ISSN: 2277-9655
Impact Factor: 3.785

IJESRT

INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY

ELECTRONIC DICE USING DOT MATRIX DISPLAY

Disha Kapoor*, Rohit Pandey, Rishav Vaid, M.V. Patil
* Electronics, Bharati Vidyapeeth University College Of Engineering, Pune, India

DOI: 10.5281/zenodo.51429

ABSTRACT

This paper includes a micro controller based digital dice game using an electronic digital dice with the help of dot matrix display. The game designed is a two player one in which each of the player gets his turn to play with the dice and the player who reaches the target score fastest is declared to be the winner. Both the players have one push button each which when pressed freezes the count on the digital dice and highlights it on the display. The score of both the players and the status of who leads till that turn Is displayed on the dot matrix display. We show how dot matrix may be more or less dependable, and suggest some improvements to standard designs. The paper includes many recommendations for developers and purchasers.

KEYWORDS: Dot matrix display, Light emitting diodes, serial interface, electronic dice.

INTRODUCTION

A dot matrix is a 2-dimensional patterned array, used to represent characters, symbols and image. Every type of modern technology uses dot matrices for display of information, including cell phones, televisions, and printers. They are used in textiles with sewing, knitting and weaving.

A seven segment display is a form of electronic display device for displaying decimal numerals that is an alternative to the complex dot matrix displays.

The roll of a dice has decided the fate of kingdoms. The dice is the oldest device known to human beings for generating random numbers from 1 to 6.In this paper, we present an electronic device using an 8x8 dot-matrix LED display to simulate the faces of a real dice. Pressing a switch generates a random number on the display. A microcontroller is used to check the status of the switch and generate a random number. The dice number is displayed on the dot-matrix LED display with the help of an LED display driver.

Rest of the paper is organized as follows:
Section II includes literature review of the previous studies related to the proposed topic. The system description is described in Section III which gives the idea about the project's basic components. Section IV shows circuit and methodology which consists of the circuit and it's working. The experimental results are explained in Section V along with the practical observations of the project. The last Section VI concludes the overall paper.

LITERATURE REVIEW

Jeena Joy proposed et al [1] in his paper that even certain aspects of the system can be modified as operational experience is gained with it. As the users play with the system, they develop various new ideas for the development and enhancement of the project. Number of players could be increased by making small changes in the programming and incorporating few additional hardware units.

Harold Thimbleby et al [2] did other study that examined seven segment displays in depth, and provided a number of recommendations, numbered for easy reference. Condensing and rephrasing, the most important points were:

- Seven segment displays are not suitable for dependable number display.

- Seven segment displays should never be used on handheld devices.
- Decimal points require particular attention.

If seven segment displays must be used, the font should be optimised for the application.
Grantham K. H. Pang described et al [3] that the LED dot matrix display belongs to a new generation of dot matrix displays, as the visual light emitted from the display contains audio messages. It has long been realized that visible light has the potential to be modulated and used as a communication channel with high entropy. This application makes use of free space as a communication medium, and the receiver is required to be in LOS with the transmitter. This is because the LEDs, being on all times, are also indicators of the locations of the transmitter. This development can lead to many new applications in the industry. With diverse commercial and industrial applications, the experimental results in this paper have demonstrated that the proposed idea is totally feasible. Ervin John U. Benigra et al [4] did another research which made use of 5 x 7 dot matrix display controlled by a programmable integrated circuit (PIC), which is a microcontroller (MCU) device, used to display repetitively information. It is advantageous over the electronic device since it is not as costly as liquid crystal display at the same time it has auto-power configuration. Compared to traditional sign boards, this electronic information display catches the attention of the passer-by since it incorporates technology with displaying information. This distinctiveness of this electronic information display could result to effectual information dissemination to the public. Wojciech Kunikowsk et al [5] implemented that ATmega family microcontrollers proved to found many practical applications, both in scientific research and industrial use.

SYSTEM DESCRIPTION

Electronic Dice

A digital dice is an electronic dice in which we can generate any numbers from 0 to 9 using dot matrix displays. The difference between normal dice and digital dice is that we can only get dice range from 1 to 6 in normal dice. In this paper, we are presenting a circuit to design a digital dice game using an electronic digital dice with the help of a dot matrix display controlled by an ATmega microcontroller. The game designed is a two player, one in which each of the player gets his turn to play with the dice and the player who reaches the target score fastest is declared to be the winner.

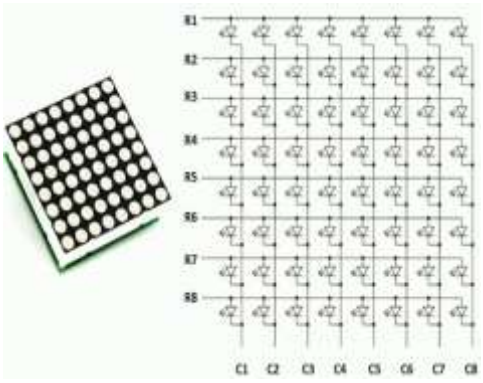
Both the players have one push button each which when pressed freezes the count on the digital dice and highlight it on the display.

Dot Matrix Display

The dot matrix LED displays can be made with individual LEDs, or a pluggable unit can be bought. By making use of the premade pluggable unit, production costs can be lowered. Further, this type of display can show graphics and normal text. This enables the display to be used for more than just sporting events. It can be used as a billboard and information board in shopping malls. These units can be stacked or cascaded in such a manner that a larger display can be constructed. This is usually done in multiples of eight, making use of an eight bit microcontroller, as this enables easier driving. A 40-pixel by 56-pixel size is thus the smallest size of a LED panel that can be constructed when making use of a 5-pixel by 7-pixel LED dot matrix unit as shown in **figure. 1**. Each of these LED dot matrix display units can display a character or symbol, hence a total of 40 characters could be displayed at any given time. These characters will, however, be too small to be seen at long distances away from a LED dot matrix billboard. Hence pixel binning will have to be used. This is the process in which adjacent LEDs are grouped together to make larger pixels. By doing this the resolution of the LED dot matrix billboard will be lowered, but the size of each character will be larger and appear brighter.

ISSN: 2277-9655
Impact Factor: 3.785

Figure 1:



Dot Matrix Display

The LED dot matrix display should :-

- be reconfigurable for indoor and outdoor applications
- be expandable by making use of extra LED dot matrix display panels
- be able to alter brightness automatically
- be visible in bad weather conditions
- have the highest possible refresh rate without compromising brightness
- use modular design and
- be able to do pixel binning for lower resolution applications

Brightness

With all LEDs glowing, the brightness of the transmitter is dramatically enhanced. This makes the audio transmission more effective and immune to noise as the attenuation in the medium becomes negligibly small for line-of-sight (LOS) reception. In addition, the receiver's distance from the transmitter can be increased.

LED Displays

Data Display designs and manufactures a large selection of both indoor and outdoor moving message displays, using LED (Light Emitting Diode) technology, which is known for its reliability, legibility and ease of maintenance. The LED displays as shown in Figure 2 are designed for outstanding visual impact, combining light, multiple colours and motion to attract attention, improve communications and promote the business and/or services. Data lines are easy to set up, program and handle and are becoming increasingly popular in airports, high street outlets, cinemas theatres, staff rooms, and auctions to transmit information to large groups of people both quickly and efficiently. The signs have various display features such as bold/script fonts, auto centering of text as well as many page transitions, which can be creatively and imaginatively used to display eye-catching text effects. The signs are easily operated, with a range of control methods including via PC or an infra-red remote keypad. The data lines are available in a variety of different formats and colors to make the electronic display more effective and eye-catching.

Figure 2:

LED Display

This paper describes LED's which are much smaller that would drop the total thickness of the project by 5 mm, and they look much cool, which will attract people to play the game. This kind of project is a complete new creation, rest electronic dices were made using dot matrix display. This is a kind of dice game, which is a new invention.

A digital dice is an electronic dice in which we can generate any numbers from 0 to 9 using dot matrix displays.

ISSN: 2277-9655
Impact Factor: 3.785

Both the players have one push button each which when pressed freezes the count on the digital dice and highlight it on the display. Each player has to submit the score by pressing the "submit score" button. The score of both the players and the status of who leads till that turn is displayed on the dot matrix. Initially a message "game start push button" appears on the dot matrix display. Player 1 begins the game by pressing his button. A score appears and it gets recorded and displayed on the dot matrix display when he/she submits it. Then a message appears on the dot Matrix display which says "player 2" choice. Player 2 repeats the same process as first player. The status of who leads is displayed on the LED after every player's turn. Now when player1 gets his next turn his present score gets added to his previous score and total score is displayed on the dot matrix display. This process continues till either of the players crosses the preset target score in the programming.

CIRCUIT AND METHODOLOGY

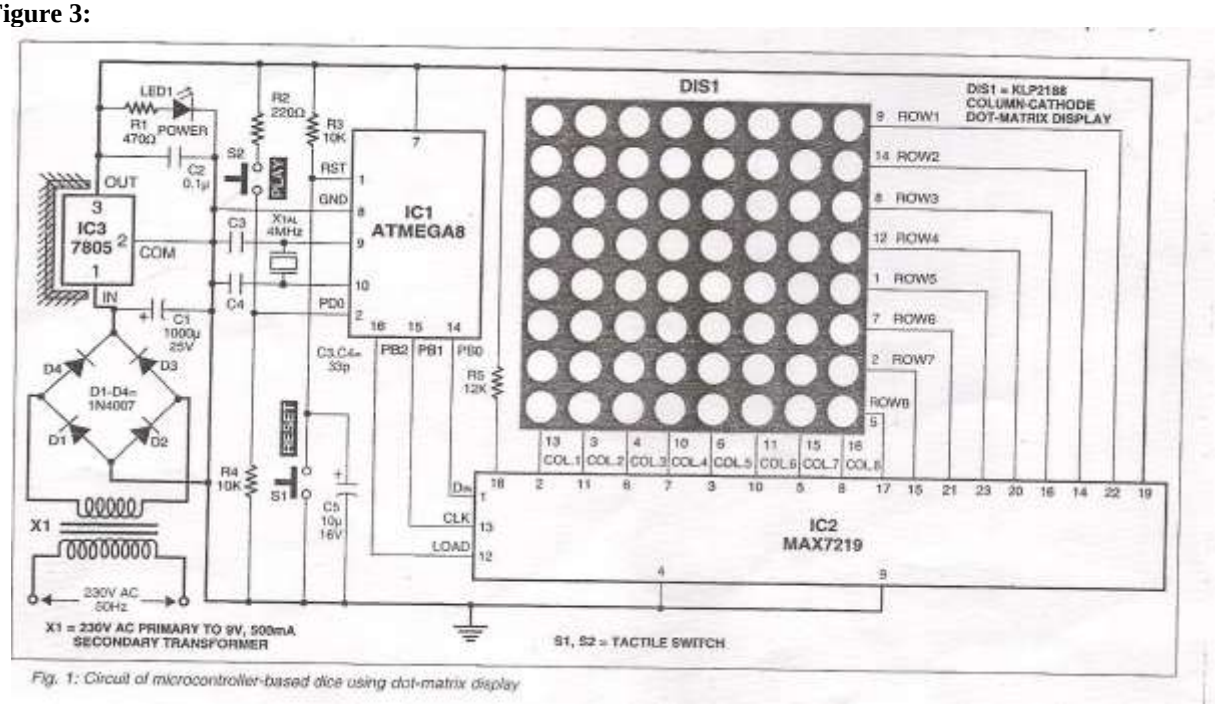
The circuit of the microcontroller-based dice using dot-matrix display is shown in Figure 3. It comprises an AVR micro-controller ATmega8 (Id), column- cathode display driver MAX7219 (1C2), regulator 7805 (1C3), dot-matrix LED display and a few discrete components. ATmega8 is a low-power, 8-bit microcontroller based on the AVR RISC. It has 8kB in-system programmable Flash memory with read-while-write I capabilities, 512 bytes of EEPROM, 1kB serial random-access memory (RAM), 23 general-purpose input/output (I/O) lines, 32 general-purpose working registers, three flexible timers/counters with compare modes, internal and external interrupts, and a byte-oriented two-wire serial interface. Port B of the microcontroller is configured as output and used for serial communication with MAX7219 driver, which is a programmable device that controls the information display on dot-matrix LED display DISI. Port pins PBO, PB1 and PB2 of micro controller ATmega8 are interfaced to pin 1 (DIN), pin 13 (CLK) and pin 12 (LOAD) of display driver MAX7219, respectively. Random number is displayed by means of lighted LEDs. The data and control information is transferred to MAX7219 in 16 clock cycles. Port pin PDO of ATmega8 is configured as input and used for checking the status of the play switch (S2). As soon as pressing of the switch is sensed, the microcontroller generates a number to show on dot-matrix display DIS1. Key de-bounce is implemented with the help of the software. Display driver MAX7219 interfaces the microcontroller to the LED display. It can control 64 individual LEDs and consists of an on-chip binary-coded decimal decoder, multiplex scan circuitry, segment and digit driver, and static RAM that stores each digit-display information for display purpose. Register R5 limits the current through segment LEDs.

Each and every function of MAX7219 is addressable and programmable by memory locations. The data is transferred to MAX7219 in serial format as shown in figure. Serial data at D is converted into 16-bit format and shifted into the internal 16-bit shift register with each rising edge of CLK. LOAD pin is held low during this process and must go high concurrently after sixteenth rising clock edge. Address locations OxX1 through OxX8 are used to show the data on dot-matrix LED display DIS1. Data to be displayed is controlled by the decode-mode register, which is available at address OxX9. Display brightness can also be cont rolled with resistor R5. The peak current sourced from the segment drivers is normally about a hundred times the current entering at pin 18 (ISET) of MAX7219. Display brightness can also be controlled digitally by intensity register (address location oxXA).MAX7219 also offers the facility to shut down the display. Normal operations can be resumed with the help of shutdown-mode register. This mode of operation is useful for power conservation.

To derive the power supply for the circuit, the 230V, 50Hz AC mains is stepped down by transformer Xl to deliver a secondary output of 9V, 500mA. The transformer's output is rectified by a full-wave rectifier comprising diodes Dl through D4, filtered by capacitor C1 and regulated by IC 7805. Capacitor C2 bypasses the ripples present in the regulated supply. LED1 acts as the power indicator and R1 limits the current through LED1.
The program is written in 'C' language and compiled using WinAVR.

ISSN: 2277-9655
Impact Factor: 3.785

Figure 3:

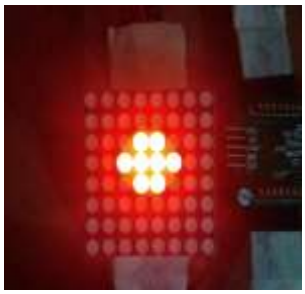


Circuit Of Microcontroller based dice using dot matrix display

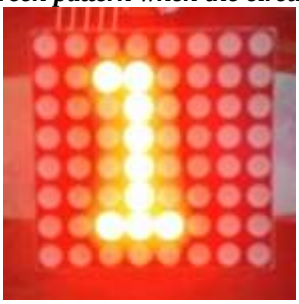
EXPERIMENTAL RESULTS

The experimental results are shown in various images below which depicts the various patterns of the dot matrix display. The project's different stages of operation are as follows:

Figure 4:



First switched screen pattern when the circuit is switched on

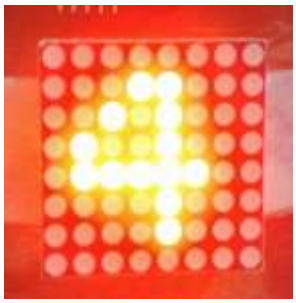


Dice roll number 1

ISSN: 2277-9655
Impact Factor: 3.785

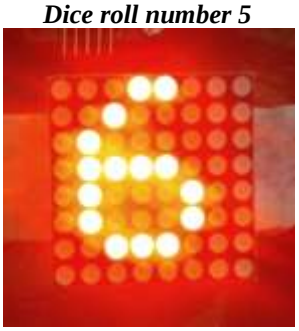
Dice roll number 2

Dice roll number 3



Dice roll number 4

Dice roll number 5



Dice roll number 6

Project In Various Stages Of Operation

CONCLUSION

1. Once the hardware is powered, it immediately enters the animated screen where two patterns are displayed one after the other in quick Succession.
2. At this point of time, the user can press the key. The display pattern freezes on the display and remains in this condition until a key is pressed.
3. As soon as the key is released, the dice-rolled number is displayed on the screen for a set time (as programmed in the source code).
4. After a preset time period, the program resumes to point-I operation described above.
5. If the pushbutton is pressed again while the dice-roll number is being displayed and released, then also a new dice-rolled number is displayed on the screen. This kind of operation also brings in an element of randomness. This research has overcome all the possible limitations of the seven segment display by the dot matrix display which is colourful and highly impressive.

REFERENCES

[1] Jeena Joy, Athira Poovathody, Athul R S, Athul Subran, Basil Paul, "Implementation of Digital Dice Game", Professor, Dept. of EEE, Mar Athanasius College of Engineering, Kothamangalam1 UG Student, Dept. of EEE, Mar Athanasius College of Engineering, Kothamangalam, India2,3,4,5, Vol. 3, Issue 2, February 2014.

[2] Harold Thimbleby FIT Lab — Interaction Laboratory, Swansea University, "Don't use seven segment displays" Swansea, Wales. p- 1-6

[3] Pang, GKH; Chan, CH; Kwan, TTO, "Tricolor light-emitting diode dot matrix display system with audio output", IEEE TRANSACTIONS ON INDUSTRY APPLICATIONS, VOL. 37, NO. 2, MARCH/APRIL 2001 , p.534-540.

[4] Ervin John U. Benigra, Bryan Leonard D. Montaño and Engr. Maridee B. Adiong," RUNNING MESSAGE BOARD USING DOT-MATRIX DISPLAY**"** Capitol University **,**College of Engineering, Cagayan de Oro City.

[5] Wojciech Kunikowski, Ernest Czerwiński, Paweł Olejnik, Jan Awrejcewicz, An Overview of ATmega AVR Microcontrollers used in Scientific Research and Industrial Applications, Department of Automation, Biomechanics and Mechatronics, Lodz University of Technology, 90–924 Łódź, 1/15 Stefanowski str. R. 19, Nr 1/2015, 15–20, DOI: 10.14313/PAR_215/15

[6] Obiechine F. Okechukwu and Don Okpala V. Uche.**"**Design and construction of a dot matrix information display for the office of the vice chancellor", Anambra State University, Uli, Pelagia Research Library Advances in Applied Science Research, 2013, 4(1):515-522