DEV SANSKRITI VISHWAVIDYALAYA

SESSION 2018-21

Assignment

Of

Computer Graphics using C

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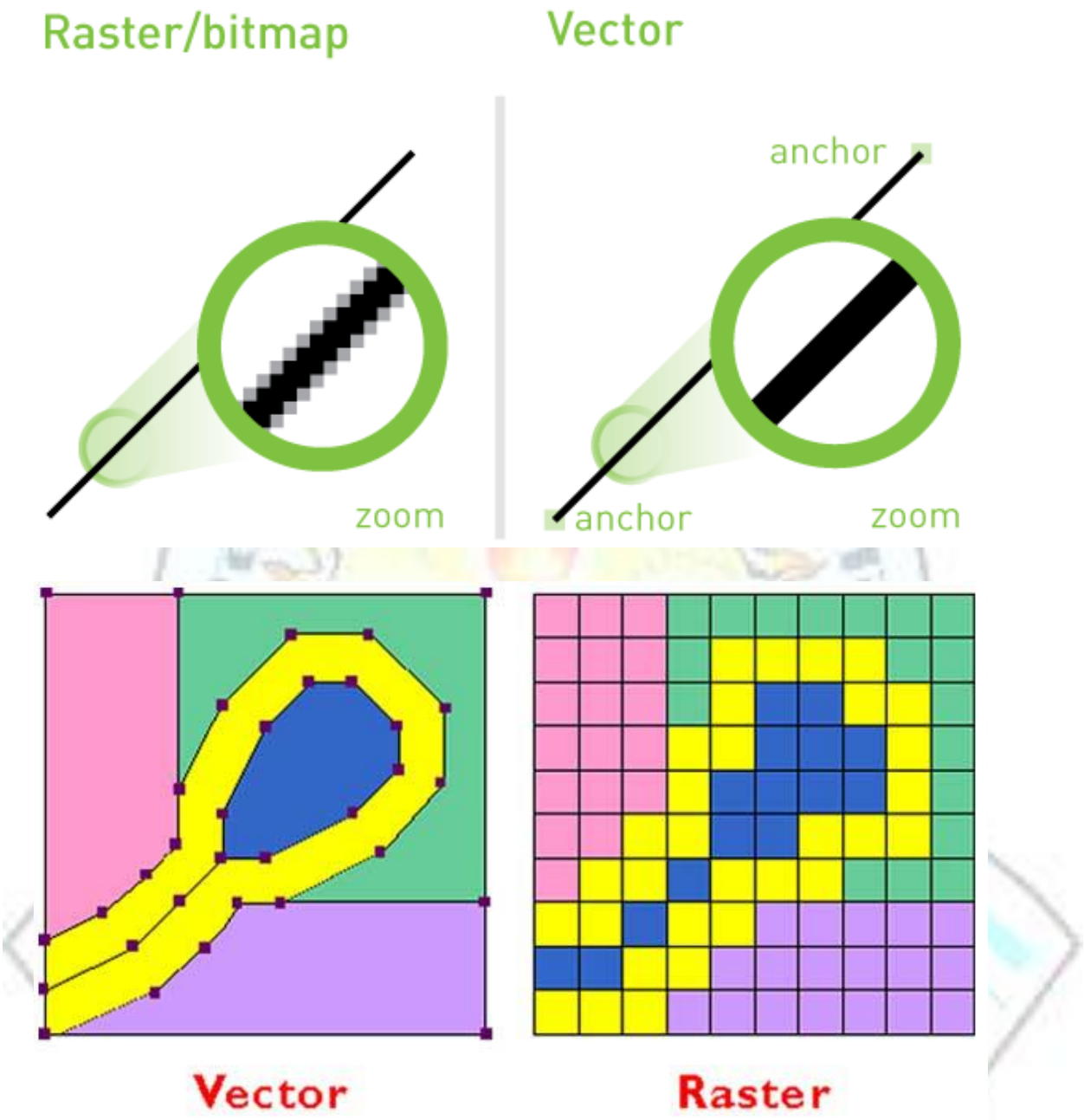
Q1. Differentiate between vector and raster graphics.

Ans

Raster Graphics	Vector Graphics
1. It is also known as “Bitmaps” and composed of pixels.	1. It is composed of paths and uses mathematical calculations.
2. It is an array of pixels of various colors which together forms an image.	2. It’s data file contains the points where the path starts and end, how much the paths curve, and the colors that either border or fill the paths.
3. The resolution is made up of thousands of square pixels, pixels per inch (PPI) or dots per inch (DPI).	3. The resolution is formed by numerous paths. These paths are defined in terms of proportions, ratio, height, width and other dimensions.
4. It is capable of rendering complex, multi-colored visuals, including soft color gradients.	4. vectors cannot achieve the color gradients, shadows, shading.
5. Quality is lost, or in other words, becomes “blocky”, since each pixel increases in size as the image is made larger.	5. Images can be scaled to be very large without losing quality.
6. It is ideal for photo editing and creating digital paintings.	6. Logos and other designs are typically created in vector format.
7. It is larger in file size but can be compressed.	7. It is smaller in file size.
8. Raster softwares includes Photoshop and GIMP.	8. Vector software includes Illustrator, CorelDraw and InkScape.
9. File extensions are – gif, jpeg, png, etc.	9. File extensions are – svg, eps, pdf, etc
10. Applications – digital paintings, budget friendly, etc.	10. Applications – websites, TV, print, etc.

Illustrative Examples :



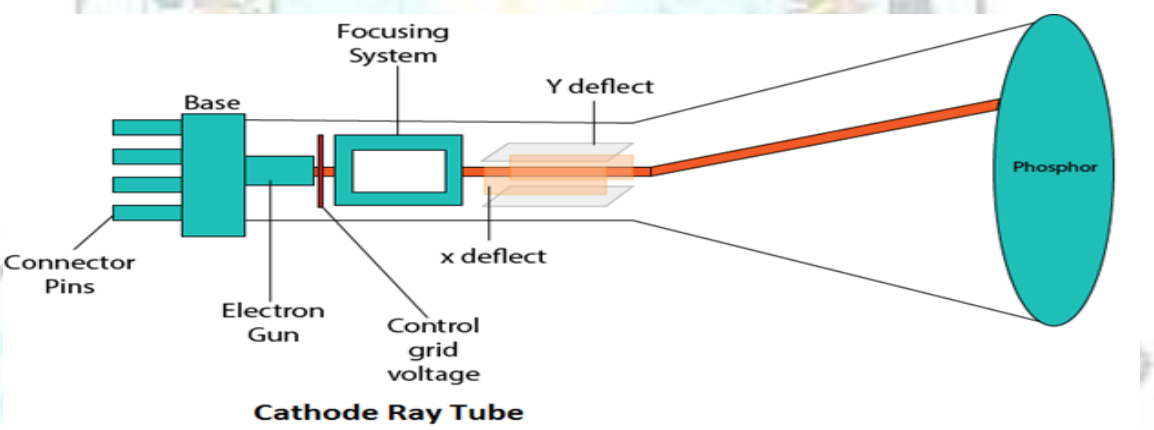
Q2. Enlist and Describe various display technologies used to render graphics.

Ans –

There are several display technologies, from the legacy CRT to LCDs and LEDs, which are used to render graphics. These are :

1. CRT – Cathode Ray Tube :

- This technology used in traditional computer monitors and televisions.
- It uses electron gun to beam rays of electrons on a phosphorescent screen to produce images.
- Once the elctron hits the phosphorous, they light up and are projected to screen.
- The colour seen is produced by a blend of red, blue and green light, referred to as RGB.
- The stream of electrons is guided by magnetic charges, which is why interference may occur with unshielded speakers or other magnetic devices that are placed close to a CRT monitor.
- This technology is still used by graphics professionals because of its vibrant and accurate colour.

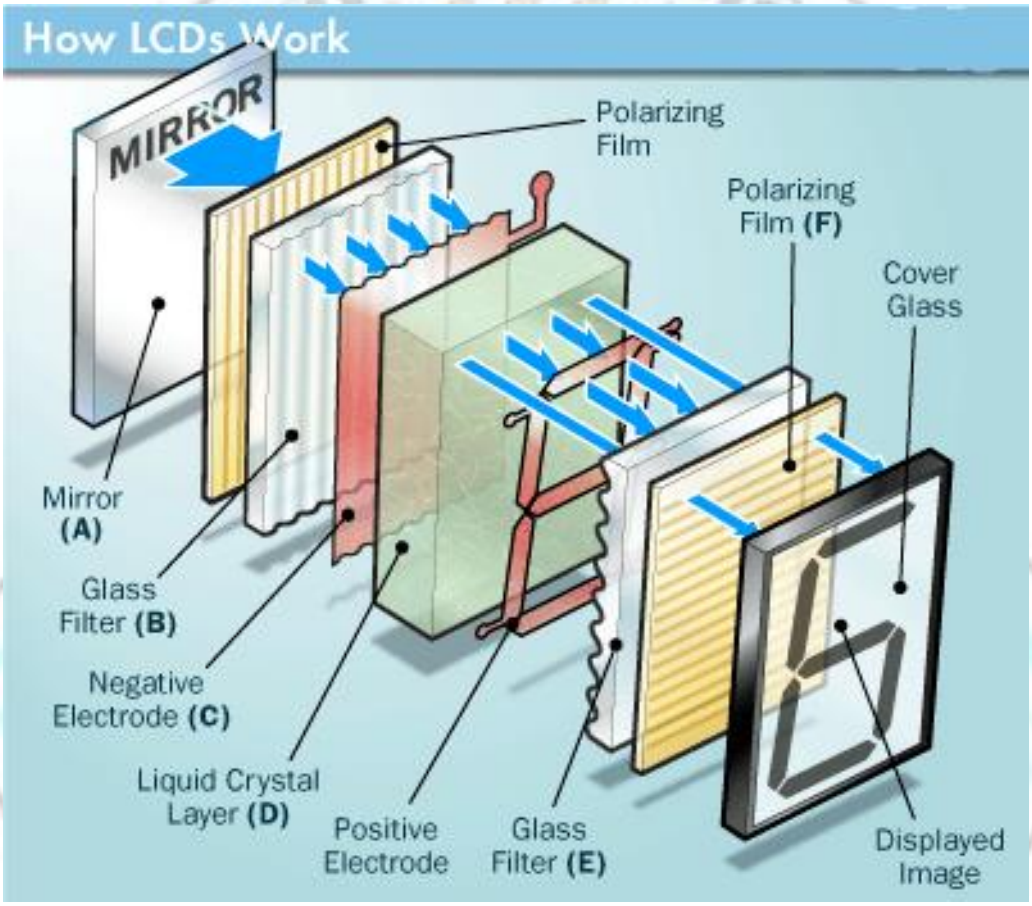


Cathode Ray Tube

2. LCD – Liquid Crystal Display

- It is a flat panel display technology commonly used in TVs and computer monitors.
- It is also used in screens for mobile devices, such as laptops, tablets and smartphones.
- LCDs replaced CRT and instead of firing electrons at a glass screen, It has backlight that provides light to individual pixels arranged in a rectangular grid.
- Each pixel has a red, green and blue RGB sub-pixel that can be turned on or off.
- It is called LCD because it uses liquid crystals and electricity to produce images on the screen.

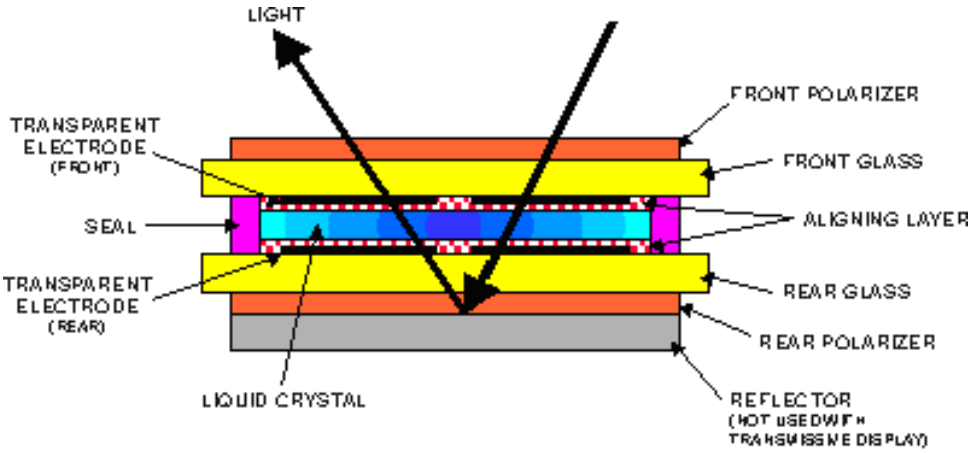
- The liquid crystals are made up of a part solid, part liquid substance that can be twisted by applying electrical voltage to them.
- They block the polarized light when they are off, but reflect red, green or blue light when activated.
- Each LCD screen contains a matrix of pixels that displays the image on the screen .
- Early LCDs had Passive – matrix screens, which controlled individual pixels by sending a charge to their row and column.
- Modern LCDs use Active – matrix technology, which contain thin film transistors, or TFT. These transistors include capacitors that enable individual pixels to actively retain their charge.



3. TN – Twisted Nematic :

- It's a kind of LCD display in which liquid crystal twist the light as it comes through.
- TN has limited viewing angles and can't accurately make all the color information by the video card.
- Older and cheaper LCD uses TN.

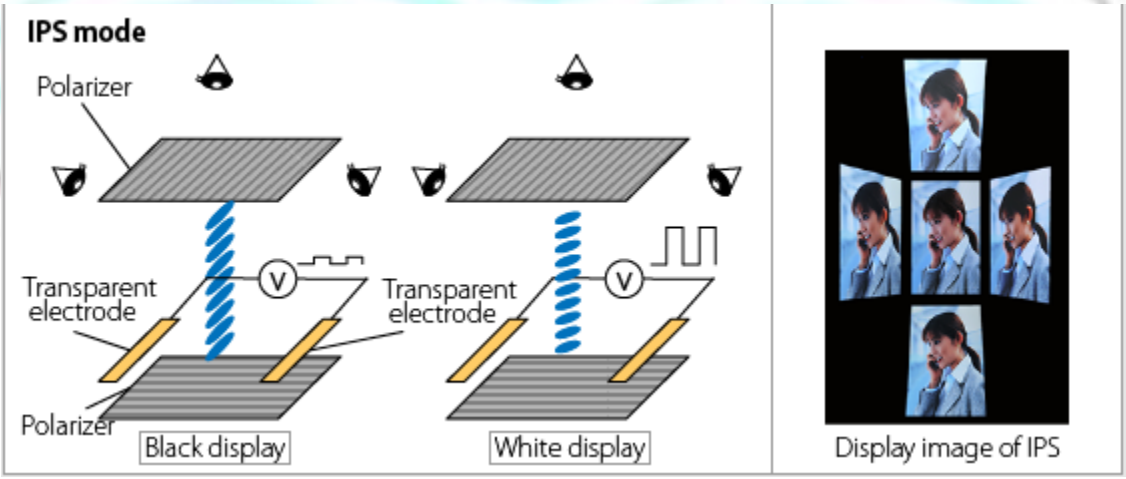
- Color and viewing angles are not as good, but has a fast refresh rate compared to IPS.
- It is good for gaming PCs.



TN LCD PANEL

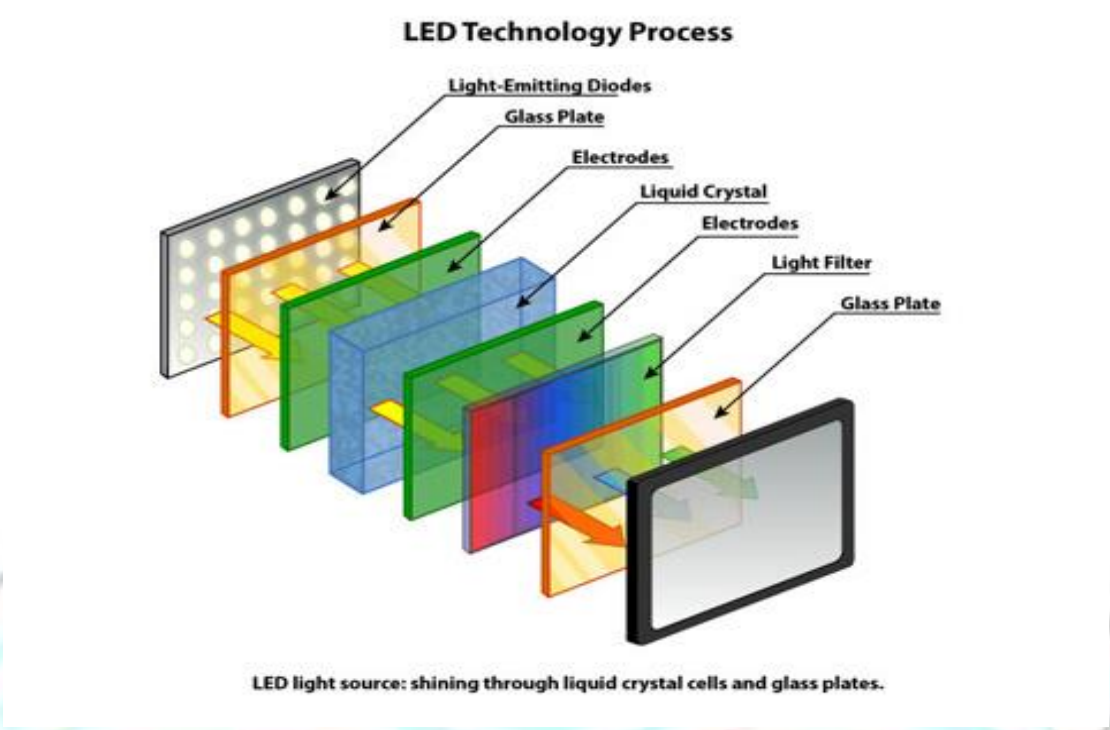
4. IPS – In Plane Switching :

- It is a display technology that replaced TN panels for more accurate colors and wider viewing angles.
- Liquid crystals stay in place and are aligned in parallel with the glass.
- It uses more transistors and consumes more power.
- It has better color and viewing angles than TN.
- It is good for graphic workstation, and CAD/CAM workstation.



5. LED – Light Emitting Diode Display :

- An LED display is simply an LCD screen with an LED backlight.
- It is a solid state device that vibrate a luminous (bright) frequencies current (flow of electricity) is applied.
- LCD LED backlight don't need inverter to operate.
- It needs DC power to operate.
- LED displays offer higher contrast ratios than a projector and are thus an alternative to traditional projection screens.
- Grids are not visible from the bezels of individual displays and can be used for large uninterrupted video walls.



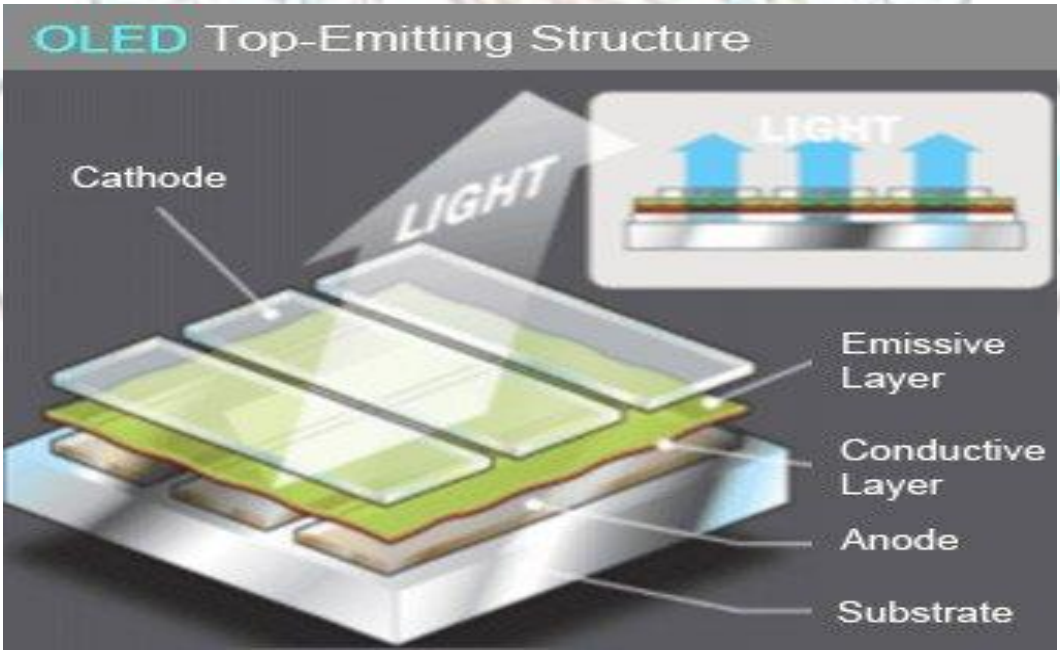
LED light source: shining through liquid crystal cells and glass plates.

6. OLED – Organic Light Emitting Diode :

- It is a type of flat screen display similar to an LCD that does not require a backlight.
- An OLED screen has six layers that work together to produce color images.
- These layers include the following, from bottom to top :
    - Substrate – The foundational structure that supports the panel; typically made out of glass or plastic
    - Anode – a transparent layer that removes electrons when electrical current flows throughs it

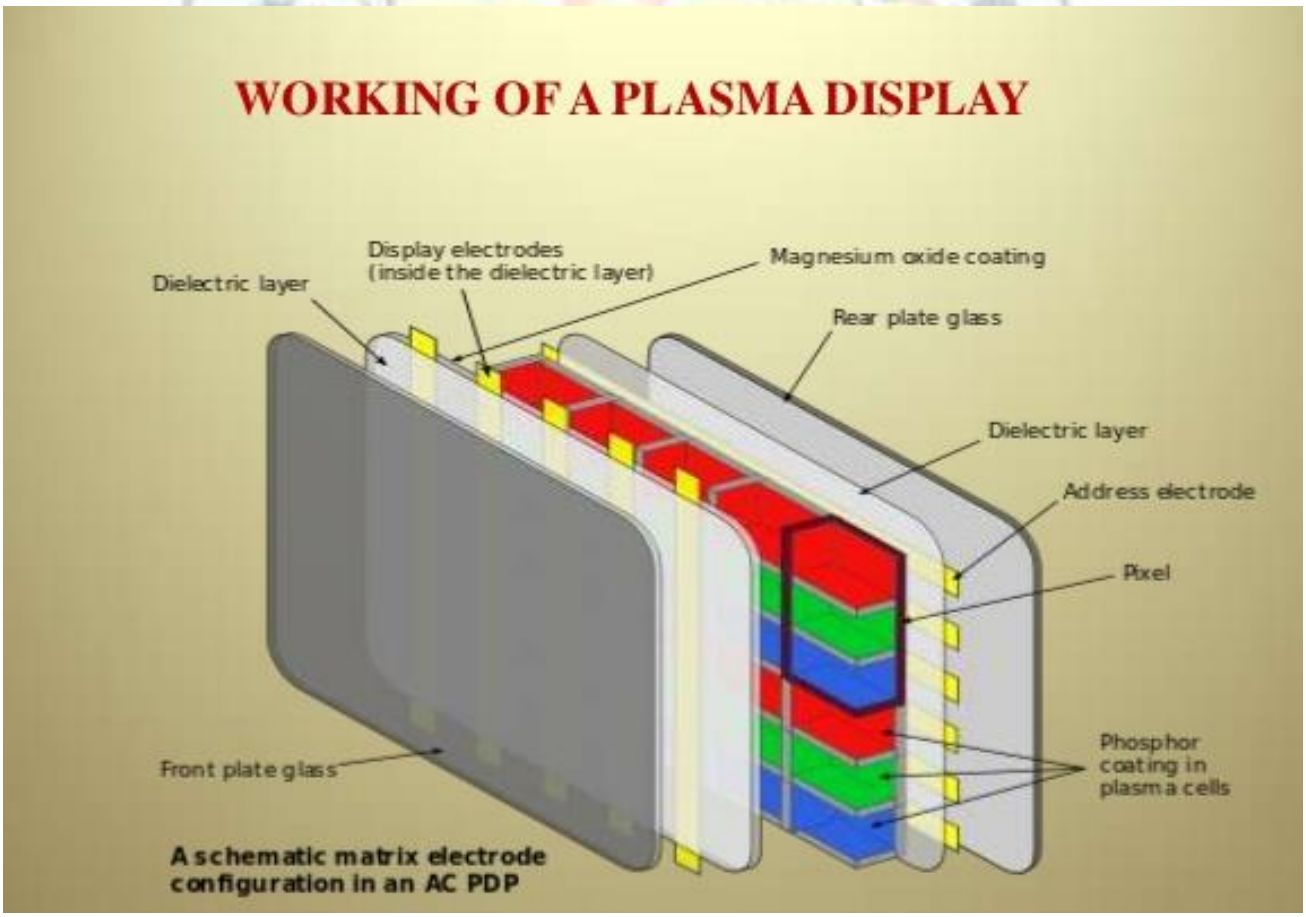
- Conductive Layer – contains organic molecules or polymers such as polyaniline that transfer current to the emissive layer.
- Emissive Layer – contains organic molecules or polymers such as polyfluorene that light up when current is passed through them.
- Cathode – injects electrons into the other layers when current flows through it
- Cover – the top protective layer of the screen; typically made out of glass or plastic

- OLEDs display light using a process called electrophosphorescence.
- Electrical current flows from the cathode to the anode, causing electrons to move to the emissive layer.
- These electrons find *holes* (where electrons are missing at atoms) in the conductive layer and produce light when they fill these holes.
- The color of the light depends on the organic molecule that the current passed through in the emissive layer.
- OLEDs uses less electricity, are thin and may be curved or even bendable.
- OLEDs are also of two types – PMOLED and AMOLED.
- A PMOLED (Passive Matrix OLED) display uses a simple control scheme, which controls each row (or line) in the display sequentially (one at a time).
- An AMOLED (Active Matrix OLED) display contain thin film transistors, or TFT. These transistors include capacitors that enable individual pixels to actively retain their charge.



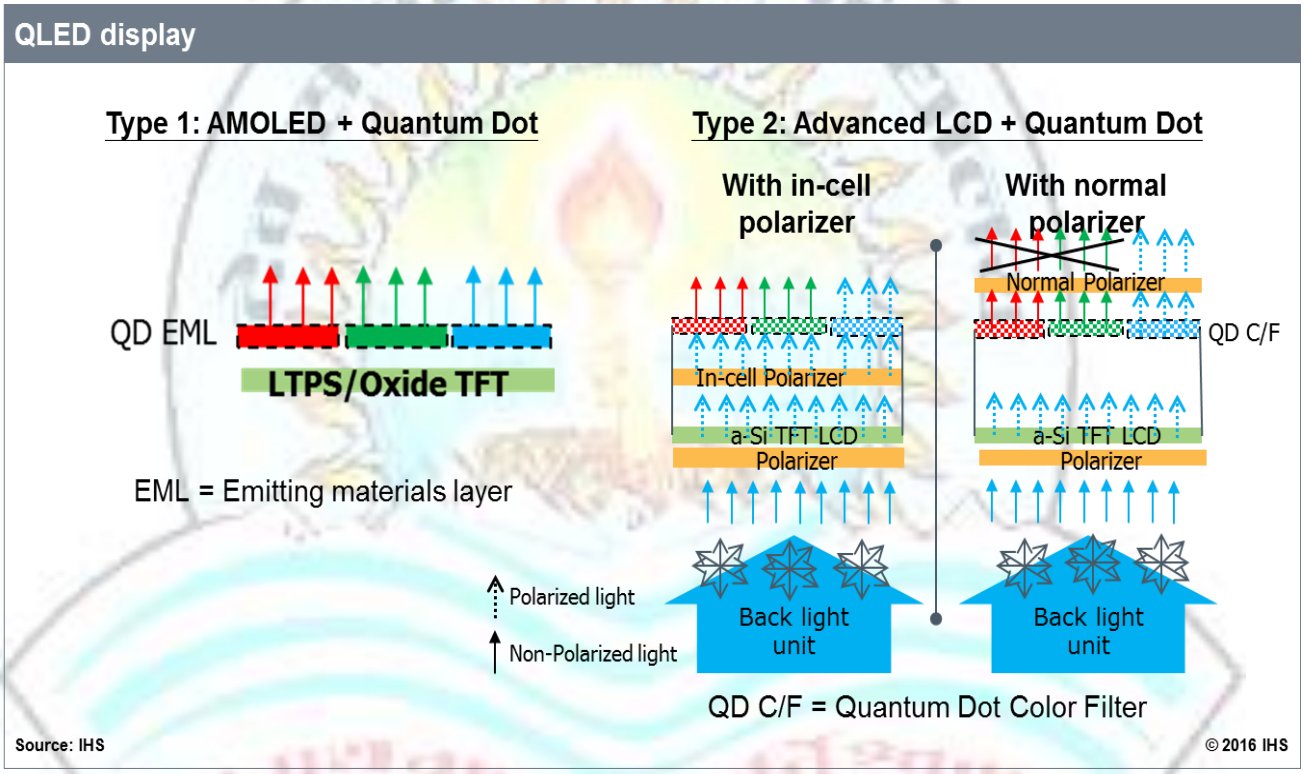
7. PDP – Plasma Display Panel :

- A PDP is a type of flat panel display that uses small cells containing plasma : ionized gas that responds to electric fields.
- The phosphors in a plasma display give off colored light when they are excited.
- Every **pixel** is made up of three separate **subpixel** cells, each with different colored phosphors.
- One subpixel has a red light phosphor, one subpixel has a green light phosphor and one subpixel has a blue light phosphor.
- These colors blend together to create the overall color of the pixel.
- By varying the pulses of current flowing through the different cells, the control system can increase or decrease the intensity of each subpixel color to create hundreds of different combinations of red, green and blue.
- The image is very bright and looks good from almost every angle.
- Very wide and thin screens can be produced using plasma display technology.



8. QLED – Quantum dot LED :

- It is relatively a new display technology being promoted by Samsung.
- It basically comprises of LCD panels that use “quantum dots” to better quality images.
- Quantum dots are phosphorescent semiconductor nanocrystals that can either emit or alter light at different frequencies when subjected to electrical energy.
- QLED screens still need LCD panels.
- The use of quantum dots, however, help LCD panels produce better contrasts and better viewing angles.
- The inherent problem of using a backlight is still there.



Q3. Write an article on various image formats.

Ans

Image file formats are standardized means of organizing and storing digital images. There are numerous image file formats out there, so it can be hard to know which file type is best suited as per our needs.

Some image types, such as JPG or PNG are best for web graphics, while others, such as TIFF are great for printing.

Following are some common image file formats:

A. JPEG (.jpg, .jpeg) :

- It stands for Joint Photographic Experts Group .
- It is a "lossy" format meaning that the image is compressed to make a smaller file.
- The compression does create a loss in quality but this loss is generally not noticeable.
- JPEG files are very common on the internet.
- JPEG - compressed images are usually stored in the JFIF (JPEG File Interchange Format) file format.
- It is a popular format for digital cameras – making it ideal for web use and non-professional prints.

B. TIFF (.tiff, .tif)

- It stands for Tagged Image File Format .
- It is lossless format meaning that the image does not need to be compressed, although there are options for compression.
- Hence, the image quality or any other information is not lost.
- This allows very high-quality images with larger file sizes.
- It is best suitable for high-quality prints, professional publications, archival copies, etc.

C. GIF (.gif)

- It stands for Graphics Interchange format.
- It is also a lossless format (compression without quality).
- It is widely used for web graphics, because it is limited to only 256 colors.
- It can allow transparency and can be animated.
- The files are typically small in size and are very portable.

D. PNG (.png)

- It stands for Portable Network Graphics.
- It is also a lossless format, originally designed to improve upon and replace the gif format.
- It is able to handle 16 million colours, unlike the 256 colours supported by GIF.
- It is best for web images, as well as, screenshots are also captured in this format.

E. Bitmap (.bmp)

- It stands for Bitmap Image File.
- It was developed by Microsoft for Windows.
- There is no compression or information loss with BMP files.
- Images are of very high quality, but also of very large file sizes.
- It is best for high quality scans, archival copies, etc.
- The system logos in Windows OS are of BMP format.

F. EPS (.eps)

- It stands for Encapsulated PostScript.
- It is a common vector file type.
- There isn't any compression, rather it uses vector information.
- EPS files can be opened in many illustration applications, such as Adobe illustrator or CorelDraw.
- It is best for vector artwork and illustrations.

G. RAW Image Files (.raw, .cr2, .nef, .orf, .sr2, and more)

- Raw images are images that are unprocessed and have been created by a camera or scanner.
- Many SLR cameras can shoot in RAW.
- These RAW images are equivalent of a digital negative, which means that they hold a lot of image information.
- They still need to be processed in an editor such as Adobe Photoshop.

Q4. Describe any five functions of C graphics library.

Ans

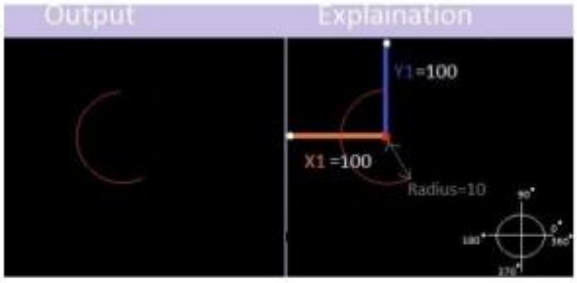
There are so many functions in C graphics library, but some of them are following:

A. arc() :

- "arc()" function is used to draw an arc.
- Syntax : arc(x, y, st_angle, end_angle, radius);
- *Here,*
  - x = x-coordinate of center of arc
  - y = y-coordinate of center of arc
  - st_angle = starting angle
  - end_angle = ending angle
  - radius = radius of the arc.
- It can be also used to draw a circle, where start and end angles should be 0 and 360 respectively.

Draw an Arc

```
#include<graphics.h>
#include<stdio.h>
#include<conio.h>
 void main( )
 {
 int gd = DETECT, gm;
initgraph(&gd, &gm, "C:\\TC\\BGI");

arc(100,100,90,280,10);

getch( );
closegraph( );
 }
```



arc(x1,y1,StartingAngle,EndingAngle,Radius)

B. bar3d() :

- This function is used to draw a 2-dimensional, rectangular filled bar.
- Syntax : bar3d(left, top, right, bottom, depth, topflag);
- *Here,*
  - Left = x-coordinate of left top corner
  - Top = y-coordinate of left top corner

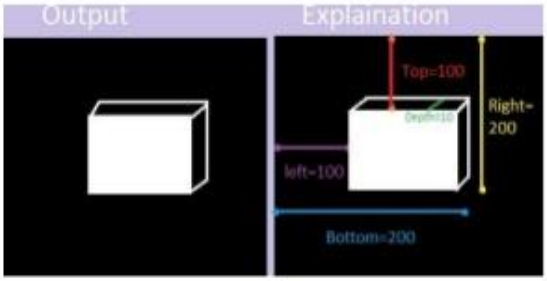
- Right = x-coordinate of right bottom corner
- Bottom = y-coordinate of right bottom corner
- Depth = depth of bar in pixels
- Topflag = determines, whether a 3-dimensional top is put on the bar or not (Zero or Non-zero)

- Current fill pattern and fill colour is used to fill the bar.
- To change fill pattern and fill colour, we have to use *setfillstyle()*.

Draw a 3D bar

```
#include<graphics.h>
#include<stdio.h>
#include<conio.h>
 void main( )
 {
 int gd = DETECT, gm;
initgraph(&gd, &gm, "C:\\TC\\BGI");

bar3d(100,100,200,200,10,1);

getch( );
closegraph( );
 }
```

Bar3d(left,top,right,bottom,depth,topflag)



C. outextxy() :

- This function displays text or string at a specified point on the screen.
- Syntax : outtextxy(x,y,"string");
- *Here,*
  - X= x-coordinate of the point, from where the text should appear
  - Y= y-coordinate of the point, from where the text should appear
  - String = It is the text or string, which is to be displayed on the screen
- This function does not supports the format specifiers, such as %d, %c, etc.
- In order to display any stored value, we have to convert it into a string before passing into the outtextxy() function.

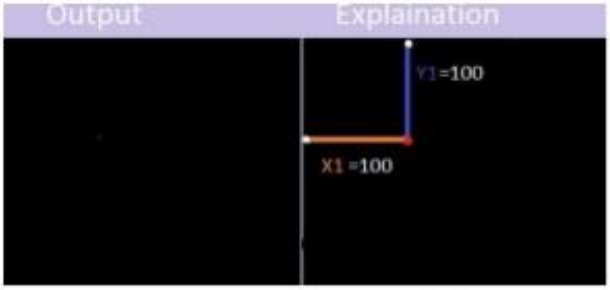
D. putpixel() :

- This function plots a pixel of desired colour at specified point.
- In other words, it lights up the pixel at the specified position.
- Syntax : putpixel(x,y,colour);
- *Here,*
  - X = x-coordinate of the pixel
  - Y = y-coordinate of the pixel
  - Colour = The desired colour, either given in uppercase letters or in integer colour code.
- This is a primitive function, which can be used to draw line, circle, rectangle and other shapes using various algorithms.

Draw a Pixel

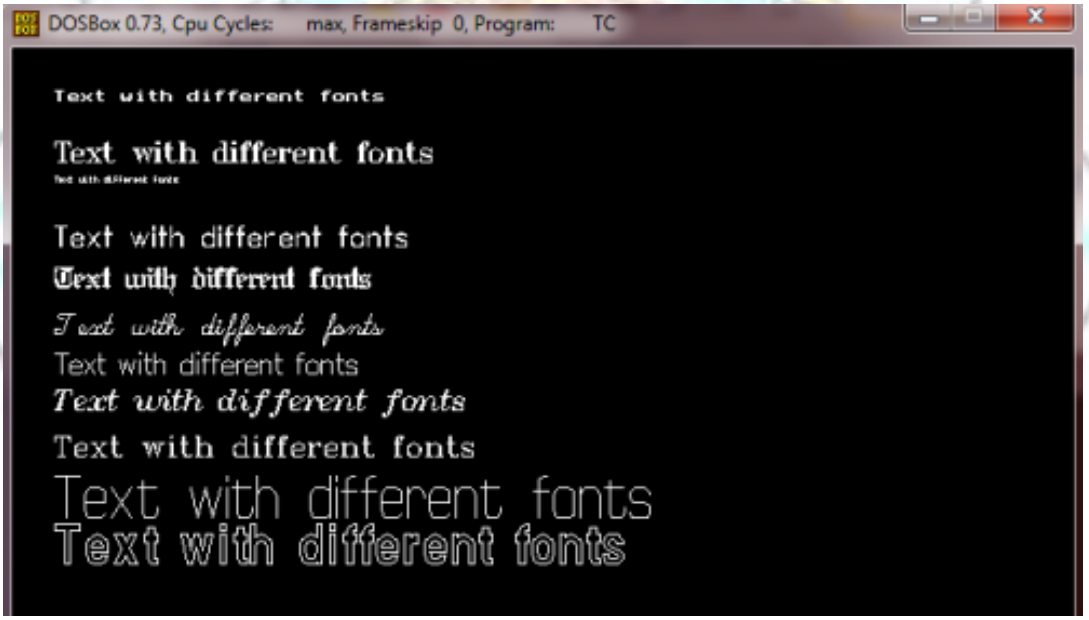
```
#include<graphics.h>
#include<stdio.h>
#include<conio.h>
 void main( )
 {
 int gd = DETECT, gm;
initgraph(&gd, &gm, "C:\\TC\\BGI");

Putpixel(100,100,RED)

getch( );
closegraph( );
 }
```

Putpixel(X1,Y1,Color)



E. settextstyle() :

- This function is used to change the way in which text appears, its style, direction and size.
- Syntax : settextstyle(font, direction, charsize);
- *Here,*
  - Font = the font style, in which text should appear
  - Direction = either horizontal (0) or vertical (1)
  - Charsize = the size of the characters.
- Different fonts available in this function are :
  - DEFAULT FONT
  - TRIPLEX FONT
  - SMALL FONT
  - SANS SERIF FONT
  - GOTHIC FONT
  - SCRIPT FONT
  - SIMPLEX FONT
  - TRIPLEX SCR FONT
  - COMPLEX FONT
  - EUROPEAN FONT
  - BOLD FONT



Q5. How Computer Graphics participating in the fight with COVID-19? Share your views.

Ans

COVID-19 (Corona Virus Disease 2019) appeared as an pandemic in the early 2020s. It is an infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The world is fighting against this with the help of several means, such as social distancing, spreading awareness, cleaning and sanitizing, etc.

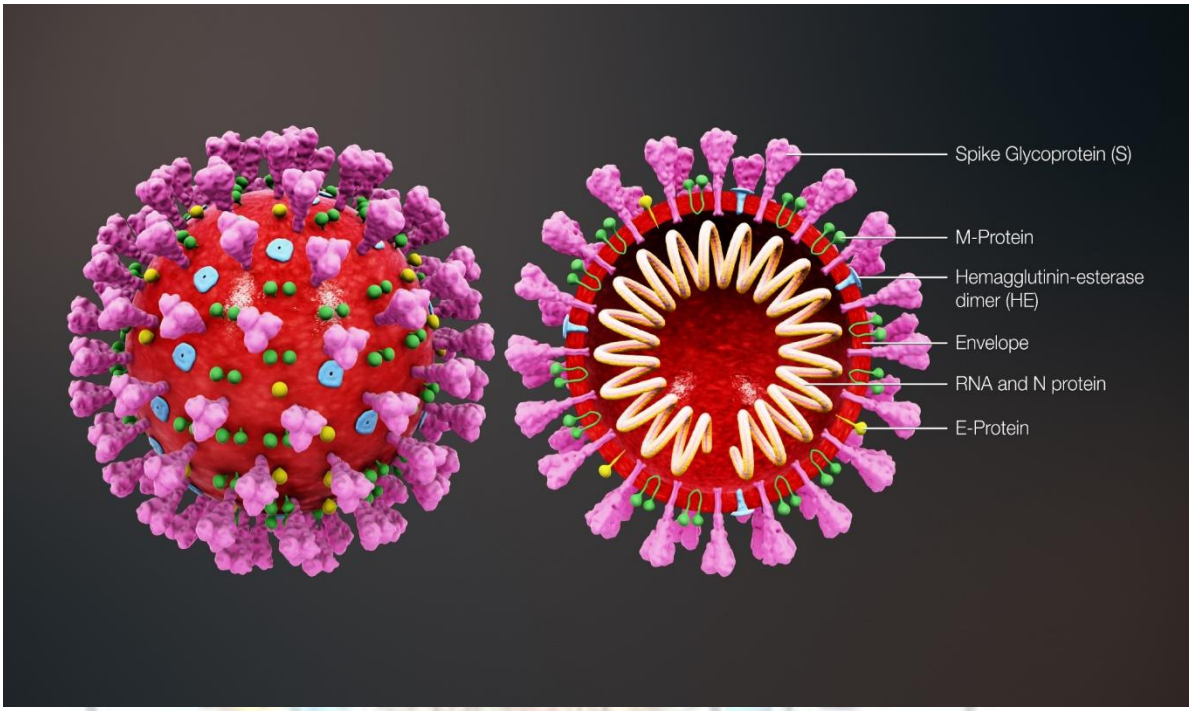
Computer Graphics is playing an important role in the fight with COVID-19. Some of those areas are : simulation, knowledge sharing, etc.

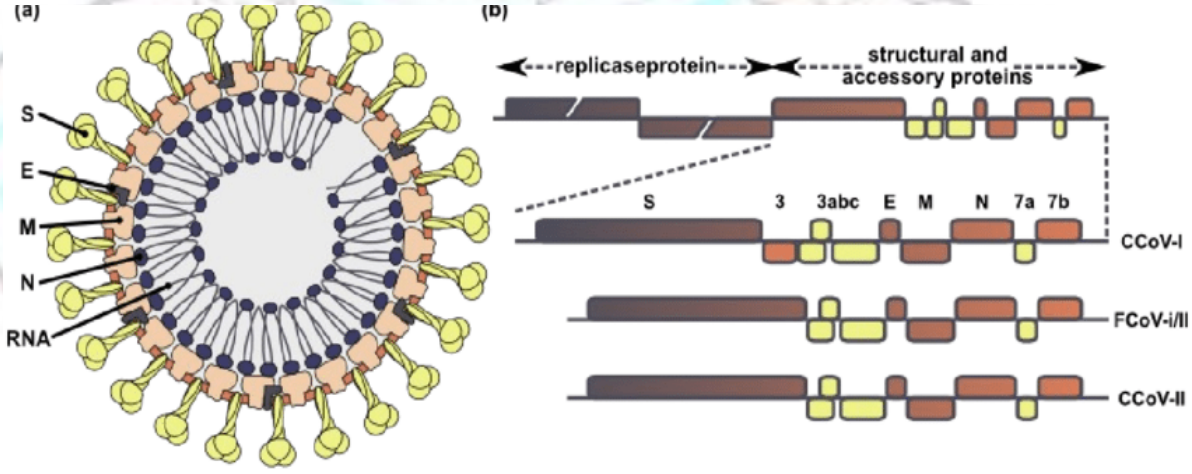
Simulation :

- A project names as “Folding@Home” is a distributed computing project that was founded in October 2000 at Stanford University
- It was specially designed for disease research.
- This software uses the spare CPU and GPU cycles of thousands of computers globally to simulate protein folding and computational drug design.
- It uses computer simulations to understand a protein’s moving parts.
- Once scientists have a firm grasp on how the atoms move and interact within a protein, they can venture closer to discovering therapeutics to treat it.

Visualization :

- As the viruses are microscopic, we cannot see them with the naked eye, but with the help of computer graphics, we can visualize it.
- It helps in understanding the the thing more quickly and effectively.
- 3-D images are obtained with the help of digital processing techniques.

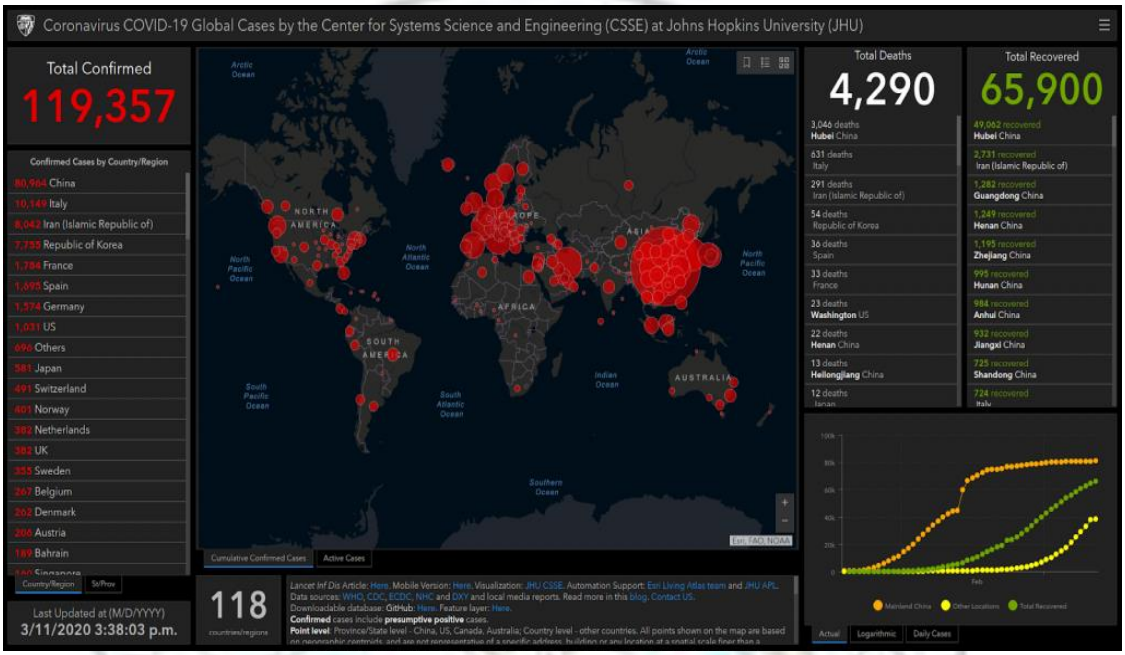




S – spike protein; E – envelope protein; M – membrane protein; N – nucleocapsid protein; RNA – genomic RNA. Virion structure dapted from http://www.expasy.ch/viralzone/. Genome structure adapted from Decaro and Buonavoglia, 2008.

Information Sharing :

- Today, when the peoples are locked down in their homes and living a quarantined life, they are gaining the information with the help of computer graphics and becoming aware.
- The records of patients from all over the world is shown with the help of computer graphics.
- Bar-graphs, pie charts, etc helps a lot in understanding the current scenario.



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