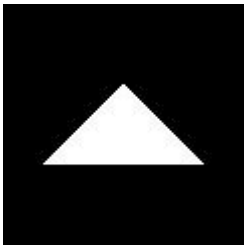
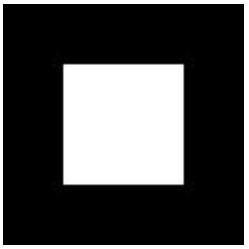
Answer to Q1

For this problem stimuli were considered as follows (pls see fig):

- The base of squares and triangles are considered to be at the same angle.
- The triangle is an isosceles right triangle with the top angle as 90 degrees.

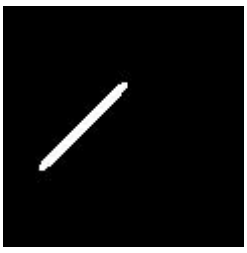



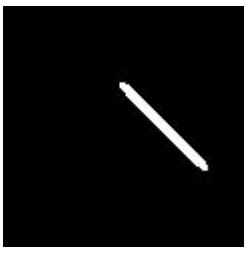
General procedures followed up for filtering:

- Images were preprocessed using adaptive thresholding to get sharp white shapes.
- Lines where detected using proper Gabor filters of different angles.
- After detection of lines corners where found.
- Based on the corners detected, finalises whether the image was really a square in case of square filter bank or triangle in case of the triangle filter bank.

The specific procedure for the triangle:

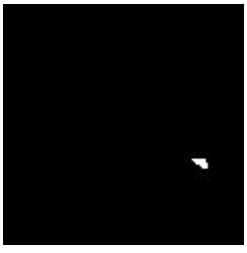
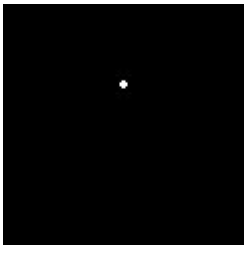
- Bank of Gabor filters used for the triangle are (see corresponding outputs):





With angle pi/4 **With angle pi/2** **With angle 3*pi/4**

- Filtered Images of any two filters were multiplied together to get the corner corresponding to it (see fig below)


- Multiplied images where checked for if it contains any white pixels or not if it contains implies corners where detected if all the corners detected implies triangle was there.

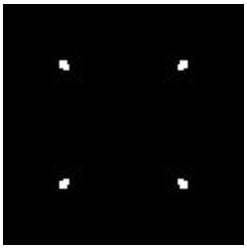
The specific procedure for the triangle:

- Bank of Gabor filters used for the triangle are (see corresponding outputs):

With angle 0

With angle pi/2

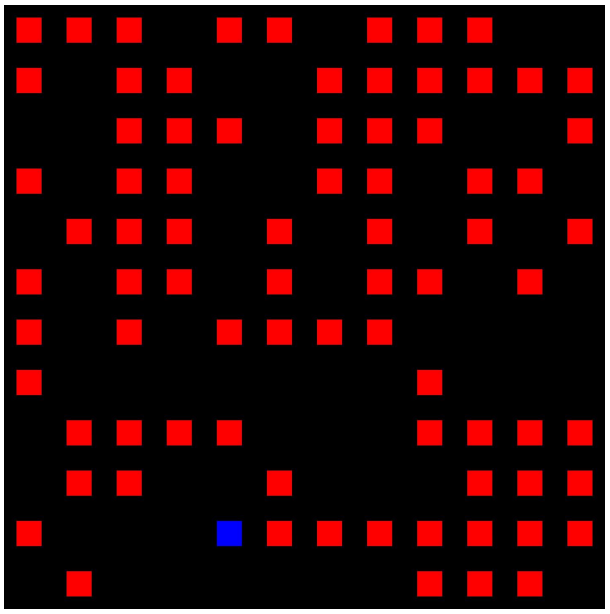
- Filtered Images where multiplied together to get the corners (see fig below)



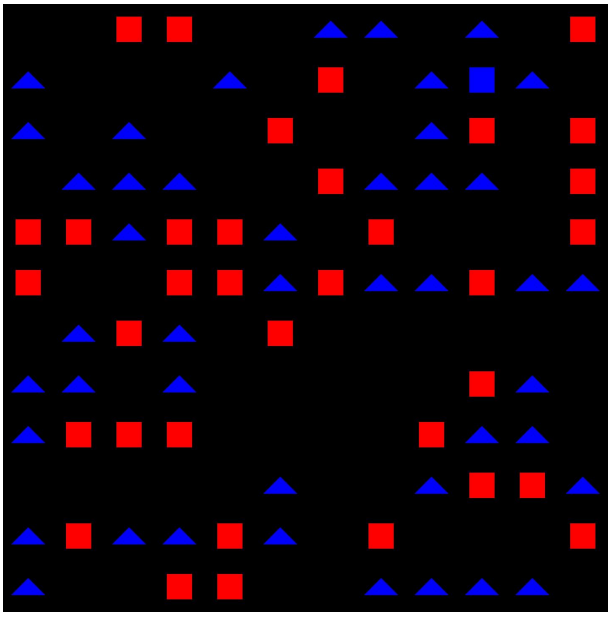
- To check for whether the number of corners is really four, the number of white patches were found by finding contours in the images i.e. continuous white dots. If the numbers of contours are 4 implies succesfull square. NOTE: This was done in order to distinguish a square from any other figure which may have corners due to one horizontal and verticle line if we want to distinguish only between triangle and square there would be no need of finding the number of corners as the given triangle will not give any corner.

Answer to Q2

- The triangle and square stimuli (of size 120x120) from the Q1 were used to fill the objects at the required location.
- Search space is a 1440x1440 image which is divided into 144 blocks of 120x120 pixel sizes.
- Based on the number of objects N points where selected randomly from 1 to 144 for object location.
- **Feature Search** paradigm was generated by just using the the square shape and changing the colour for a randomly selected location out of chosen object location as odd stimuli.
- **Conjuncture Search** paradigm was generated using randomly choosing the number of squares and then randomly selecting that number of points as squares location out of the available object location. All squares were given the same colour and all the triangles were of the same colour but the colour of the square and triangle were different. Colour was changed by randomly selecting an odd stimulus.



Feature Search



Conjunction Search

Answer to Q3

Colour Maps were generated on the basis of max intensity in the specific channels as per the stimuli used we will get 0 channel for red stimuli and 2 channel for blue stimuli.

Feature Search:
Since this search is based on just one feature, counting the occurrences of each type i.e. numbers of blues and numbers of reds will solve the problem. The one which gives only 1 occurrence will be the odd one. A time delay of 0.02 secs where added for checking which has an occurrence of 1.

Conjunction Search:
After going at every position object will be classified on the basis of both features. Will give four different types:

- Blue Triangle
- Red Triangle
- Blue Square
- Red Square

One which yields only one occurrence will be the odd one. A time delay of 0.015 secs where added for each integration and a time delay of 0.02 secs where added for checking which has an occurrence of 1.