

Three Dimensional Cubic Display and Lattice Analysis Using 89C51 Microcontroller

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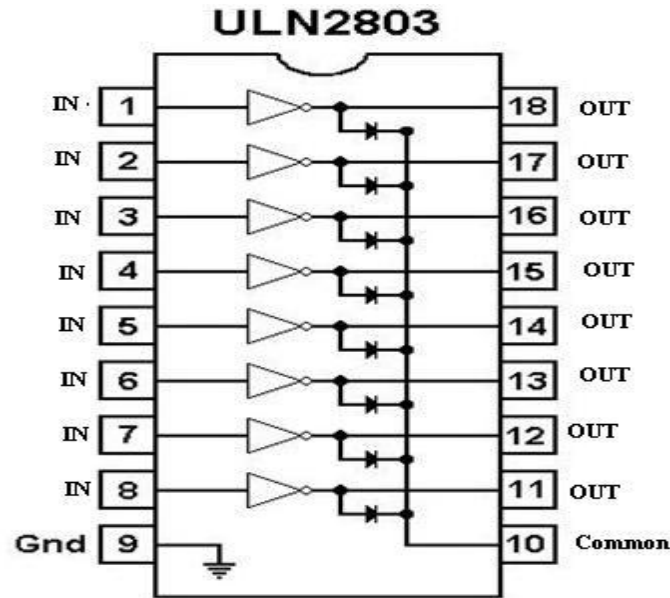
ABSTRACT

A three dimensional display is been presented in this paper which is driven by a microcontroller. A new form of display has been introduced in the LED arena. Any size cube of $A*A*A$ can be effectively implemented which are cheap as well as rugged. A three dimensional mosaic of light emitting diode is formed in a cube which is comprised of light emitting diodes arranged in the dimensional matrix. Cheapness and ruggedness is result of the simplicity of this design. The circuit comprises of a cube connected to a micro controller which is in turn connected to a laptop. The display patterns are sent by the laptop.

Keywords: Light emitting diode lattice, Light emitting diode stacking, cubic display, Light emitting diode driver.

INTRODUCTION

The light output against current characteristics is less effective by temperature. The generally lower drive currents and reduced temperature dependency results in simple drive circuitry. Against current characteristics an LED has a linear light output. LED Driver: The conversion of information voltage signals into modulation current is done using LED drive circuits. This can be done via both digital and analog transmission. A switching on and off of a current in range of a several values 10 -1000 mA is required in a digital transmission. It is performed at high speed . A LED driver controls the amount of current and voltage supplied to an LED light. LED driver is a self contained power supply. The loop current of each LED is monitored by a LED constant current driver. It automatically adjusts the generated DC to minimum value needed to produce the highest forward voltage. The use of rectifier is essential in this circuit as the main power is AC and LED runs on DC . The role of current driver is fulfilled by the IC ULN2803. It has an output range of 500mA and voltage range upto 50 V. Being and 18 pin IC it uses the darlington transistor pair. Inputs are inverted and then applied to the driver IC for gaining required output. There is a diode in the driver IC for checking the back voltage entering the circuit.



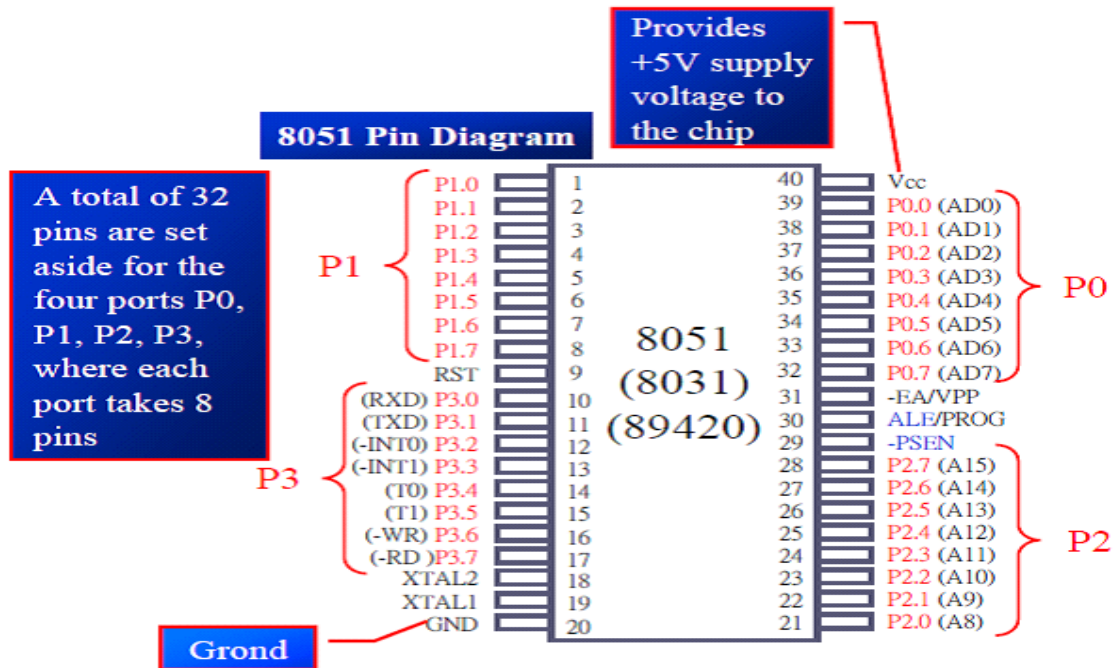
Pin diagram of ULN2803.

Lattice : Division of the cube is done in 8 lattices. Every individual lattice has spacing of 2.5 cms between the 64 LEDs arranged in them in the form of a square. The cathodes of every LED are soldered adjacent to each other thus there are 8 common cathode lines from the different lattices. The cathode lines as used as a switch when they are connected to a transistor. For interconnecting the lattices anode legs are used. This is due to the fact that they are bent 90 degree from the cathode.

Stacking of lattices: For forming the cube he lattices of the LEDs are joined together. Each and every individual lattice has 64 LEDs. For obtaining a single cathode line at each lattice the cathodes of the LEDs of each lattice are joined together which are adjacent to each other. Soldering of anodes is done with the anodes of underlying lattice.

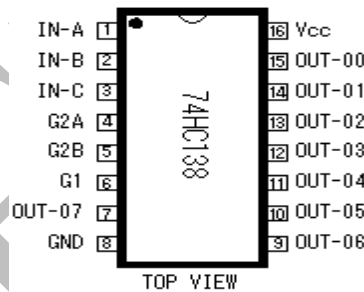


Stacking of LED Lattice's.



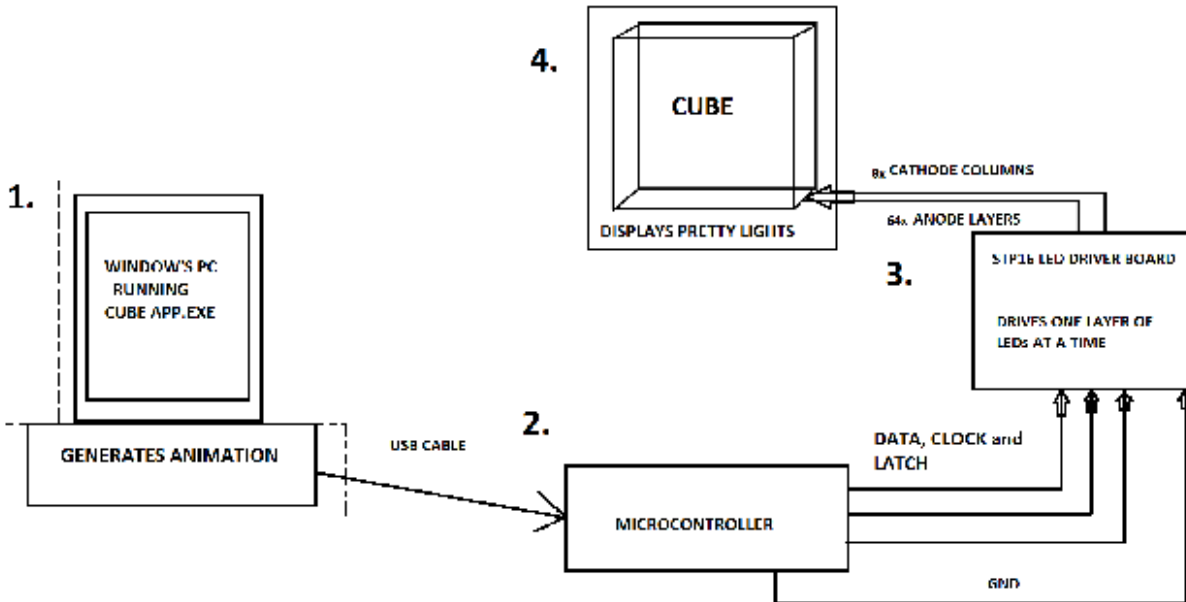
Demultiplexing of LED

74HC138 IC (demultiplexing IC), which is a 16 pin IC is used due to large number of requirement of De Multiplexer. A 3 bit input is taken and it gives 8 bit output which is used here to connect 64 anode pins, and additional 1 IC is required for connection of common cathode line on each lattice. 72 pins are used in the IC for direct connection of cube to microcontroller. Thus 40 pins are saved by using 74HC138IC on the AT89C52 (Micro Controller). This makes pin conservation a necessity.



OPERATION OF SYSTEM

Led cube is the major component of this display system which runs on a particular set of instructions. It comprises of 512 LED's (it is 8x8x8 display system and the number of LED,s can be changed as per the size of the cube). An RS232 standard is used to directly connect the PC to the microcontroller. Seril communication is used for this purpose.. "CUBEAPP.EXE" is an application designed for the PC which sends the input data from user to microcontroller. The circuit comprises of an LED Drive circuit to which a microcontroller is connected. A clear and accurate response is given by LED cube according to the current signal from driver.



BLOCK DIAGRAM OF LED CUBE SYSTEM

CONCLUSION

In the paper, a cheap and affordable 3D LED cubic display system has been developed which supports image exhibition and display patterns. It includes 3D LED CUBE, a driver circuit, a power supply system, display control circuit board. The glow of different LEDs at a specified time results in brilliant image quality and can be viewed from any angle. The RS232 IC is used for serial communication. The advantage of the 3D version of cube over 2D version is data it gives a saturated image quality. The 3D LED display gives a very eye-pleasing and sophisticated image. Its advantages are that it is very low in cost and saves a lot of energy and power. The size, the number of LEDs and the effectiveness are be adjusted and varied. Also the 3D display system is very interactive.

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