The persistence of vision (POV) LED globe

R.M.C.P. Karunarathna, T. Ekanayaka, and W.K.I.L. Wanniarachchi
Faculty of Science and Technology, Uva Wellassa University of Sri Lanka

Introduction

Every day we see a new display technology emerging around us. One of most important technology development is Persistence of Vision or POV. Persistence of Vision is the ability of the eye to retain the impression of an image for a short time after the image has disappeared. This ability can be used to create an illusion of images/characters floating in the air, by rapidly flashing a column of light emitting diodes (LEDs) while moving the display in air. The developed POV globe is a half ring consists of 32 LEDs that is rotated axially at high-speed (300 rpm). Due to this high-speed and the phenomenon of persistence of vision (POV), our brains interprets this moving half ring of light as a solid, spherical surface. When each of the LEDs is illuminated in proper frequency it appears as a 3 dimensional globe.

Methodology

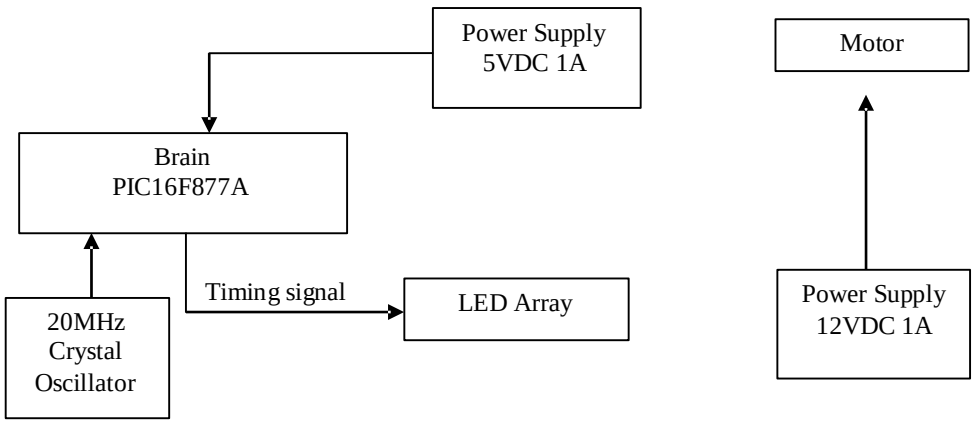

Figure 01: System Overview

The PIC16F877A microcontroller was the brain of the developed LED globe. The available 32 I/O pins under ports A, B, C, D, and E were directly used to control the 32 LEDs. The maximum rating for I/O pin of the used microcontroller is 20mA. Therefore 330 ohms resistor connects serially with each LED where it helps to protect the microcontroller from draining more current and also it provides necessary current and forward voltage for LED. The 5V DC voltage regulated circuit consists with LM7805 was used to power the microcontroller. PCB wizard software was used to design the required circuits.

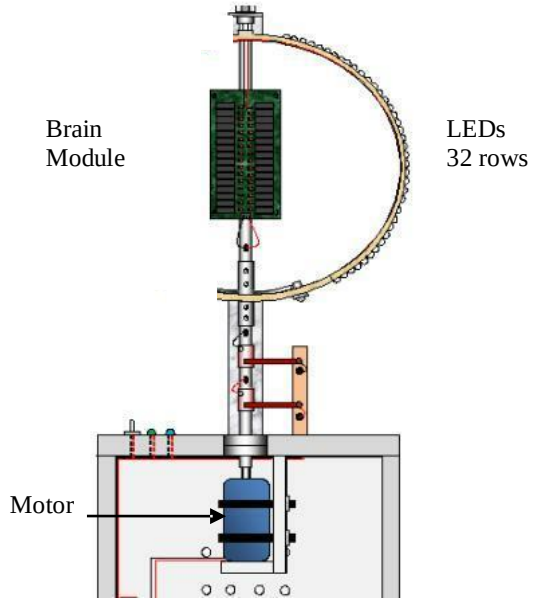

Figure 02: LED half-ring and frame

The mechanical structure of the globe is made PVC ring that has been carefully-designed to be balanced and hence stable when rotated at speed. The heavy basement also supported to stable the system when it is in action.

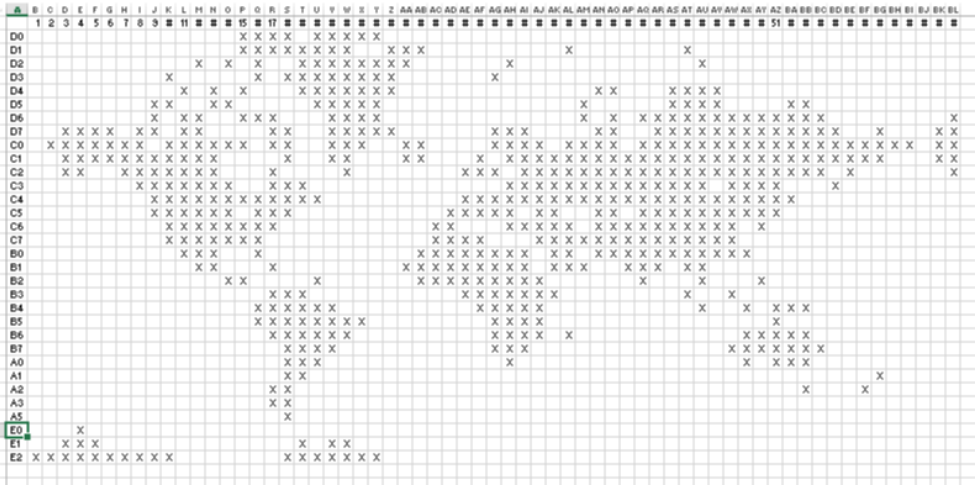

Figure 03: 32x60 matrix of the world map

The corresponding LED illuminated according to the digitized data obtained from the 32x60 matrix of the world map as shown above. Each LED represent a raw, in this case 32 LEDs were used. The

60 columns of a single raw represent the positions to illuminate that particular LED. The used motor rotates 5 frames per second (300 rpm). Therefore each 3.3ms the status of each of the LEDs was updated to synchronize with the rpm.

Result and Discussion

The Figure 04 shows the final output of the developed POV LED Globe. One of the main difficulty was to balance the whole structure when it is in action. To overcome that problem several parameters were optimized, such as the rotational speed, dimensions, weight of the system and the center of mass of the entire system, by trial and error method. Also in this work we used cogwheel to increase the speed. Large cogwheel used for driver and little small cogwheel used for driven to increase the speed of the globe. By increasing the number of rows, resolution can be increased. In this work 32 rows were used.

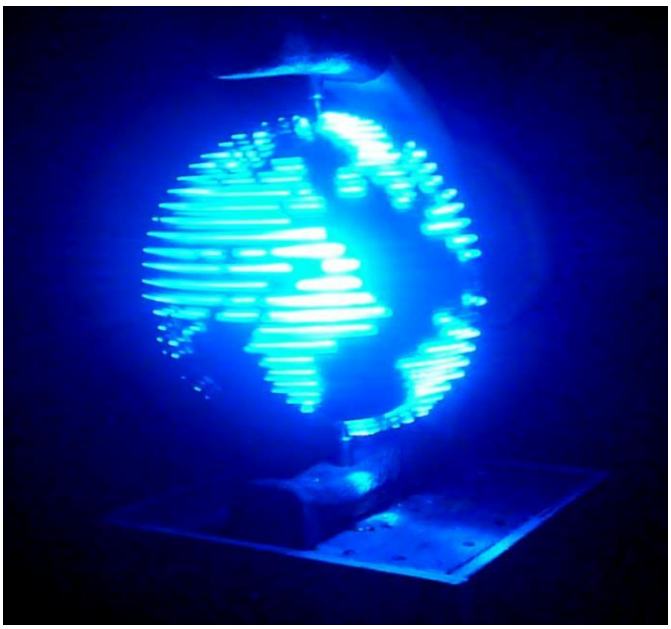

Figure 04: Capture of the LED GLOBE

References

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Stuff and Nonsense, Making a POV globe, retrieved 29 th of September 2012, from the World Wide: http://hotchk155.blogspot.com/2012/09/making-pov-globe.html