

LASER PROJECTOR USING A SINGLE COLUMN OF LASERS TO DISPLAY MESSAGES

A Y Abeysekara¹, N C Gammanage¹, Y I Gamage¹, I M Kaluarachchi¹, S Dharmasena¹, J. Wijayakulasooriya²

¹ Department of Mechatronics, Faculty of Engineering, South Asian Institute of Technology and Medicine (SAITM), Sri Lanka. Email: yasitha19@live.com

² Department of Electrical & Electronic Engineering, University of Peradeniya, Sri Lanka, Email: jan@ee.pdn.ac.lk

ABSTRACT

Digital displays are a common and a very flexible mode of communication, as the message presented in a digital display can be changed any number of times by changing the input signal. There are various techniques in use ranging from seven segment displays to LCD or LED screens. Projecting a digital image, for example using Laser Beams to display messages on a projected screen is an emerging display technique. Lasers are ideal for a projector as it has several properties such as high coherence, directionality and sharpness and focus.

In this work, we present a design for a laser based display unit that uses a limited number of Laser Beams with the capability to project words/phrases on to a screen, instead of a grid of LEDs or Lasers to turn on and off displaying the intended message. Low power consumption and High portability are its main aspect and key advantages. The core concept is to reflect the lasers using a mirror and project them on to a screen, while the mirror itself rotates at a high speed. As a result, the message appears to be continuous due to the phenomenon called *Persistence of Vision (POV)* while the lasers are turned on and off.

The design includes three main objects, the Laser Source of seven Laser Beams, a mirror in the shape of a hexagon rotated by a DC motor and the projected screen. The objective is to simply display line/lines, a letter, a word or probably even a sentence. The lasers are stationary and are vertically aligned with a distance of 8mm gap between each of them. These lasers are then reflected off by a mirror to the projected screen, the mirror is in the shape of a hexagon and its base is rotated by a motor. Six sided mirror figure reduces the speed or rpm required by the motor to achieve POV. At any particular instance if a picture were to be taken using a digital camera all that could be seen are vertically aligned laser dot/dots.

The rotation of the mirror hexagon and the on/off sequence of lasers at a given instances controls the letter/character displayed at the time. Any particular character will be basically broken into 3-4 columns and a code will be given to the microcontroller to turn on/off particular Lasers in each consecutive columns. A combination of these characters may be used to display a message where a space between words would be indicated by 2 columns where the lasers would be off. In the proposed design, the hexagon should spin at a given rpm of 100rpm. This is calculated based on the knowledge that time for POV is less than or equal to 0.1 seconds(s). Since a hexagonal shape is used the time should be divided by 6 therefore increasing the time for POV to be 0.6s. This suggests that one cycle must be completed less than 0.6s or less. The challenging part would be to maintain the image within 0.6 seconds or else it would appear distorted and unclear. The beams from first column to the last column of a character or message in a time period should be displayed in less time than the amount of time the first column would leave our brain.

This projector is much different when compared to others as it only uses a single column of 7 lasers to display sentences which clearly saves up on a lot of power and can be battery operated. If the projected distance doesn't meet the requirement it can be increased by using lenses.

Key Words: Persistence of Vision, Laser Projected Display Unit, Portable Projector