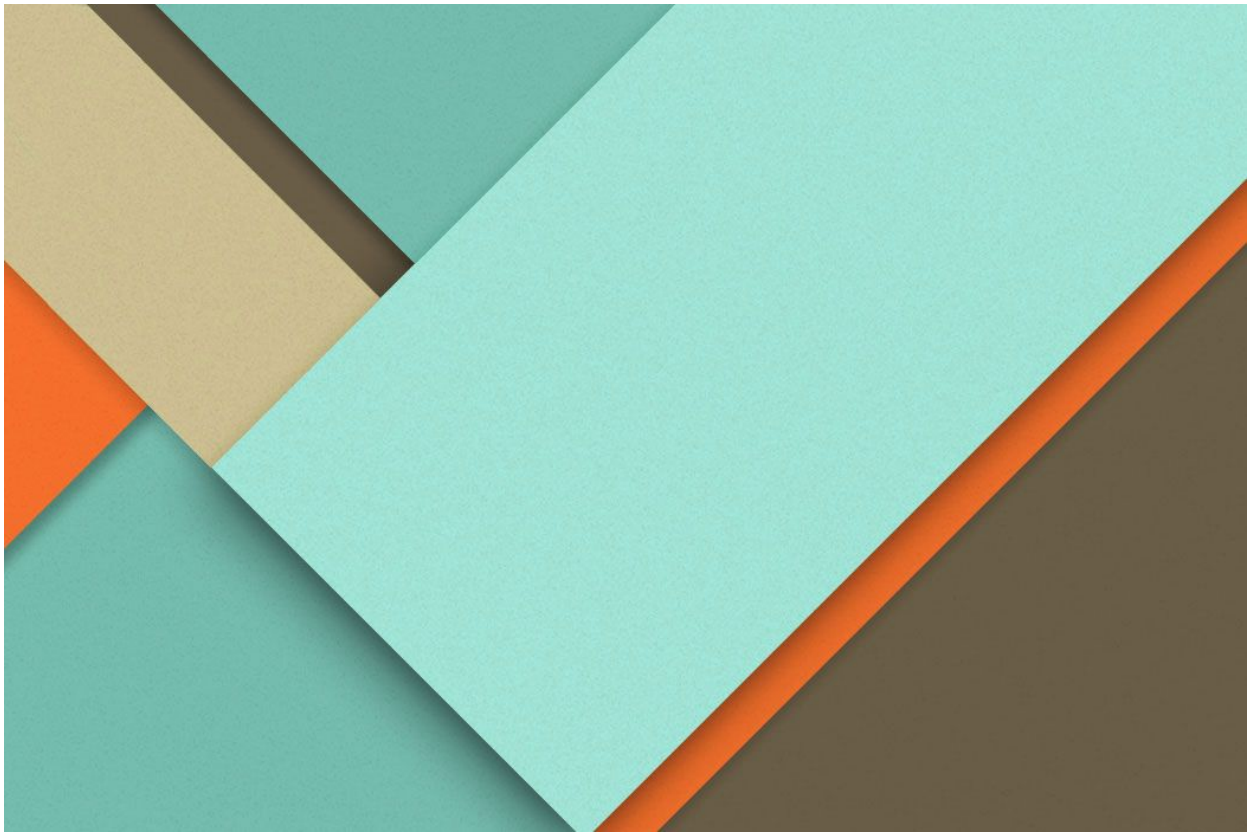

METRO ROUTE DISPLAY

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Pratik Pranav
2018CS10368

Sarthak Behera
2018CS10384

Abstract

We have created a mini-map of Delhi metro with all the important station along with their colours (line-colours). User defines the start and end station and the shortest path between the stations is displayed on the monitor. It also gives all the line changes required along with the intermediate stations.

Goals

1. We have used the idea of displaying the image on the VGA monitor and extended this idea to display the metro-map of Delhi and take some inputs from the user based on which we find the shortest path between the stations.
2. The shortest path was found using the Dijkstra's Algorithm which is a standard algorithm for finding the shortest path between two nodes in a graph. Finally we combined the various components of the project to get a furnished outcome.

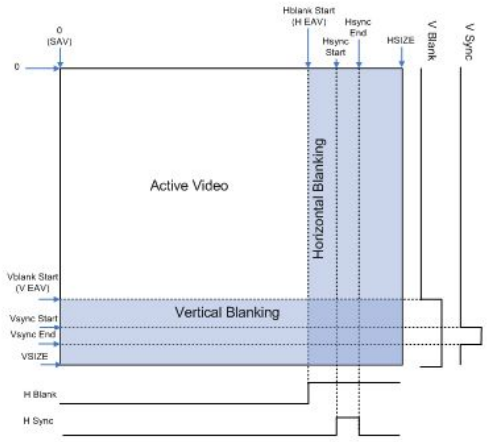
Project Component

I. VGADrive

This is the basis of programming of the VGA monitor. It has all the essential components of programming each of the pixel. It has the Horizontal-Sync, Vertical-Sync, Horizontal Blank, Vertical Blank,

The image on the VGA is controlled by three timings Horizontal Blanking, Vertical Blanking and Field timing. The Horizontal Blanking interval consists of Horizontal front porch, Horizontal Sync and Horizontal back porch. Each of the Horizontal blanking interval occurs after the processing of the active pixels on each line. The active pixels control the programming of each pixel in a line and they are interspersed in between by the H-blank intervals. The Horizontal front porch provides some dead time so that the electron beam can fly back to the left end. The

Horizontal back torch in the meanwhile provides the colour calibration in the beginning of the next line of execution. The Horizontal Sync is essential as it is a trigger to the monitor via a voltage change that enables it to move to the start of the next line of execution after completion of the previous line. We have a VGA monitor of 640*480 pixel so the total horizontal cycle is executed in 800 pixel units of time.



The Vertical Blanking period occurs after the total completion of the Horizontal programming of the monitor and the next frame is then ready to be programmed. It also consists of a front porch, back porch and a sync period. The Sync period here moves the electron beam to the beginning of the pixel resolution start(EAV to SAV). The front and the back porch play a similar role in as in the Horizontal blanking case.

II. vgatest

This is the component in which the VHDL program for the metro route is displayed. It also contained the if-statements to light a particular route depending on the input specified by the user. A C++ program was used to implement Dijkstra's Algorithm by giving weights to each of the edge of the map. The shortest path for every possible value of user input is output into file and the if-statements are added in the end.

III. PMOD-KYPD

It has two sub-components which consists C0 and C1. C0 controls the input of the PMOD-KeyPad while the 7-segment display is controlled by C1. In the KeyPad we go through the columns and for each column we check if any particular key of that

column is pressed. Through this we ascertain the value of the key pressed. It is similar to an array of inputs that turns 0 if a particular key is pressed. Therefore C0 outputs the value of the key pressed on the KeyPad. C1 is used to display the source and destination of the user-defined input on the 7-segment display.

IV. debounce

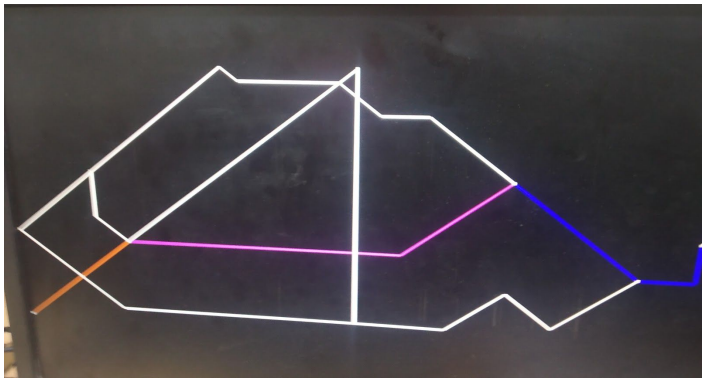
It is a component that was used to debounce the input obtained from the KeyPad. The input obtained is irregularly spaced and requires to be debounced. So we use a slow clock to account for the input and a debounced signal is obtained as output.

V. Top-module

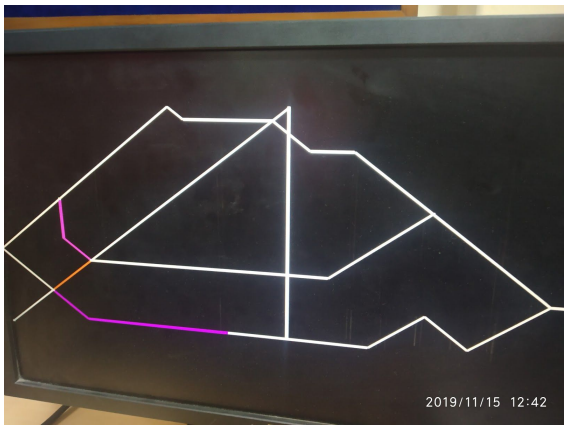
It is the controller of all the components in the program. It basically combines the functioning of all the components to form a coherent working model that takes in user inputs and gives the required output. The various entities and their ports are mapped in it and the buttons for resetting are defined here.

Routes on Display

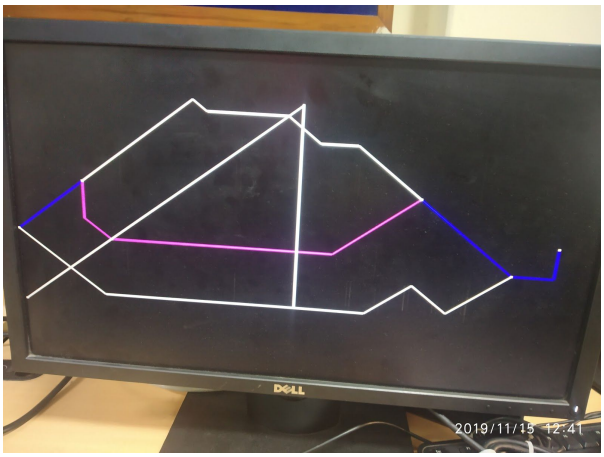
1. Image of Metro Map from Noida City Centre to Dwarka



2. Image of Metro Map from RK Puram to Janak Puri East



3. Image of Metro Map from Noida to Janak Puri East



Conclusion

The mini-project gave us the overview of VGA programming. The VGA can be thought of as an array of programmable circuit that are controlled by the signals given by the programmer. The display timings were chosen in such a way that the refresh rate of the monitor remains at 60Hz which is a standard for the computers present in our lab. The display of the map of Delhi-map was inspired by the Delhi-metro app which displays the time, money and the line changes needed for travelling between two stations. We gave weights to each route based on the distance between the route and the stops needed to go from one station to the other.