ASSIGNMENT-2
Computational Cognitive Science (CS786)

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1) Design complex cells that can recognize triangles and squares using a bank of orientation-selective 2D Gabor filters:

Step 1: We have taken four gabor filters at angle of 0, $\frac{\pi}{2}$, $\frac{\pi}{3}$ and $\frac{2\pi}{3}$

Step 2: We calculate response of our sample rectangle and equilateral triangle by taking convolution.

Step 3: We noted down mean of response and set threshold such that for triangle it is high for 0,60 and 120 degree and for rectangle it is high for 0 and 90 degree.

Now when new image is tested , its mean response is calculated and thresholded and then check condition if it is high for 0 an 90 means rectangle or if high for 0 60 and 120 means triangle.

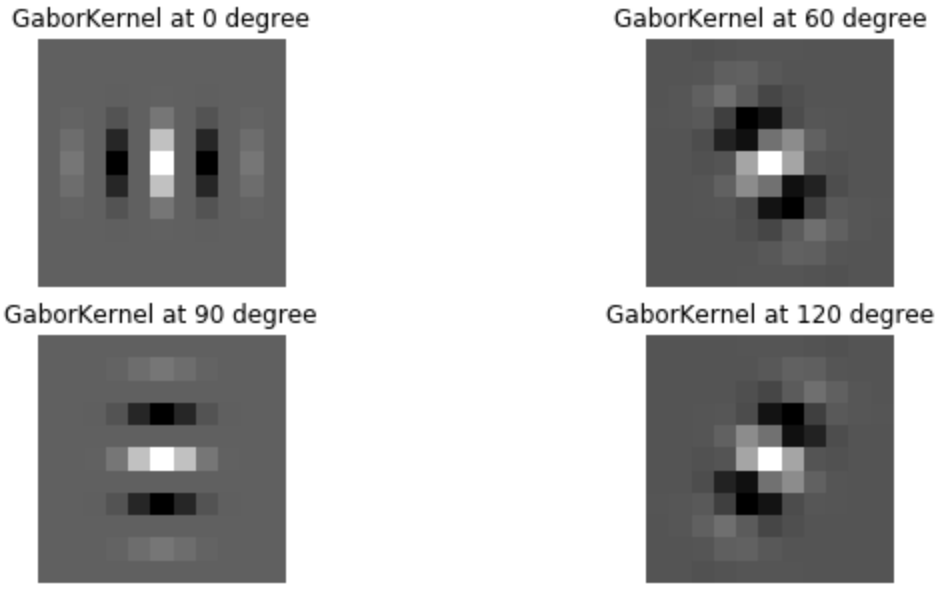

Figure 1: Gabor filter for different theta

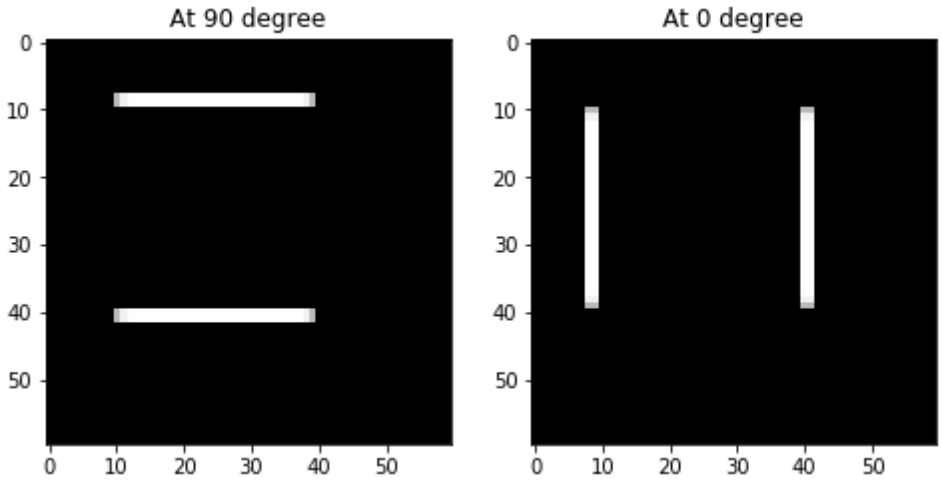

Figure 2: Response for Rectangle

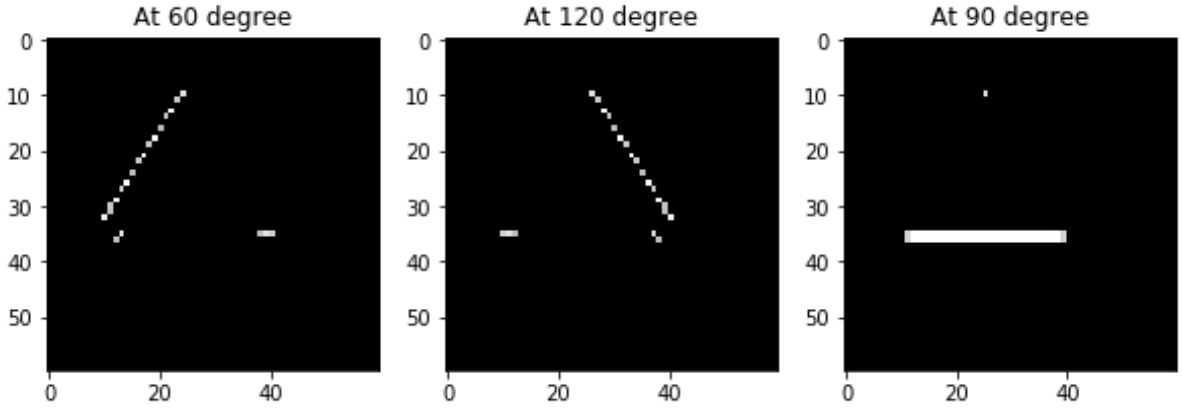

Figure 3: Response for Triangle

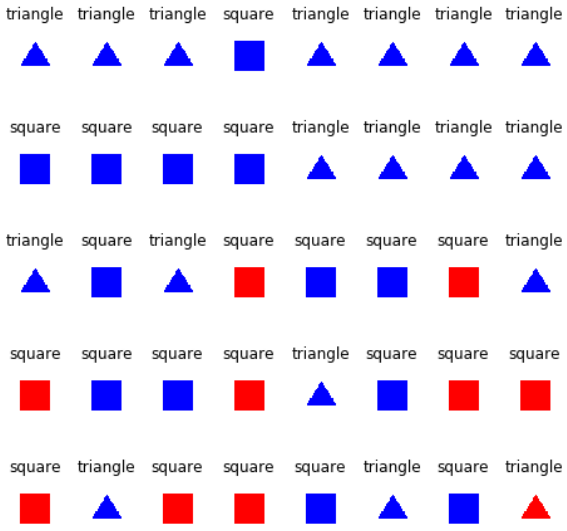

Figure 4: Sample response of Gabor Complex Cell

2) Image Frame generation for Paradigm

For Feature search we randomly decide whether feature will be color or shape.

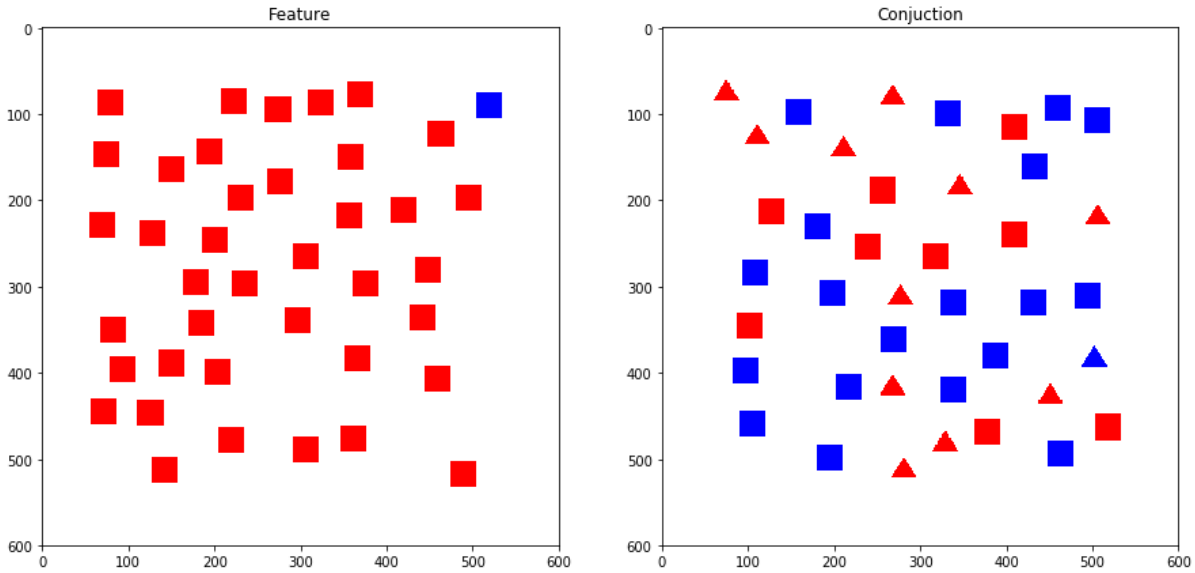

Figure 5: Image Frame for FIT

3) Feature Integration Theory Simulation:

First of we pre calculate color and shape information which is done parallely according to FIT theory in preattentive state. We get the location of object present from question no. 2 and then using Complex cell from question no. 1 we detect shape information. We use RGB Value of pixel at location to detect color information.
Next for feature search we need to look for only one property i.e either shape or color. so no need to go through all the location.
For conjuction search we need to see both properties to detect object so we need to go through all the loaction to find the odd object.

Feature Search:

Here there will be only one distinctive feature(either color or shape) we pop out the odd by using information using of preattentive stage.

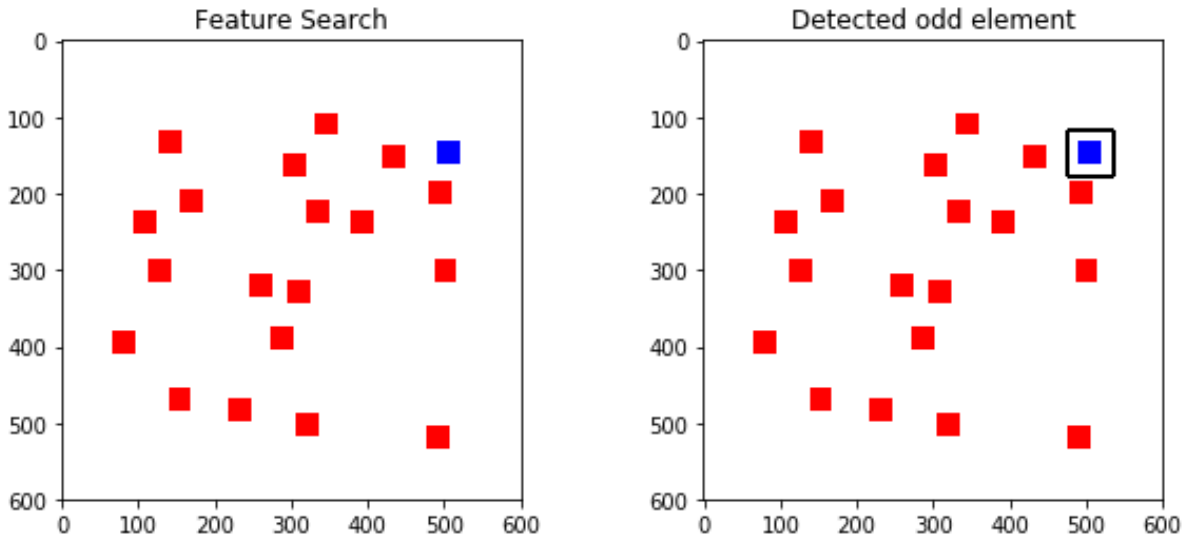

Figure 6: Feature Search Odd Detected

Conjuction Search:

Here pre attentive stage information in processed sequentially to detect odd element.

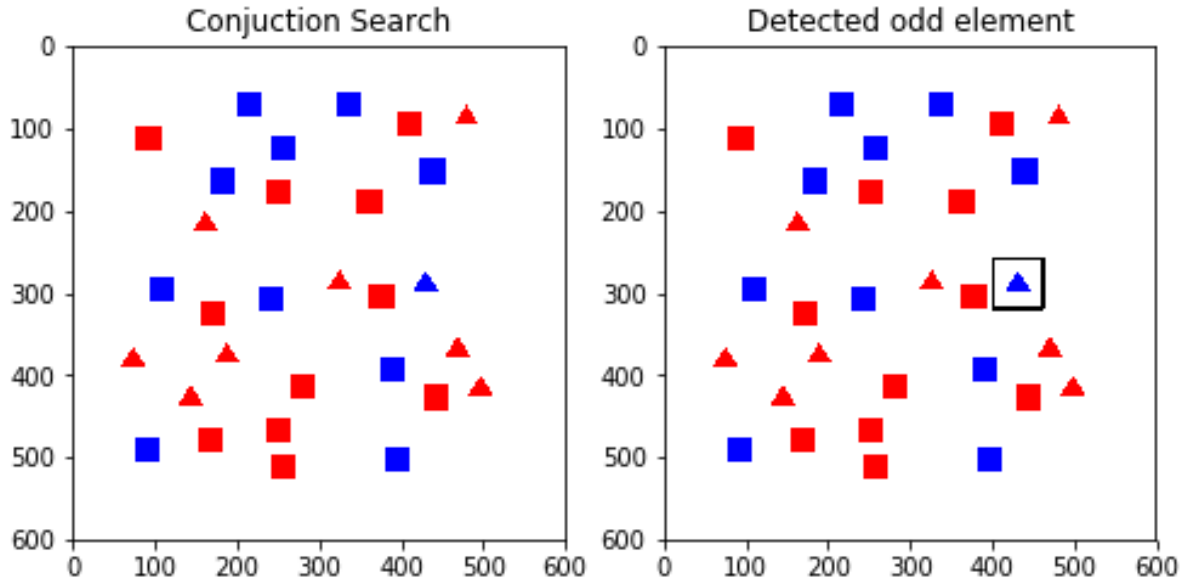

Figure 7: Conjuction Search Odd Detected

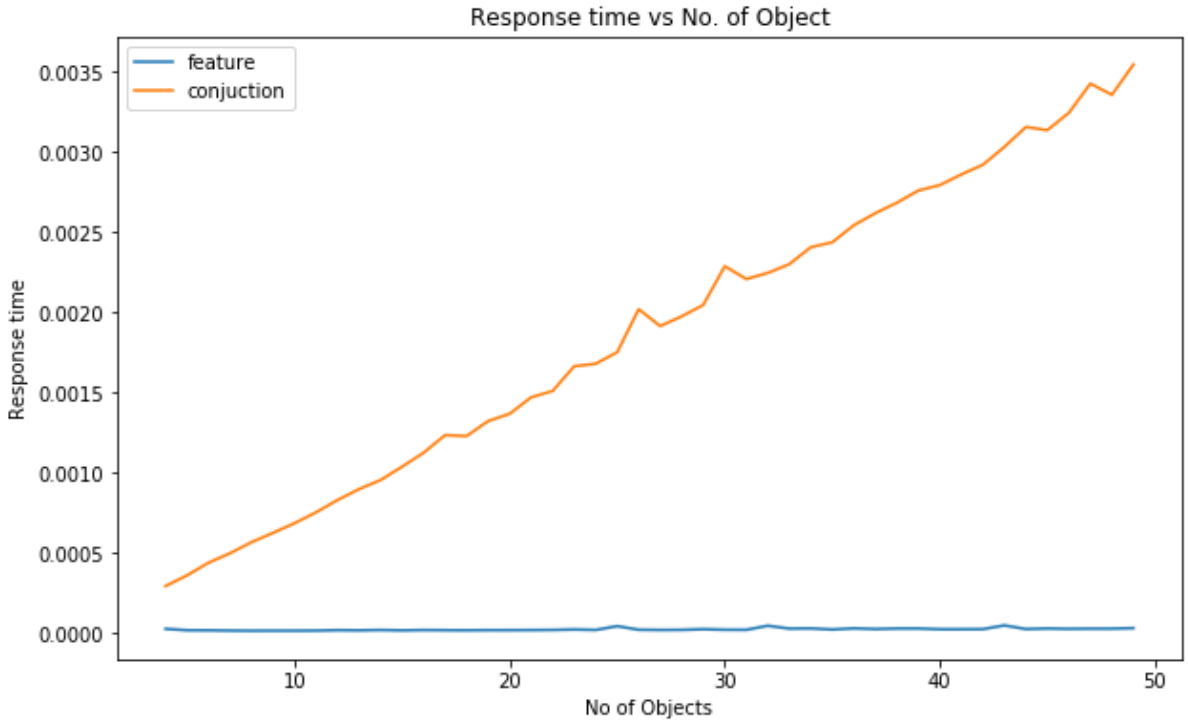

Figure 8: Feature integration theory

The Graph of Response time vs no. of object is as expected. For conjuction search as no of distractor increase time response increase whereas for feature search it almost remain constant which is because of sequential phase involve in conjuction search due to binding of feature.