Preparation of Papers for IEEE JOURNAL OF

"PROPELLER CLOCK" Mechanically Scanned LED Clock

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***Abstract* – This project is a different view of holographical clock construct in linear array arrangement. It will be the coordination of electrical, electronics and some mechanical engineering. This "illusion" is based on inertia of human eye. The motor spins at a constant rate such that the LEDs rotate around a centre pivot point. As the LEDs spin around they light up sequentially such that they will display the current time. The motor spinning fast enough that the human eye will perceive all of the display is on at once, and the viewer will be able to read the time constantly. If LED formed digits will periodically and frequently enough flash, they will appear solid and steady.**

A microcontroller is used to keep the time and blink the LEDs in an appropriate pattern to show the numbers. It has to be programmed so that it will both keep time and also send the appropriate signals to the LEDs to light them in the correct sequence. Its looks like the digital numbers are floating in the air.

I. INTRODUCTION

The propeller clock is a linear array of light emitting diodes, rotating at a high angular velocity to generate a circular screen. Now by synchronising these light emitting diodes, and keeping in mind the concepts of persistence of vision & limit of resolution, we can display a clock. The persistence of vision, "What we see is a blend of what we are viewing and what we viewed a fraction of a second before". The mechanical scanning mechanism, which is performed in the clock when the motor is turned on, the connected seven LEDs are scanned line by line at a very fast speed which makes the observer to observe those led display clock.

Fig1.Analog Propeller Clock

II. METHODOLOGY

A. BLOCK DIAGRAM

Interrupter Module (OPTO COUPLER) :-

Interrupter module is our hardware sensor module, consisting of the IR interrupt sensor MOC7811, from Motorola Inc. This sensor was selected from a variety of other alternatives, because of its small size, precise interrupt sensing, and sturdy casing. One great advantage of using this module is interfacing it with the microcontroller is just a matter of two resistors and a general purpose transistor and is provides isolation between 2 circuits.

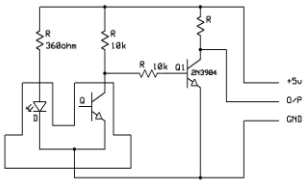


Fig2. Circuit diagram of interrupter module

Microcontroller AT89C2051:-This project is based on the microcontroller AT89C2051, which is a derivative of 8051 family, from Atmel Inc. This is a 20 pin IC packaged in DIP package. This small sized IC is used, mainly because of its reduced weight. This improves the performance of the display.

LED Module:- LED module consisting of 7 bright LED is fixed in another side of the arm of our project. These LEDs are connected with each of the port pin of microcontroller, with a series current limiting resistor of 470 ohm.

DC Motor: Repeated scanning of the display is must for continuous vision. This task is achieved using circular rotation of the whole circuit assembly. So, we used a DC motor with 1200 rpm speed as the prime mover.

DC Power Supply: For microcontroller, as well as the DC motor, a regulated DC power supply is required. We have to provide +6V to the microcontroller, while +9V to the motor.

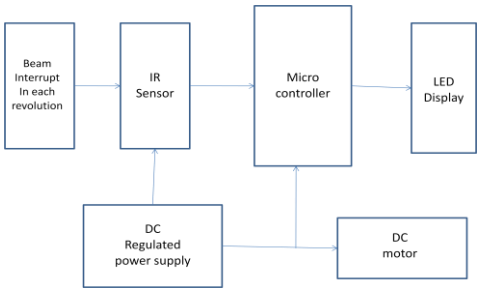
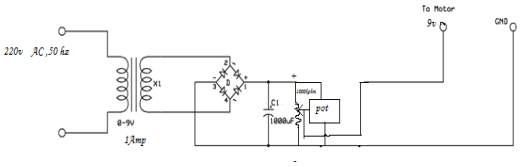


Fig3.Block diagram of propeller clock

B. CIRCUIT DIAGRAM

It include the circuit diagram of both dc power supply for motor and PCB circuit diagram. AC power supply is converted into dc by full bridge rectrifier bridge. For dc supply we can also use battery here but there is continuous degradation of power supply of battery which creates the problem of reduced speed.Thus we prepare this circuit



Power Supply circuit

Fig4. Power supply circuit for ac to dc regulated conversion

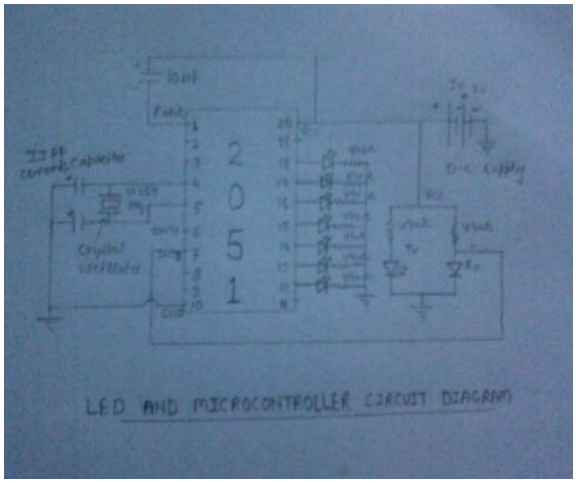


Fig4. Circuit diagram of propeller clock

C. SOFTWARE DESCRIPTION

Kiel compiler

The KIEL 8051 Development Kits are a complete solution for creating software for the 8051 family of microcontroller. The development Kits comprise many different tools that allow projects ranging from simple to highly complex to be developed with relative ease. You will find that with the KIEL development kits you can rely on tools that have been tested by real users over a long period of time.KIEL provides a familiarity to the tools that will provided a basis for using more complex features. It is assumed that the user is familiar with Windows and has at least some familiarity with the 2051 microcontroller family and the C programming language.

Algorithm

i. Main routine

1. Load proper value in IE register, so that the interrupts INT0 and T0 are enabled. (IE =83H)
2. Offer higher priority to the INT0 (External) interrupt.(IP = 01H)
3. Configure timer 1 as 16-bit timer, and timer0 as 8-bit auto reload mode timer. (TMOD= 12H)
4. INT0 should be configured as edge interrupt. (IT0=1)
5. Configure port 3 as input port. (P3 = 0FFH)
6. Move input string to the video RAM area.(call'ramc' function)
7. Start the timers.
8. Initiate an infinite loop.

ii. Interrupt Routines

a. External Interrupt

1. Stop the timers.
2. Move th1 and tl1 into convenient registers.
3. Divide this 16 bit value by our total number Of segments.
4. Subtract the answer from 256, and load the Result in th0.
5. Now, reset the video RAM pointer and character segment pointers to their initial respective
6. start the timer.
7. Return from interrupt

b. Timer 0 Interrupt

1. Call the display routine.
2. Clear timer overflows flag.
3. Return from interrupt

III. RESULTS

Interrupt Module Testing

This Interrupter module testing is required for

detecting exact position of wheel on which whole circuit assembly is mounted. Supply voltage given to Pin. No.1(Collector) and Pin.No.3 (Anode) of MOC7811=6.0V Output voltage obtained at Pin.No.1 of MOC 7811 without interrupt=5.5v.Output voltage obtained at Pin.No.1 of MOC7811 with interrupt=0.08V

DC Motor RPM Testing

DC Motor used in this project is +9V dc motor which is tested by using digital contact-less tachometer. Arrangement was made so that the sensing circuit gives high to low pulse for each completion of revolution. By measuring the time difference between two successive pulses RPS can be calculated which further provide RPM value, as shown below:

Power supply given to DC Motor = +9V

Time interval between two successive pulses as seen

On CRO = 50.55ms

o RPS = 1 / (50.55) =19.78

o RPS = 20

o RPM= 20x60=1200

Power Supply Module Testing

Power supply module was designed to provide +9V DC power supply necessary to drive motor and +6.0 for circuitcircuit. AC input is given from +10V, 1 mA transformer. Results are as follows.

Input voltage, Vs=+10V AC.

Output voltage observed, Vo = +8.11V DC)

D. DISPLAY GENERATED PATTERN

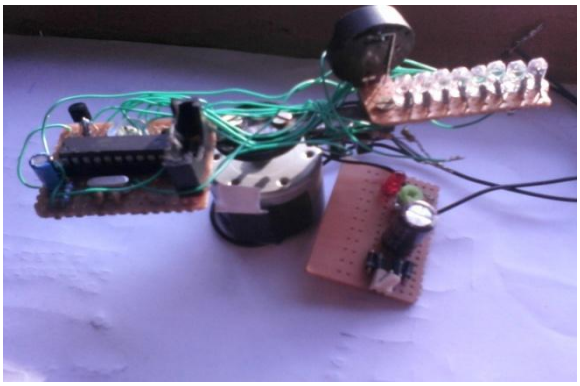


Fig5.Actual Hardware module

Fig6.displaying a complete circle

Fig7.Displaying 3/4th circle

Fig8.Displaying a string

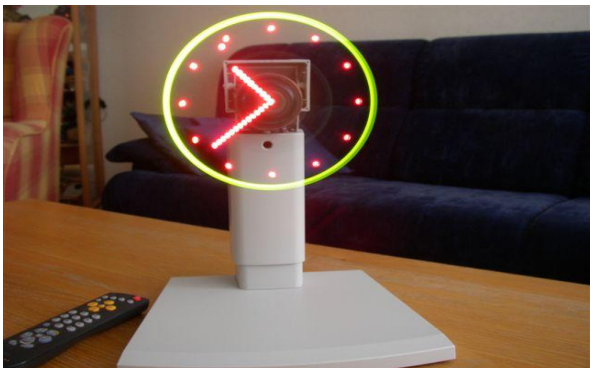


Fig9.Displaying analog clock

Fig10.Displaying propeller clock

IV. REFRENCES

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