International Journal of Advanced Research Foundation
Website: www.ijarf.com, Volume 2, Issue 7, July 2015)

POV: Persistence of Vision

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***Abstract*— A persistence of vision (POV) refers to the phenomenon of the human eye in which an afterimage exists for a brief time (10 ms). A POV display exploits this phenomena by spinning a one dimensional row of LED's through a two dimensional space at such a high frequency that a two dimensional display is visible. In our case, we created a cylindrical display by spinning a column of LED's around a central motor shaft.**

***Index Terms*—POV, persistence of vision, human eye persistence, human eye capability, POV display, human eye phenomenon.**

I. INTRODUCTION

The purpose of this project is to design and to create a persistence of vision (POV) display. This display will allow users to upload an image to be displayed through wireless communication. A persistence of vision (POV) refers to the phenomenon of the human eye in which an afterimage exists for a brief time (10 ms). A POV display exploits this phenomena by spinning a one dimensional row of LED's through a two dimensional space at such a high frequency that a two dimensional display is visible.

In our case, we created a cylindrical display by spinning a column of LED's around a central motor shaft. The rotational speed of the LED's is fast enough such that the human eye perceives a two dimensional image.

II. PRINCIPLE

The logic behind our project is very straightforward. Our software must calculate the rotations per minute (RPM) and the release and deadline times which set the time duration to display each "pixel" of the display (explained in software section). From a high level design, we simply measure the period of each rotation, divide time the cantilever takes to rotate through that section by the number pixels we want to display and then calculate the amount of time each pixel occupies during the rotation. By turning on a light emitting diode (LED) for just that duration of time, we can then display the pixel.

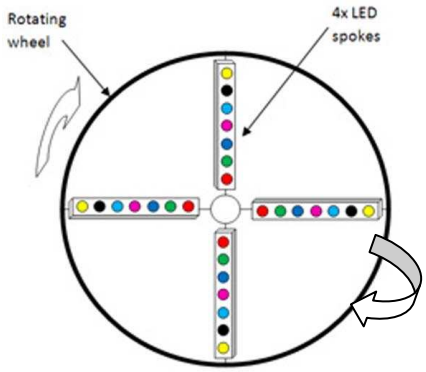

Figure 1. Showing the principle working of POV display.

Thus, we've mapped the entire display area to a 14 by 90 matrix where each element in the matrix represents a pixel that can have any red, green, and blue (RGB) value. The nature of our design allows the software and hardware design to be independent of each other in terms of tradeoffs. The more robust our hardware becomes (i.e. tying down wires and securing boards), the safer our project becomes. The more robust we make our software (i.e. robust state machine and LED mapping), the more optimized and error free our project becomes. The only case where our decisions about which hardware we used affected software decisions was when we ran into memory issues in RAM when the resolution of our display grew too large. On our microcontroller, the ATmega644, in order to increase the resolution of the display (i.e. to store a larger matrix which contained the pixel information); we would need additional memory modules to provide this functionality. We decided against this due to time and space constraints on the arm itself.

III. WORKING OF POV DISPLAY

The 12volts DC motor is fixed with the fabricated PCB which is capable of rotating at 1200 rpm. So the background of the lights is bit darker one so that lights are visible during rotating. The speed regulator is used so as to view the words or letters clears accordingly human eye persistence. When the power is made on the lights starts glowing randomly before starting the rotation, when the rotation starts then lights with delay are now felt as if they are making some meaning full human understandable combinations. So by adjusting the

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Website: www.ijarf.com, Volume 2, Issue 7, July 2015)

regulators one can see the programmed words with right vision and can be clearly visible after the persistence of human eye crosses.

IV. System Diagram

The overall design of this project can be grouped in the following three categories: PCB design, mechanical design, and software design. The most labor intensive portion of this project was the mechanical design..

A. *Pcb design*

The pov display is designed for fabrication of the components over the pcb (printed circuit board). As we have fabricated smd components over the PCB so the pcb has to be smd based designed. The below shown figure is pcb designed for fabricating smd devices over the copper clad board.

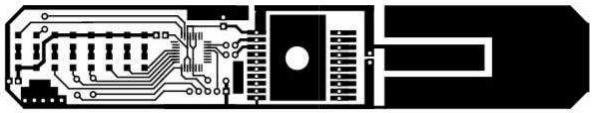

Figure 2. Showing the pcb design of the POV display.

B. *Mechanical design*

Mounting the fabricated PCB of pov display to the DC motor with 1200rmp with 12v dc volts. So before mounting the fabricated pcb is placed over the dark color board and then this fabricated pcb and board is mounted to the DC motor and mounted such that only the fabricated pcb rotates not the dark color board. This is mechanical design is shown in the below figure 2.

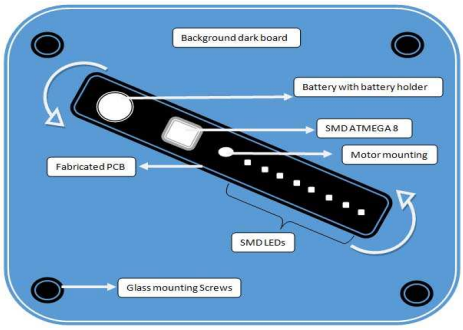

Figure 3. Shows the mechanical design of pov display.

C. *Software design*

The ATMEGA 8 SMD is burnt with the code for pov so that the light over the fabricated pcb glows according to the desired letters or words. These are coded using the software called AVR studio, and Khazama software to burn the ATMEGA 8 SMD. The ATMEGA does the glowing up of SMD LEDs accordingly delay mentioned in the program.

V. Conclusion

In conclusion, this project really demonstrated competence combining a difficult integration of the mechanical and electrical systems to build a persistence of vision display. We built a general standalone system which can receive input from any device wirelessly to print out a display based on the pixel information programmed. We demonstrated this by programming the predefined letters into the processor. The onboard system is a fully contained system, capable of outputting the display at varying RPM speeds and not carrying about what system interfaces developed by us. This project also has so much room to explore further exciting developments and additions to the many devices with which it could interface.

Acknowledgment

The authors wish to thank Anoop Kolsur, Sandeep Awale, and Nagraj Ullagaddi. This work was supported in part by a grant from XYZ.

References

[1] Jun Ma and David Bjane “Persistent of Vision Display” http://people.ece.cornell.edu/land/courses/ece4760/FinalProjects/s2012/jm787_dab355/jm787_dab355/.

[2] Robinson P. Paul and Ghansyam B. Rathod “Persistence of Vision Control Using Arduino” Published Online December 2013 in MECS (http://www.mecs-press.org/)
DOI: 10.5815/ijisa.2014.01.11

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