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# PROPELLER DISPLAY OF MESSAGES BY VIRTUAL LEDs

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**Abstract** — *This paper explains the project which is a special kind of circular LED display, which is rotating in 360°, with the help of mechanical assembly which is consist from DC motor and propeller like structure. The basic principle behind this project is persistence of vision (POV). This project is very cost effective the no. of LED which is used for display the message consumes less power, the hardware cost is also less. This project uses 40 pin 8051 family microcontroller. For displaying the message we calculate the proper delay time with the help of some mathematical tools. The program is implemented with help of embedded C which is burn on controller chip with the help of PIC programmer. This project displays the message, which is usually displayed by around 525 LEDs.*

***Keywords***- *Propeller, Persistence of vision, Microcontroller.*

## I. INTRODUCTION

Propeller is a term associated with a circular rotating object. As this project needs to rotate whole circuit assembly, there must be some prime mover attached to it so the term 'Propeller'. This project using 8 bright light emitting diodes for displaying the characters and symbols on its assembly that's why this project is named as "PROPELLER LED DISPLAY". Basic principle behind this project is POV (Persistence of Vision). This is the phenomenon which is related to vision capability of human eye by which an after- image is thought to persist for approximately 1/25th of a second. So if someone is observing the images at a rate of 25 images per second, then they appear to be continuous. The best example of this property is the red circle we observe when we rotate the firecracker or incense stick in circle.

This project was started with a simple principle which is frequently encountered in our everyday life, which is Persistence of Vision. This phenomenon makes one feel fast moving/changing objects to appear continuous. A television is a common example; in which image is re-scanned every 25 times, thereby appear continuous. Further, a glowing objects if rotated in a circle at fast speed, it shows a continuous circle. By modifying this basic idea, 8 LEDs can be rotated in a circle, showing 8 concentric circles. But if these LEDs are switched at precise intervals, a steady display pattern can be shown. Existing systems do employ POV principle, but for displaying each pixel, individual LED is used. This results in a huge number of LEDs even for small sized displays. By using a propeller type display, LED count can be kept to a bare minimum. Even 8 LEDs can perform a task of over 525 LEDs.

## II. METHODOLOGY

2.1. Hardware Description

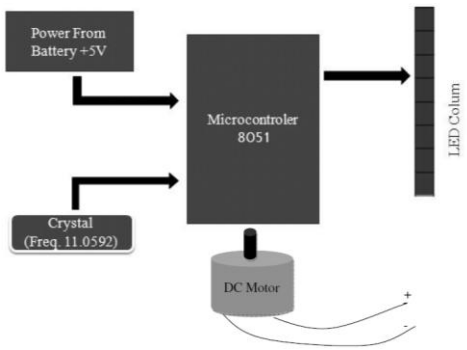



***Figure 1. Block diagram***

In this section we will emphasize on detailed overview of each of the block shown in above block diagram. In every description of the block respective schematics and working is explained. The propeller display consists of following blocks, as shown in the block diagram.

2.1.1 Microcontroller AT89S52

The AT89S52 is a low-power, high-performance, 40 pin, CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high density non volatile memory technology and is compatible with the industry standard 80C51 instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional non volatile memory programmer. By combining a versatile 8-bit CPU with in-system programmable Flash on a monolithic chip, the Atmel AT89S52 is a powerful microcontroller which provides a highly-flexible and cost effective solution to many embedded control applications. The AT89S52 provides the following standard features: 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry. In addition, the AT89S52 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port, and interrupt system to continue functioning. The Power-down mode saves the RAM contents but freezes the oscillator, disabling all other chip functions until the next interrupt or hardware reset.

2.1.2. LED module

LED module consisting of 8 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 220 ohm.

2.1.3. Crystal (11.0592MHz)

An electronic oscillator is an electronic circuit that produces a repetitive electronic signal, often a sine wave or a square wave the output frequency is determined by the characteristics of the devices used in the circuit.

2.1.4. DC motor

In our project the rotating assembly uses +12 Volt Gear Motor for rotating LED panel with the speed of 1000rpm. In this speed the POV is achieved. 1000 RPM 12V DC Geared Motor is high quality low cost DC geared motor. It has steel gears and pinions to ensure longer life and better wear and tear properties. The gears are fixed on hardened steel spindles polished to a mirror finish. The output shaft rotates in a plastic bushing. The whole assembly is covered with a plastic ring. Gearbox is sealed and lubricated with lithium grease and require no maintenance. The motor is screwed to the gear box from inside. Although motor gives 1000 RPM at 12V but motor runs smoothly from 4V to 12V and gives wide range of RPM, and torque.

2.1.5. DC power supply

This project uses a two power supply 1st is +12volt supply for Gear Motor and the second +5V is applied to controller call on the board supply.

2.2. Circuit Diagram

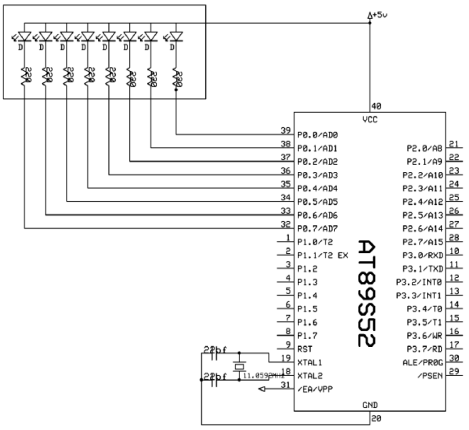



***Figure 2. Circuit diagram***

In this circuit diagram the cathode of each 8 led diodes are connected to 8 pin of port 0. The anode of all LEDs are connected to +5V Power Supply. This type of LED connection is called Active Low Logic. Now the pin no. 18 and 19 are XTAL pin which is connected to external oscillator which frequency is 11.0592MHz. This oscillator is grounded through 22pf ceramic capacitor. The controller is powered by Pin no. 40, the positive +5 volt supply is given by the +9V battery by using 7805 regulator.

2.3. Software Description

2.3.1. Keil Micro Vision (IDE)

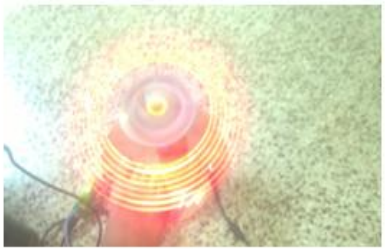
Keil an ARM Company makes C compilers, macro assemblers, real-time kernels, debuggers, simulators, integrated environments, evaluation boards, and emulators for ARM7/ARM9/Cortex-M3,XC16x/C16x/ST10, 251, and 8051 MCU families. Keil development tools for the 8051 Microcontroller Architecture support every level of software developer from the professional applications engineer to the student just learning about embedded software development. When starting a new project, simply select the microcontroller you use from the Device Database and the µ Vision IDE sets all compiler, assembler, linker, and memory options for you. Keil is a cross compiler.

## III. CONCLUSION

The propeller should build as lighter and more stable. It matters to a faster rotation of propeller. And if the assembly is balanced perfect with having good mechanical strength, then it can achieve stability, and rotate at high RPM. More clear display can get using bright light LED s. This Project Propeller LED Display is first tested and then successfully implemented. The programming of microcontroller AT89S52 used in the project is done in C language which is converted to HEX Code by KEIL software. All the passive elements are tested by multi meter. And all other circuits are first analysed on breadboard and then implemented on PCB.







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