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Persistence of Vision Display

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***Abstract*:- The purpose of this project is to design and to create a persistence of vision (POV) display. The objective is to develop an LED display system which uses enormously lesser amount of LEDs and power consumption than the normal LED display and which is compact in nature using persistence of vision based technology.**
This display will allow users to upload an image to be displayed through wireless communication using LED lights. The rotational speed of the LED's is fast enough such that the human eye perceives a two-dimensional image.Our project focuses on meeting the tremendous growth of advertisement.

Keywords:- POV technology,Arduino,Micro controller,LED display,Microprocessor

I. INTRODUCTION

Persistence of Vision (POV), occurs when a visual image seems to persist continuously when a stream of light is repeatedly interrupted for very brief instances and does not enter our eyes during those durations[1]. A POV display exploits this phenomenon 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. There are a lot of applications of persistence of vision. For example, Newton Disc, Kaleidoscopic color top, Thaumatrope, rubber pencil trick etcetera[2]. A visual form of memory known as iconic memory has been described as the cause of this phenomenon. A critical part of understanding that emerges with these visual perception phenomena is that the eye is not a camera and does not see in frames per second[3]. In other words, vision is not as simple as light registering on a medium, since the brain has to make sense of the visual data the eye provides and construct a coherent picture of reality.

II. LITREATURE REVIEW

Here are the theory and concepts from the past projects. The objective is to explain the perspective and method which has been used in the past projects and to observe how this project can be related to existing research and theory. This shows how the theory and concept have been implemented to solve project problems. Here are the past theories on this project :

A. Past Theories

This project is based on the microcontroller AT89C2051, which is a derivative of the 8051 families, from Atmel Inc. This used an Interrupter module consisting of the IR interrupt sensor MOC7811, from Motorola Inc. This sensor was used because of its small size, precise interrupt sensing, and study casing. This module was interfaced with the microcontroller with two resistors and a general-purpose transistor. It consisted of IR LED and Photodiode facing each other enclosed in the plastic body. When light emitted by the IR LED is blocked because of some completely opaque object, the logic level of the photodiode changed. This change in the logic level was sensed by the microcontroller or by discrete hardware[4]. An interrupt module is used (Interrupt circuit), to introduce an interrupt after each revolution. In our project, the hardware is further simplified by removing the interrupt module and programmatically implementing it. Introducing an interrupt module complicated the coding and the hardware part. It was not an effective way to generate the display as there would be an interrupt after displaying each column and this adds to the extra delay[6]. To enhance the synchronization of the display we will remove the interrupt module in our project[5]. The project referred to in this paper used a microcontroller AT89C2051, which had few drawbacks. We are using Arduino Atmega 328 due to its extended features and simple implementation. The next paper that we referred was “Low-Cost Propeller LED Display” by Manavi Sharma1and Krishan Mohan (The project in this paper used a VCR motor to prevent noise)[6]. The circuit also consisted of a phototransistor to generate a precise index pulse. To display the characters, the circuit had a memory capacitor to keep the character displaying even when the power is not supplied to the circuit. Our project will not include any existing patents, copyrights, or trademarks. We will make all the hardware from scratch and all the software will be our original work with some assistance from the project head.

III. METHODOLOGY

The overall design of this project can be grouped into the following three categories: electrical design, mechanical design, and software design. The logic behind this project is very straightforward. The nature of our design allows the software and hardware design to be independent of each other in terms of trade-offs. The more robust the hardware becomes (i.e. the tying down wires and securing boards), the safe the software becomes. The more robust the software (i.e. LED mapping), the more optimized and error-free the project

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becomes. The circuit of our project includes two parts display and main supply.

A. Block Diagram

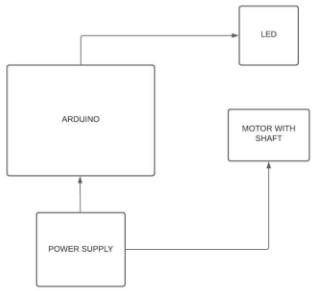

Fig. 1 Main Circuit

B. Main Supply

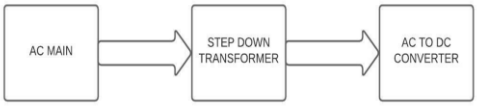

Fig. 2 Main Supply

C. Circuit Diagram

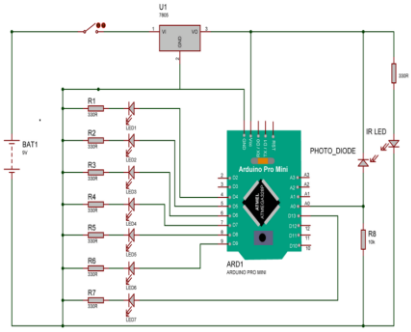

Fig. 3 Circuit Diagram

D. Mechanical Design

The major mechanical challenge we will face of designing a robust rotating system capable of transmitting power to the display circuitry. The mechanical system also has to be sufficiently reliable to withstand multiple tests at a minimum rotation speed of 1200 rpm to achieve POV[7]. Our POV display uses a fix speed motor. To create a platform to hold our LED array and circuit board we will use a wooden board. Also, we will use a PVC pipe to hold the display and give it a certain height.

E. Electrical Design

The main challenge when designing the electrical system is to control 7 LED's, with Arduino ATmega328 for 2-dimensional display. To accomplish this, LED's are split into 5 columns of 7 LED's each which could be selectively turned on and off by synchronizing the flashing of LED and rotation of the DC motor. The main component of the electrical system is the timing system and LED control system for 7 LED's using Arduino.

F. Software Design

The final consideration of our project is user interactivity. While commercial POV displays present a static image, our display was intended to be customized. Another challenging aspect of the project is finalizing a mechanical system in time to test the functionality of our electrical and software systems.

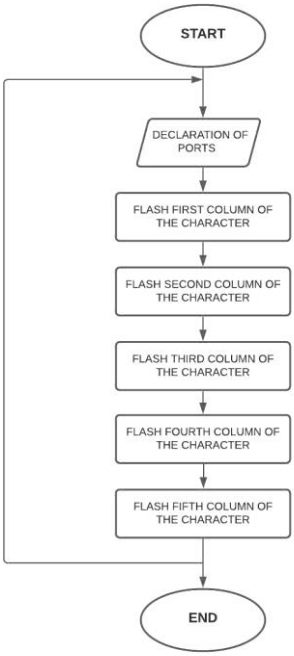

Fig. 4 Software Flowchart

IV. SCOPE OF THE PROJECT

A. Future Scopes

i. An innovative evolution of POV display known as JANUS display is the advancement in POV display. It is being developed by "Design media and HCI labs of KAIST in Daejeon, South Korea aims to expand upon both the functionality and practicality of these devices[8].

ii. The present POV display features a single LED array facing towards one viewer is potentially problematic for anyone viewing the image from the other side- it will appear inverted. The JANUS display includes a second arm on the opposing side of the device which allows for two viewers to observe the image from either of the sides[9].

iii. JANUS display also includes direct interaction by placing two sheets of plexiglass between the observer and the blade so this evolves a new development- one might even go so far as to say that it is a holographic imager[10]. This advanced implementation of the present POV display is certainly a unique concept, one can come up with plenty of interesting ideas to take advantage of it and this may lead to the future of display technologies[11].

iv. Ultra low cost solar rechargeable POV display this produces a bright and eye-catching display to write text and small images through the air[12]. It has a

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built-in RC clock and uses a small rechargeable battery and solar cell which are typically pricey items, but currently, there is a huge flood of keying-sized cheap solar-powered torches from China[13].

B. Expected Outcomes

Safety will be a concern for our project. Spinning essentially a blade at 500rpm is dangerous enough, and we will mount several PCB boards, a 9V battery, a transceiver and a row of LED's to our spinning blade.

CONCLUSION

In the the following few words the entire conclusion can be summed up.In our project, hardware and software based system were designed and developed for the implementation of persistence of vision phenomenon through Arduino technology using various LEDs and an AC motor . The software algorithm,electrical and mechanical systems were designed from the scratch and were implemented through a working physical model of the project .The main aim of the project was achieved and various images and text could be displayed on the POV display which uses an AC motor.

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