Design and Development of Computer Interfacing for Mechano-Luminescence

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Abstract

This paper proposes a new approach to design Software for interfacing of Mechanoluminescence (ML), our study focuses on interfacing. The interfacing of computer is used in wide variety in research program in different ways, hardware and software interface plays an important role to design of the embedded computer system. This interfacing provide the highly précised result with high speed. The manual work will reduced by using this interfacing device and it will be available in portable size, low cast, and very low power consumption enabling battery operation when used with laptop computer.

KEYWORDS : Mechanoluminescence Interfacing, Analog to Digital Converter interfacing, Computer interfacing

1. INTRODUCTION

This paper deal with design and development of software interfacing for Mechanoluminescence (ML), ML is a type of luminescence induced by the elastic deformation, plastic deformation and factor of crystal. ML can be excited by compressing, stretching, loading, rubbing, grinding, cutting, cleaving, shaking, scratching, or crushing of solid. It can also be excited by thermal shocks caused by drastic cooling or heating or by shock waves produced during exposure of sample to powerful infrared laser pulses or ultrasonic waves. ML also appears during the deformation caused by the phase – transition or growth of certain crystal as well as during separation of two dissimilar materials in contact.

Luminescence materials have drawn considerable interest and are recently being investigated by the scientists in through the world. Luminescence is the general term for the emission of visible and non visible electromagnetic radiation from a substance during or following the absorption of energy from suitable sources, such as high energy particles, UV radiations, X-rays etc. This software is used to interface with the application of ML and produced high speed and more accurate automatic observed results.

This hardware software interface consist with the optical sensor , microcontroller based analog to digital converter , parallel port and a software by using Visual basic, the above component and device are used to design and development of computer interfacing for Mechanoluminescence (ML).

2. Materials and Methods

This section consists with hardware implementation and experimental arrangement for measuring ML.

2.1 Experimental

Experimental arrangement consist with 1-Stand, 2-Pully, 3-Card, 4-Pressure, 5-Pipe, 6-Aluminium foil, 7- Phosphors, 8-Transparent Lucite plate, 9-Wooden block, 10-Optical Sensor, 11-Iron base mounted on a table. The phosphor used for present Investigation was prepared. The ML intensity at different impact velocities was

measured by dropping a load of particular mass and shape from different heights the experiment setup for this measurement has been shown in figure 1.

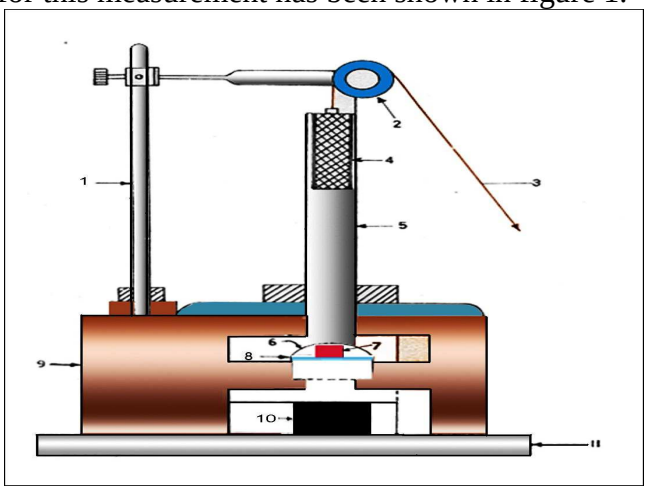


Figure 1. Schematic diagram of the experimental arrangement used for measuring ML.

The time dependence of ML was determine by placing 5 mg of phosphor on a transparent Lucite plate. The luminescence was monitored or converted by optical sensor, placed below the transparent plate. The optical sensor is connected to micro controller based Analog to Digital converter which provide digital output at the parallel port. This parallel port will connect to the PC and the result of phosphor will display on the monitor.

2.2 Hardware Implementation

The hardware implementation is carried out based on optical sensor and widely used PIC 16F873A micro controller based analog to digital converter and parallel port. The experimental block diagram for deign and development of software interface for ML is shown in figure 2.

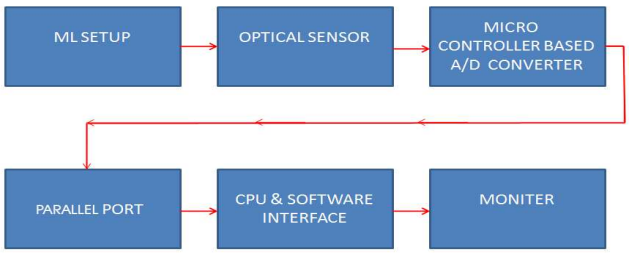


Figure 2. Block Diagram Representation

The luminescence is obtained from ML setup as shown in figure 2 and luminescence is converted in voltage with the help of optical sensor and the output of the optical sensor is applied to the micro controller based Analog to digital converter and A/D converter is able to convert the signal on digital form on parallel port. The parallel port is connecting to PC and installed software detects the voltage which is available at parallel port.

2.3 Explanation of main components

The A/D Converter is based on microchip PIC16F873A which contain 4K words x 14 bits Flash Program Memory, the PIC16F873A device are available only in 28 pin packages and it has three input/output ports (A,B,C) and fourteen interrupts signals and it has also five A/D channels and its frequency range is from DC to 20 MHz, 192 data memory bytes and 128 EEPROM data memory bytes and it has two analog comparators and 35 instruction set. When interfacing the program memory block, the EEDATA and EEDATH register form a two byte word that holds the 14 bit data for read/write and the EEADR and EEADRH registers form a two byte word that holds the 13 bit address of the program memory location being accessed. The devices have 4K words of program Flash with an address range from 0000h to 0FFFh. There are actually two 8 bit latches one for data output and one for data input. The user write 8 bit data to the PORTD data latch and reads data from the port pin latch (they have the same address) in this mode, the TRISD register is ignored since the external device is controlling the direction of data flow.

Pin diagram of micro controller PIC16F873A are shown in figure 3.

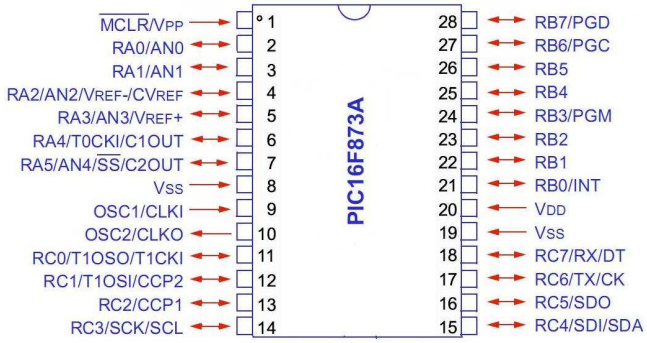
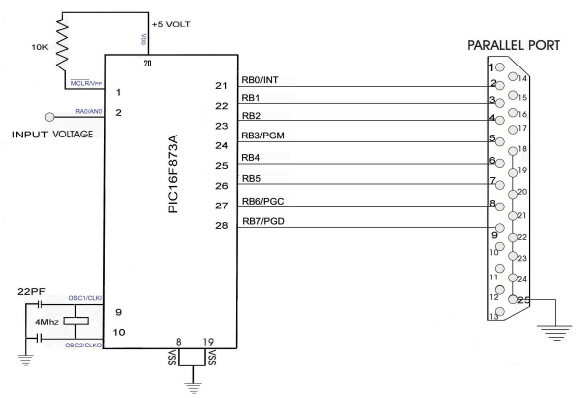


Figure 3. Pin Diagram of PIC16F873A Microcontroller

2.4 Circuit Design: - in circuit designing pin no. 21 to 28 is connected with parallel port pin no. 2 to 9 and pin no. 18 to 25 is grounded of parallel port and pin no. 1 and 20 is connected with +5 volts power supply with 10k resistance of micro controller and pin no. 9 and 10 is connected with 4 MHz crystal oscillator, pin no. 8 and 19 is grounded, pin no. 2 is used for input voltage, connection diagram is shown in figure 4.



Figurer 4. Circuit Design with Port

2.5 Verification and Results: - Functionality of created software for design and development of computer interfacing for Mechanoluminescence is based on

micro controller PIC16F873A. In testing configuration the A/D converter is connected via parallel interface with standard personal computer. In order to view measured Mechanoluminescence data simple visualization program in visual basic was created. Main window of the program is depicted in figure 5.

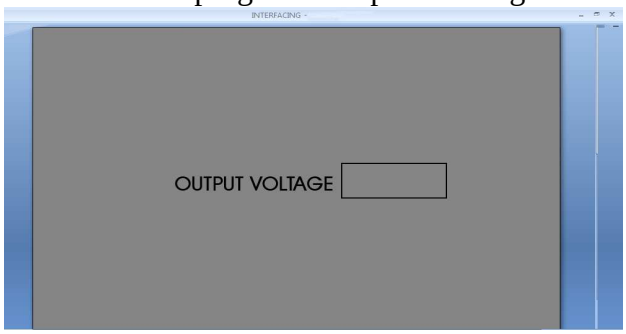


Figure 5. Interfacing Window

2.6 Conclusion

The ML intensity at different impact velocity was measured by dropping a load of particular mass and shape from different heights. The obtained results is converted by sensor and interface with A/D converter parallel port with standard personal computer and intensity of ML is converted in output voltage and display on the monitor. The obtained output voltage is proportional to ML intensity.

2.7 References:-

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