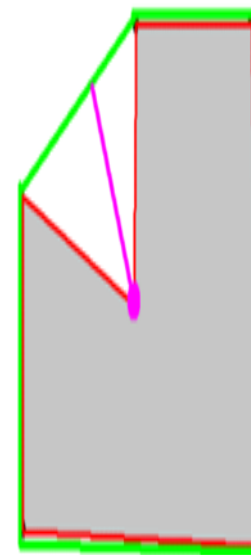




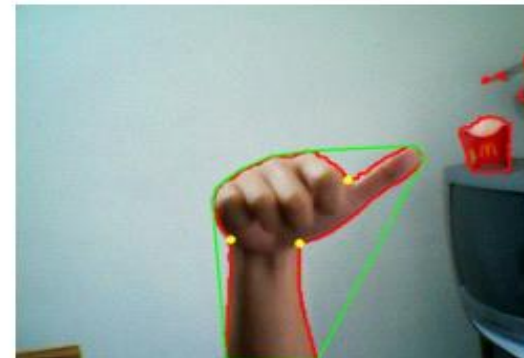
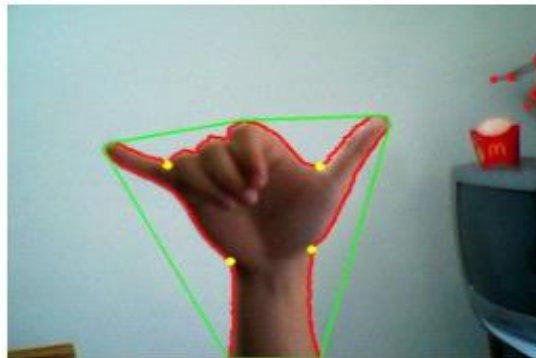
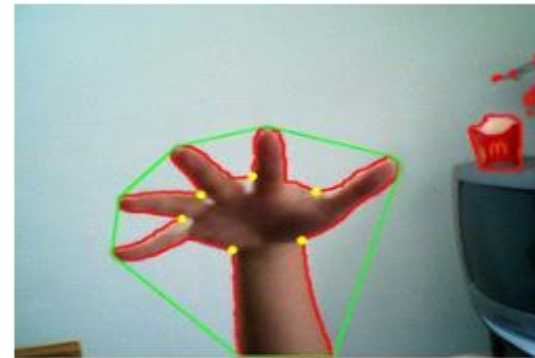
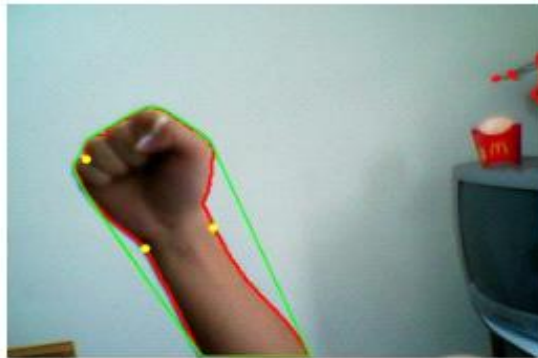
# *Convexity Defect*



# Convexity Defect

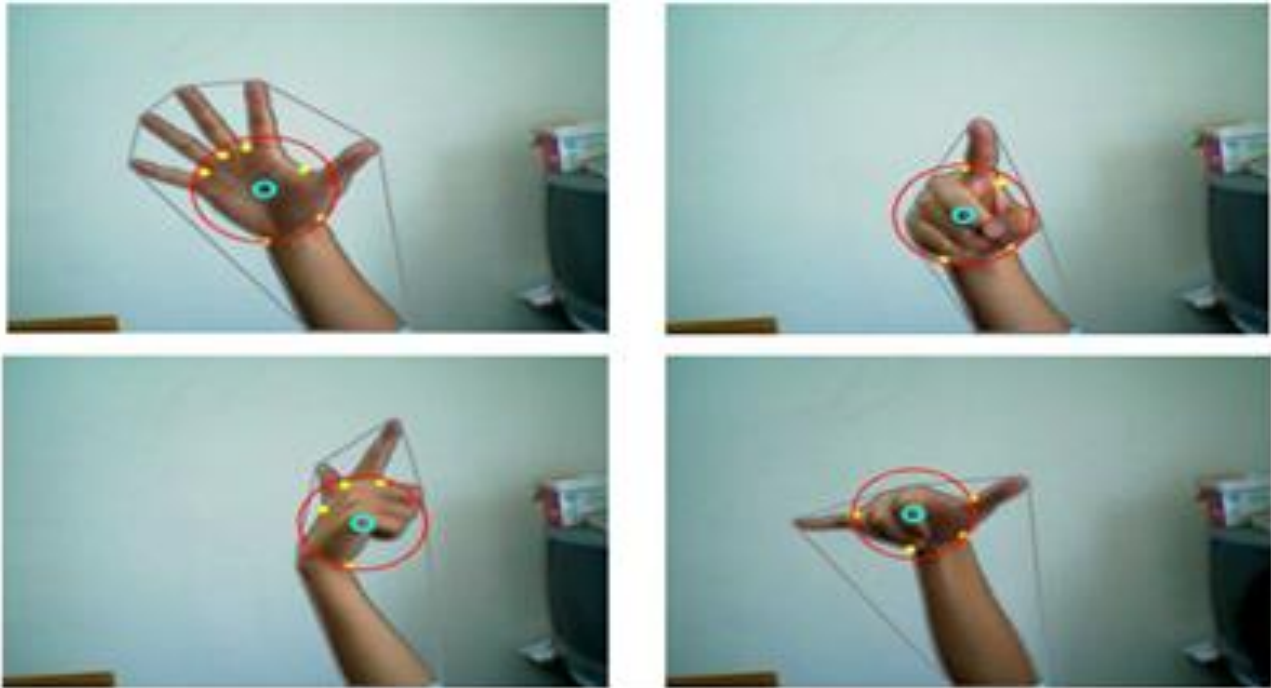


# Convexity Defect

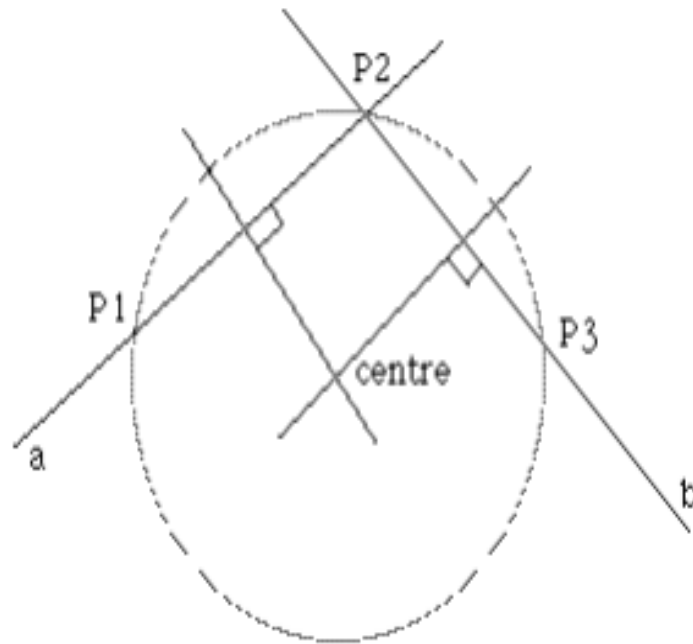


Step six

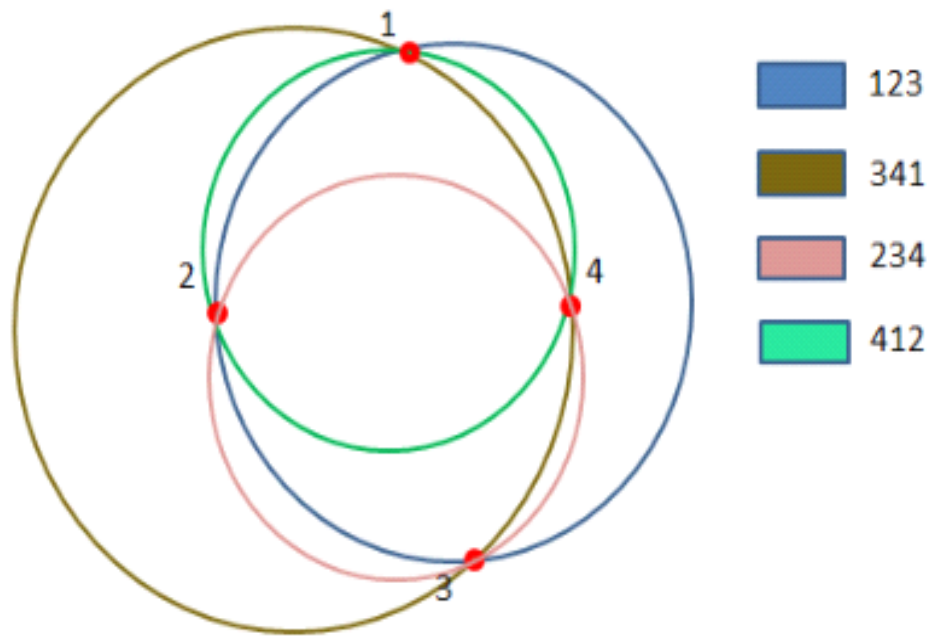
## *Minimum Enclosing Circle*



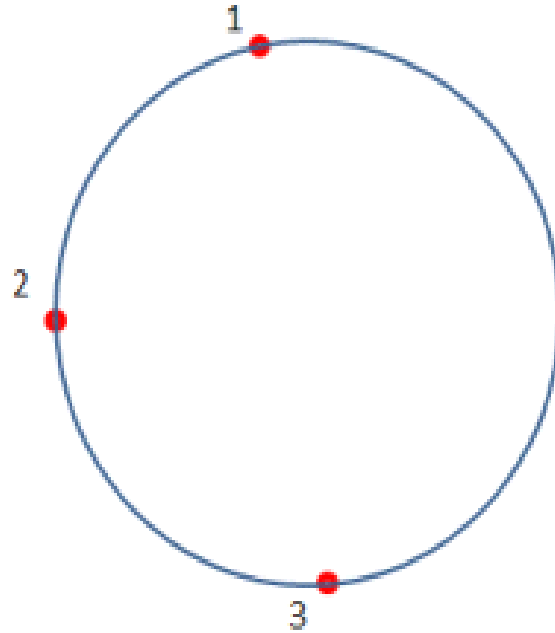
# *Skyum's algorithm*



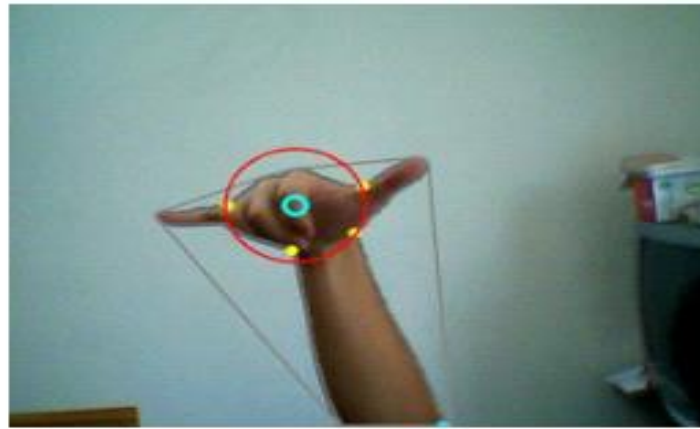
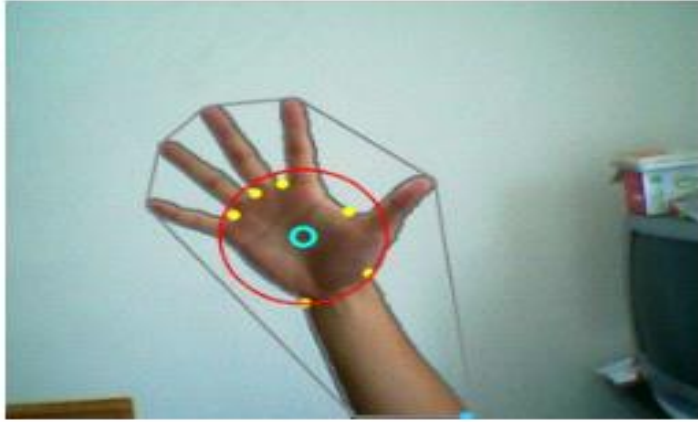
# Skyum's algorithm



# *Skyum's algorithm*



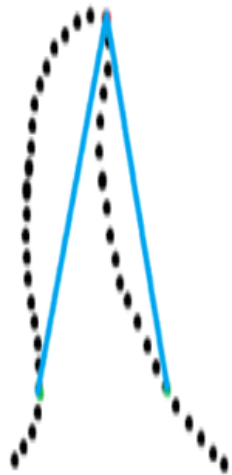
# *Skyum's algorithm*





Step seven

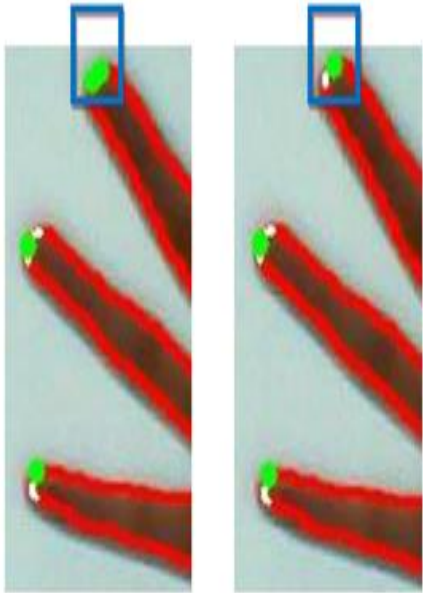
## *Fingertip Detection*



# *Fingertip Detection*



# *Fingertip Detection*

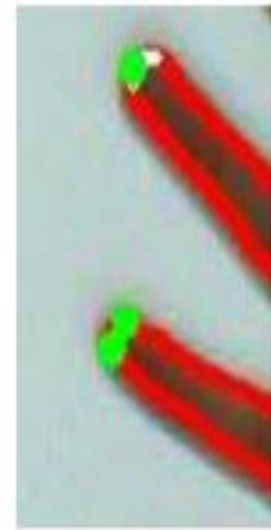


(a)

(b)

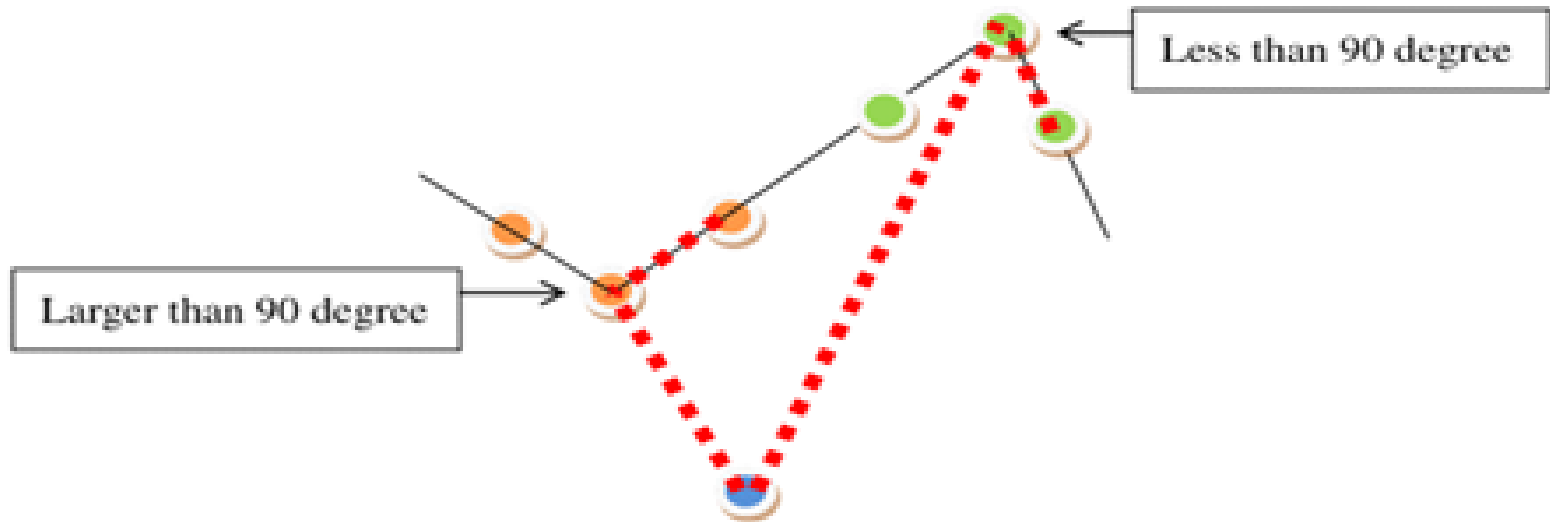


(a)

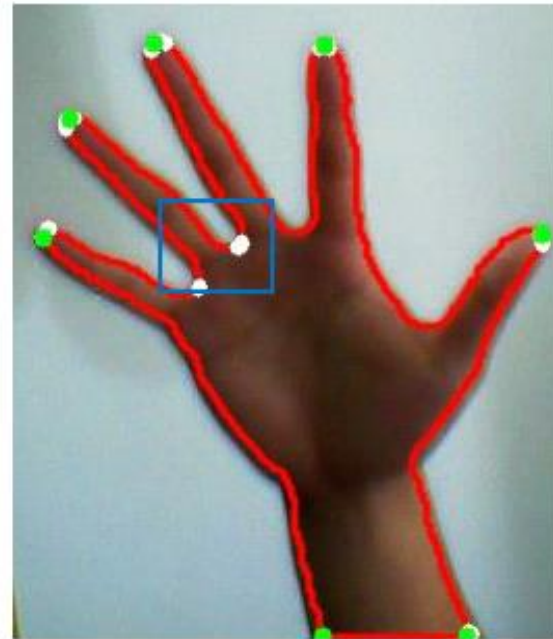
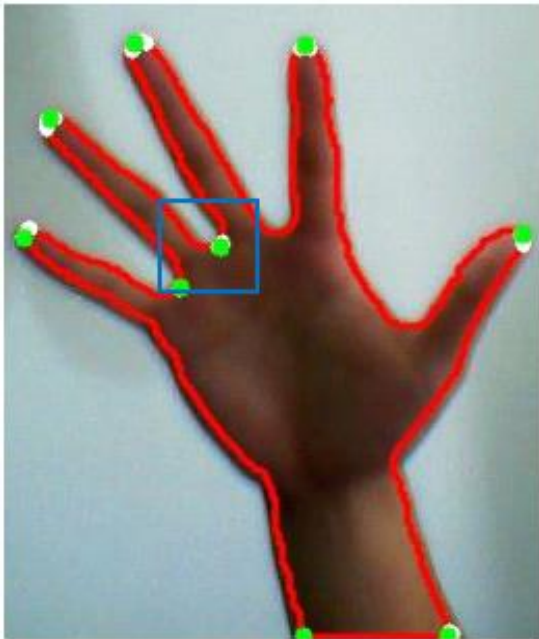


(b)

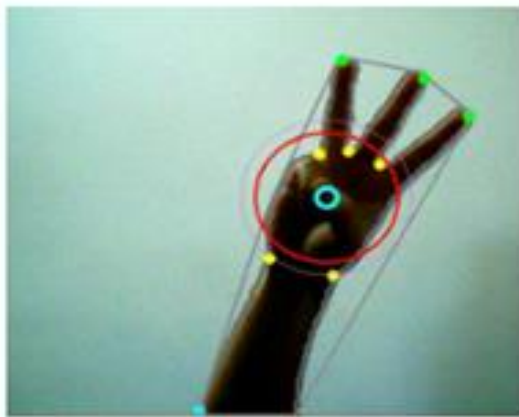
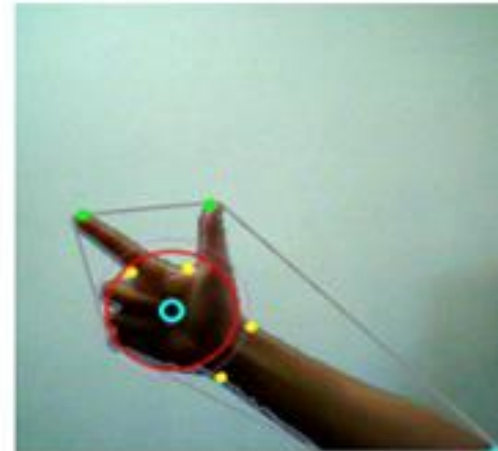
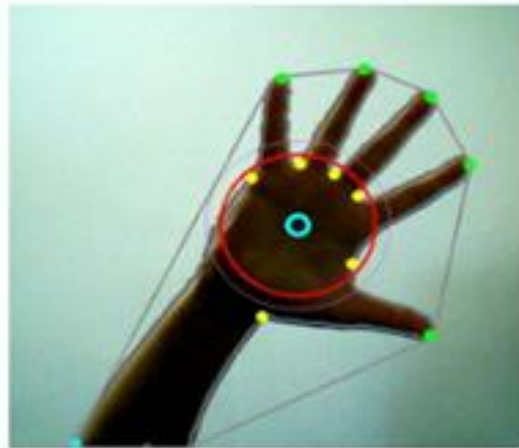
# Fingertip Detection



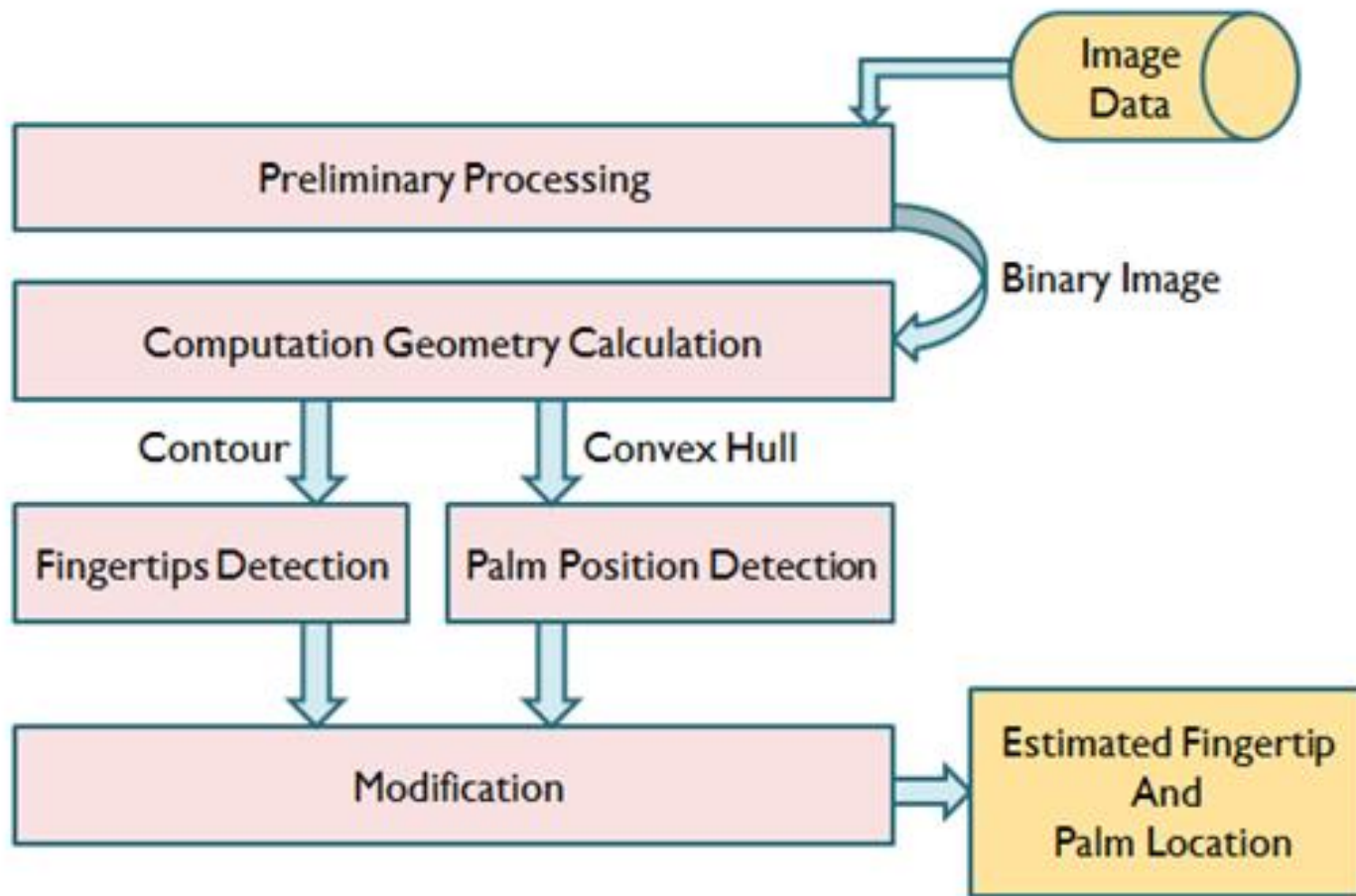
# *Fingertip Detection*



# *Fingertip Detection*

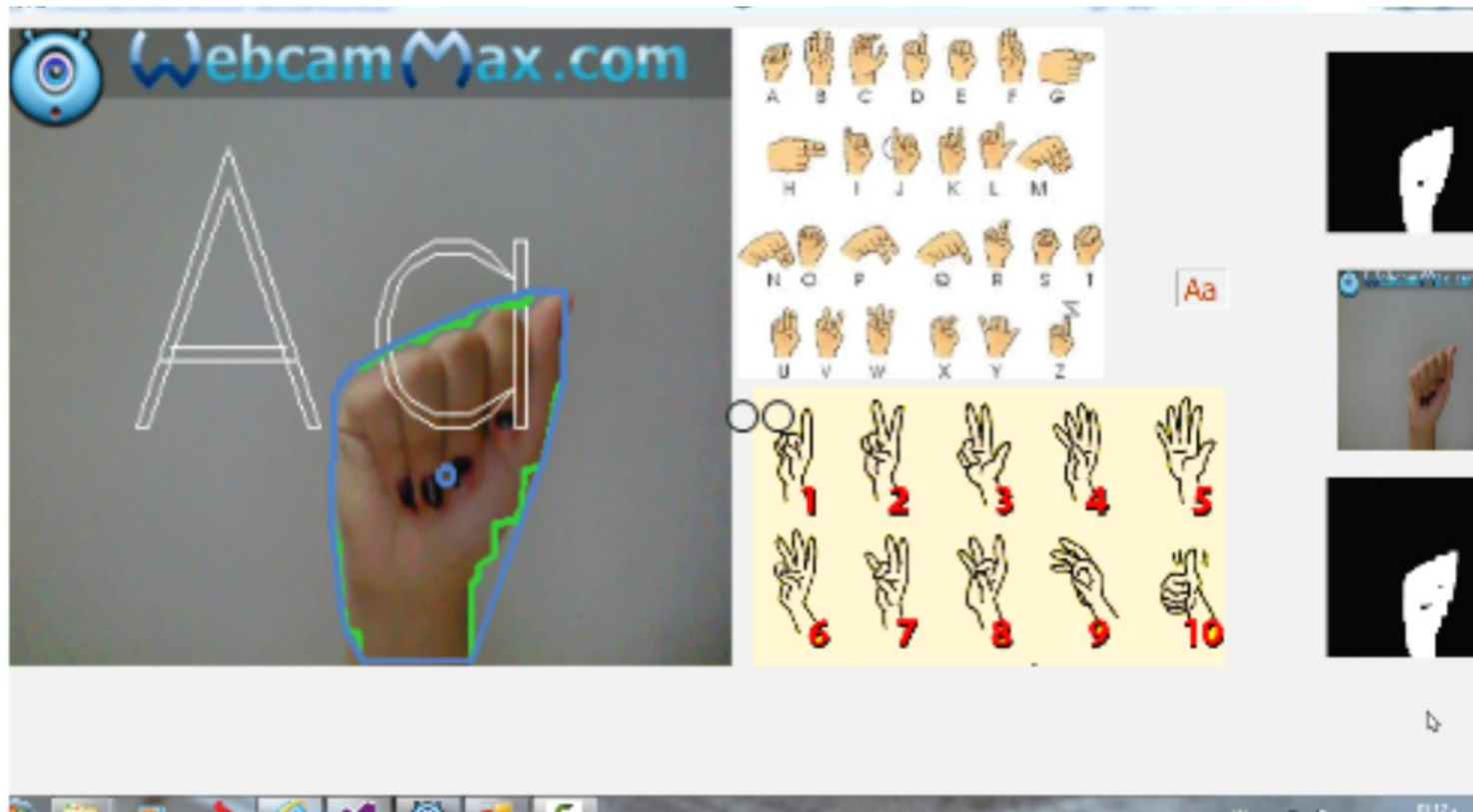


# Design and Implementation Of Proposed System





# Final results





# Final results

