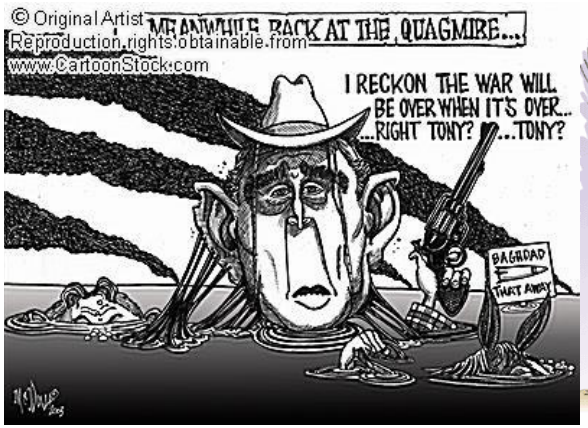
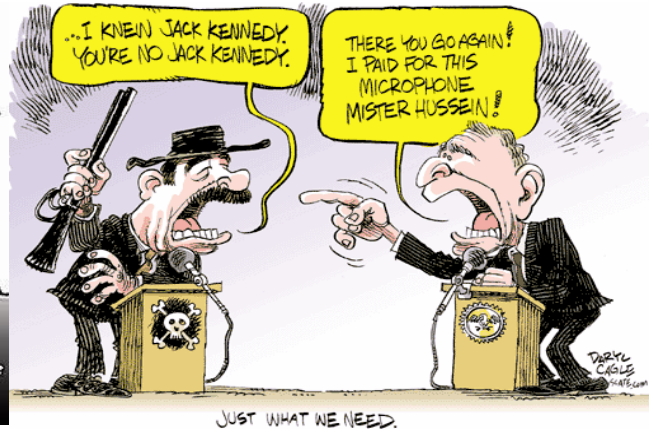
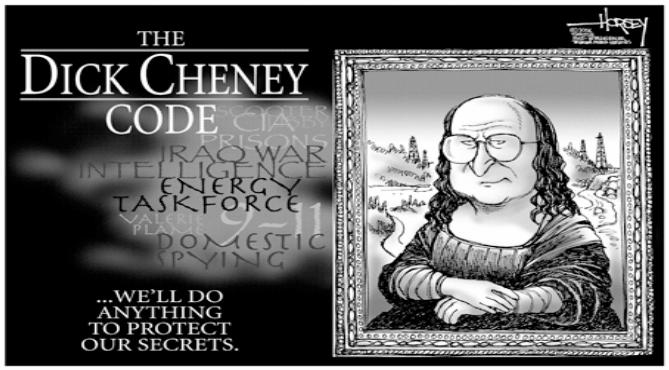
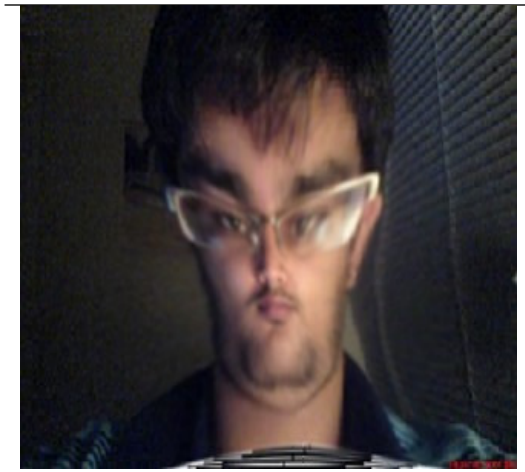






Human Facial illustrations



Presented by:
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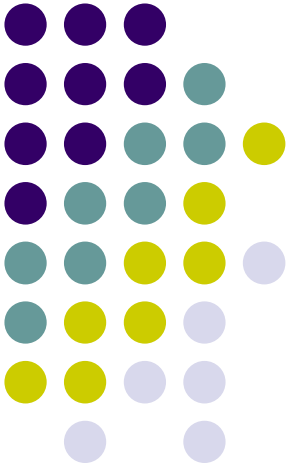
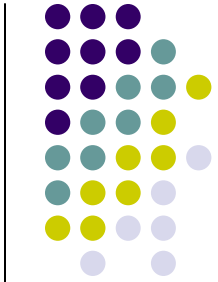


Purpose



- Creating Black and White illustration of human faces.
- Deforming these illustrations to Caricatures.
- Check if such Images help in Recognition.

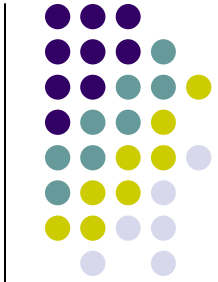
Illustration

- Formed by removing the extraneous features from the photograph keeping the lines and the shapes intact.
- The two-tone (Black and White) Image obtained after the first step is called illustration.

Caricature

- Created by exaggerating features of the illustration Image.

Usage:



- Consumes less memory for storage about 1 bit per pixel.

  Hence can be used for rapid transmission over low band networks.

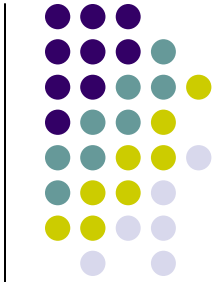
- It is claimed that such images used to speed up learning

  Hence can be used for visual learning applications.

- It is demonstrated that brain processes such images in a different way

  Hence can be used for Face recognition Tasks

How to get illustrations



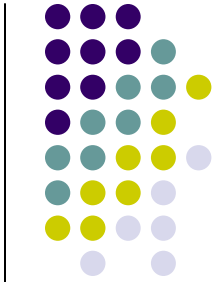
- Possible methods:

1. *Drawing image with the high intensity gradient and then using a threshold.- only few facial features are captured*

2. *Stroke based methods which are concerned with determining the strike placement to maintain tonal values.- heavily dependent on user info*

3. *Edge based methods.- reduces recognizability.*

Proposed method

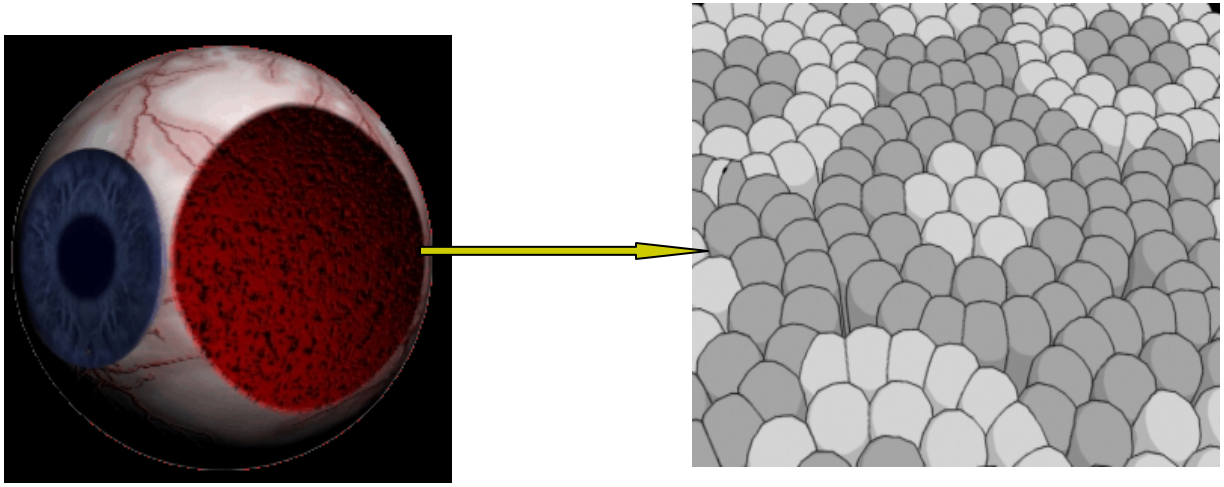


- Based on the brightness perception model proposed by Blommaert which models *Lateral Inhibition*.

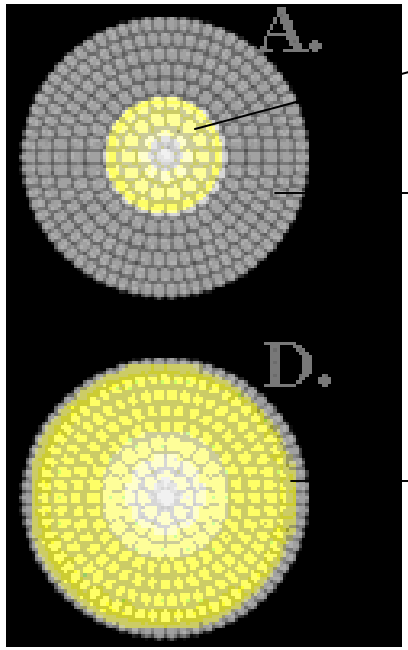
- Brightness: *How humans perceive luminance. [Palmer 1999].*

Lateral Inhibition

- Myth: *Eyes provide all the visual information to the brain and it processes the same.*
- *Reality: Most of the information is thrown away by eye and leaves to brain to fill up the missing information.*
- *Lateral Inhibition: A characteristic pattern of connections among neurons.*



Continued…



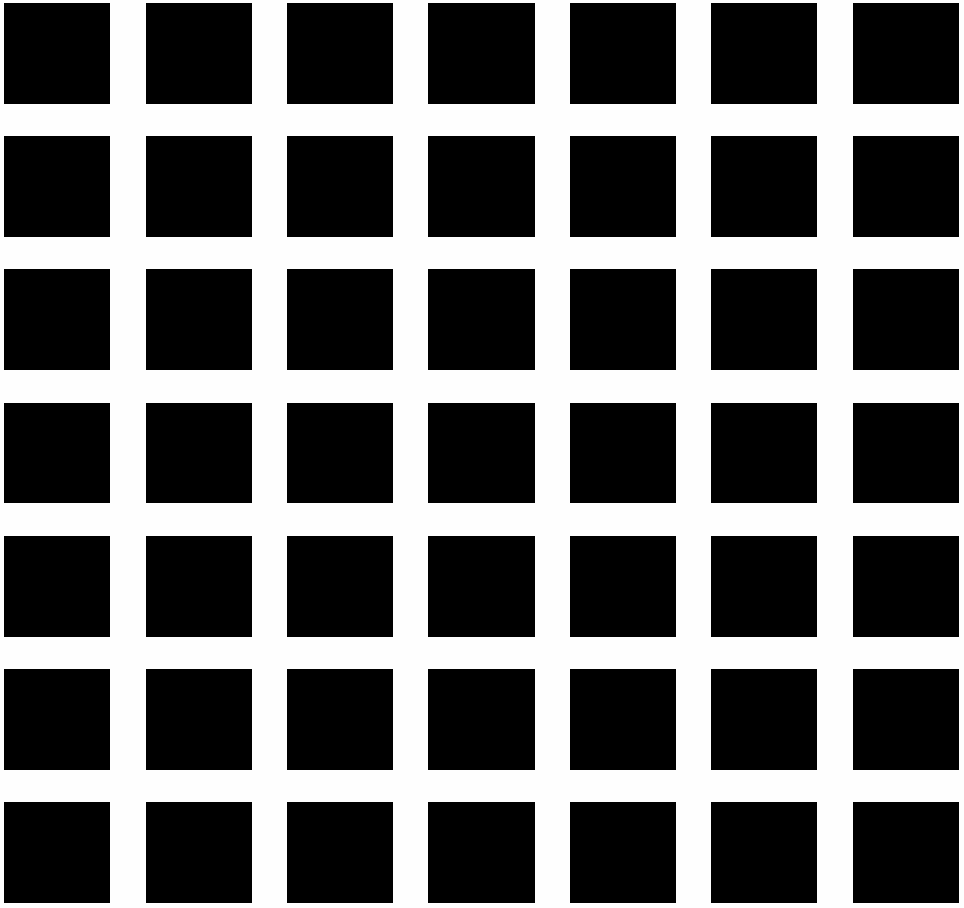
Cells Sensitive to light

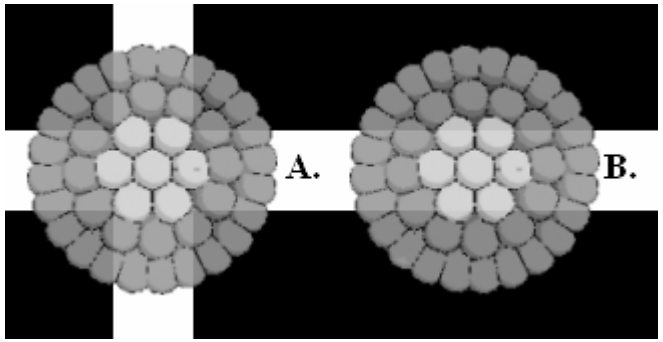
Cells active in absence of light

One region highly activated and other highly deactivated

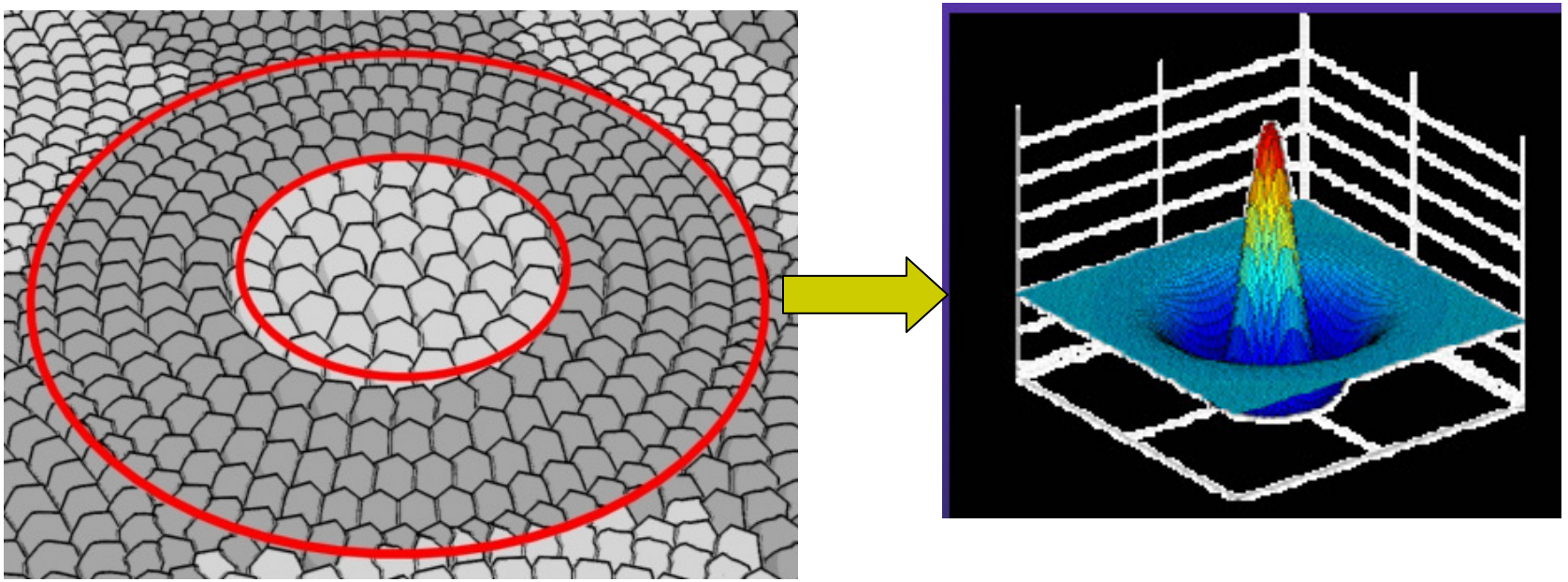
In D both regions are receiving light so surrounding is actually deactivated and the center is highly activated. Both the regions compete with each other and hence over all activity of the field may increase or decrease depending on amount of illumination. This competition is called Lateral Inhibition.

Hermann Grid





Resemblance to LOG



Finally Algorithm…

LOG can be approximated as the difference of the Gaussian provided the two Gaussian are scaled by factor of 1.6 with respect to each other.

Gaussian $\longrightarrow$ $$R_1(x, y, s) = \frac{1}{\pi(\alpha_1 s)^2} \exp\left(-\frac{x^2 + y^2}{(\alpha_1 s)^2}\right).$$

Response $\longrightarrow$ $$V_1(x, y, s) = L(x, y) \otimes R_1(x, y, s).$$

Center-Surround $\longrightarrow$ $$V(x, y, s) = \frac{V_1(x, y, s) - V_2(x, y, s)}{2\Phi / s^2 + V_1(x, y, s)}.$$

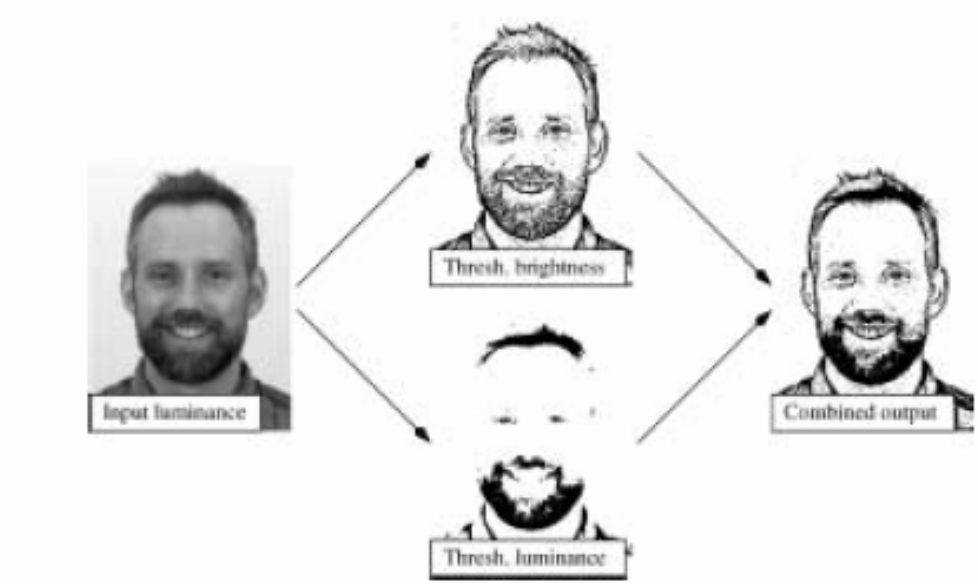
Brightness $\longrightarrow$ $$B(x, y) = \sum_{s=s_0}^{s_{max}} V(x, y, s).$$

43

1

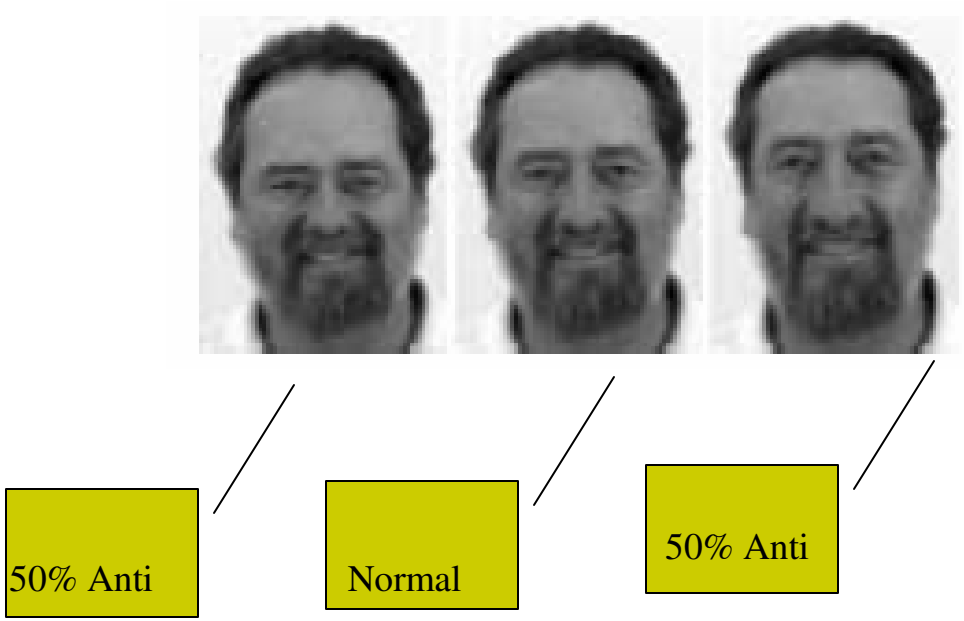
100 cd arcmin^2 m^{-2}

Result….


Input luminance
Thresh. brightness
Thresh. luminance
Combined output

Super -portrait

- Super-Portraits are the produced by exaggerating the features based on how far the features can deviate from norm.

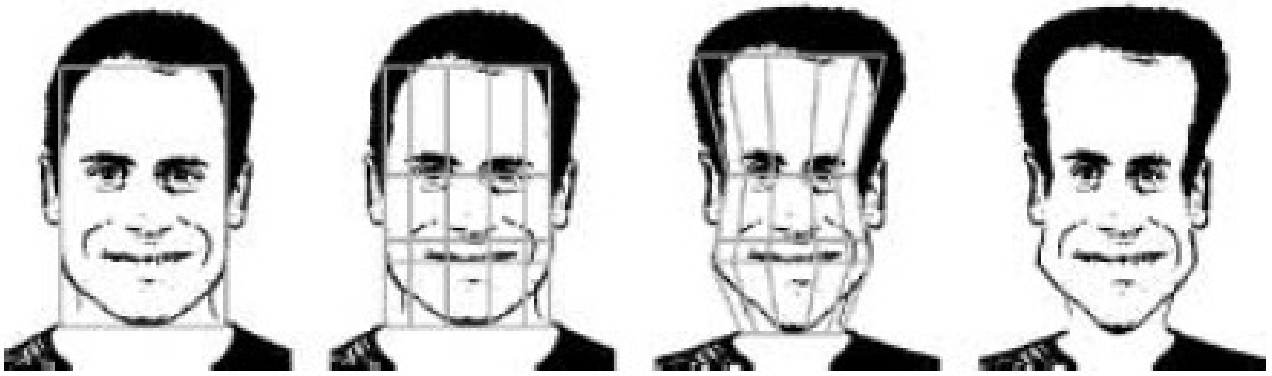


Generated by using set of horizontal and parallel lines called Face feature Grid or FFG.

When FFG is specified for a given face, the difference between the norm FFG and the specified grid is exaggerated.

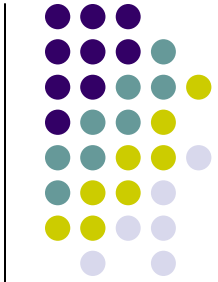
Caricature

- The vertices of the Feature Grid are manipulated individually.
- Internal vertices are prevented from manipulation by user so that creation of unrecognizable faces is prevented.



User Study Results….

Recognition Speed

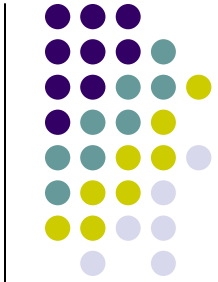


- Participant were tested for recognition speed by testing them on Photographs, Caricatures and Illustrations of their colleagues.

- Observation

  Recognition of Photographs was better compared to Caricatures while illustrations were recognized equally fast as Photographs.

Learning Speed

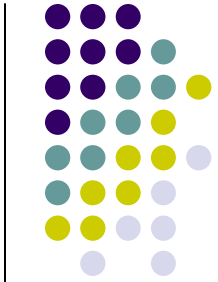


- Participants were made to learn faces by training them on illustrations, Photographs and caricature images of the face.

- Observation

  Participants learnt the faces better when presented as illustration, followed by Caricature and then Photographs.

Learning Accuracy



- Learning on both, Caricatures and illustrations gave nearly equal accuracy(98 %)

Discussion about the results..

- Since the illustrations and caricatures contain the clear representation of prominent features ,that too without any shading and color effects, which have been proved to be used by humans for recognition, it is quite natural that observers will tend to recognize them faster compared to Photographs which contain much more details and other effects.
- Since observers have to observe and remind very few features compared to Photographs, faster learning on illustrations and Caricatures is quite obvious.
- It would be nice to observe if the participant , trained on Caricatures or illustrations of unfamiliar person would be able to recognize that unfamiliar person in real word.

THANKS