Control method of LED matrix bulletin board that can be connected to Bluetooth mobile phone

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ABSTRACT

Traditional bulletin boards use paper as a way of presentation, and with the promotion of sustainability, it is clear that paper that can only be used once is very wasteful. The use of LEDs to replace traditional bulletin boards is not only more efficient and functional but also beneficial to the environment. This paper focuses on an operating system for LED bulletin boards that interacts with an Android application via Bluetooth, where the user can send the content to be displayed to a matrix that then displays and moves the message. The central processing unit used in the system is an Atmega328 microcontroller dedicated to the Arduino UNO board, shifts for measuring, walking, and scrolling the screen to move the text from right to left, and a Bluetooth module for enabling wireless network functionality and receiving features. It is hoped that the system will benefit LED bulletin boards.

KEYWORDS
LED Bulletin Board;
Wireless Control;
Bluetooth Connectivity;
Arduino

1. Introduction

We live in a world where technology is advancing as the days go by. Technology has had good maneuvers in various fields, including sending data remotely [1]. However, we think that this technology can replace people. In the last decade and a half, the speed of technology has increased a lot [2]. This development of network technology has densely encouraged its development and growth, and the only reason for the decrease in the use of landlines is that people need to connect to the network anyway, so they prefer to use mobile phones [3]. However, today, using bulletin boards from primary schools to major messaging organizations is a problem [4]. Organizations later waste the paper that is currently in use. These make forests more vulnerable and increase global warming [5]. Taking small steps to bring technology to the desired global state may become an environmental crisis if specific points are not followed [6]. The development of mobile networks in the 1970s caused a shortage of frequencies in networks [7]. This led to the emergence of advanced mobile system technology [8]. This means transfer only by analogy [9]. Three generations of mobile networks in the following order AMPS, GSM ERMES and FPLMTS UMTS IMT-2000 [10]

2. Method

Bulletin boards may be used in many public places. All of them are managed manually. In advertising, it goes through a long process [11]. L.E.D: Monitors used in railways for train entry information [12]. Disadvantages: Expensive - to work for a long time, it must be heated [13]. L.C.D: These are bulletin boards that are used in buses and shopping malls, although the notices are already fed into memory [14]. Therefore, its warnings cannot be changed, or it is time consuming [15].

An opensource processor called Arduino that runs on a microcontroller screen and has a development environment designed for smart screens. The Advantages are

- Ability to accept multiple inputs (switches, sensors, etc.)
- Ability to run on Windows, Macintosh, and Linux operating systems.
- Ease of learning programming for beginners. Amateurs
- A tool for building better versions of computers.
- Ability to feel, control and interact with more than one desktop computer.
- Ability to leave activities individually.
- Accompanied by running programs.
- Assemble the page by hand or purchase the assembled version.
- Its programming language is a platform for comparing physical calculations.

The above is why the open-source physical processing process focuses on a simple microcontroller. It can create an interactive environment, control lights, and input from switches and sensors.

There are many microcontrollers available today for performing physical calculations. Comparative devices and many other elements of the cluttered part take the programming part of the microcontroller and organize it into regular software.

The Arduino is relatively cheap compared to other comparators and has many advantages. So, you can efficiently work even with the version under $ 50. The benefits can be summarized as follows [11,12]:

- There were no restrictions
- Simple, clear, open source and extensible programming
- Ability to develop in hardware and open source.

2.1. Bluetooth Technology

Bluetooth is a technology that, in a short time, could cover a large part of short circuits with short extensions [16]–[18]. He used wires between electronic devices such as digital assistants, cell phones, PCs, and laptops [19]–[21]. Bluetooth technology is available in homes, schools, offices, hospitals, and cars [22], [23]. Bluetooth also enables users to connect to multiple devices in a short amount of time [24], [25]. The method used in data transmission and related to the security of this technology is the guarantee against external interference and the convenience of sending data [24], [26], [27]. The primary and positive features resistance, low cost, energy saving, ease of use, and its low complexity [28].

Fig. 1. Bluetooth technology and its facilities include

Usable devices must have microchips available at 2.4 GHz and can receive and transmit data across multiple bandwidth locations [29]–[31]. In addition, three audio channels can exchange data at a speed of one megabit per second (two megabits in the second generation) [32]–[34]. Hop frequency: It is a frequency that allows gadgets to connect to areas that interfere with electromagnetic waves [35][36]. Bluetooth remote exchanges allow most devices, including cars, cell phones, and computers, to exchange remotely [14], [37], [38]. Figure 1 shows the Bluetooth technology and its facilities, including Sound, text, music, photos, and more [39]–[42].

2.2. Bluetooth Module

The Arduino-Ono board alone does not support Bluetooth [43]–[45]. This makes it impossible to connect to Android devices wirelessly, which requires the use of an interface [46]–[48]. This study focused on the HC-O6 Bluetooth module, figure 2 shows the diagram of HC-O6 [49]. The causes of

use HC-O6 are user friendly, requires basic knowledge, it can be programmed according to the Art commands, and available in a fixed or master mode only [50], [51].

Fig. 2. Schematic diagram of HC-O6

2.3. 8×8 LED Matrix

8x8 Led Matrix work save electricity, long life, low cost, high brightness, wide viewing angle, long range of view,waterproof, and developmental perspective. Developmental perspective: Since it could meet the needs of different applications. It can be said that it also has a development perspective. This module consists of pixels and each pixel has an L.E.D that connects to pin 16.

2.3.1. Common cathode and common anode

There are two types of matrices that do not look different from each other, but there are labels on them to separate them, figure 3 shows the 8x8 Led Matrix.

Tag AX: Common Cathodic Point Matrix

Tag RX: Matrix is a common one.

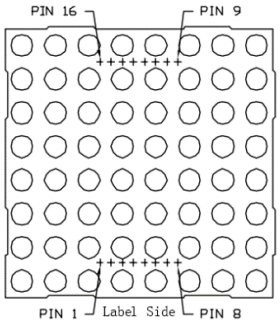
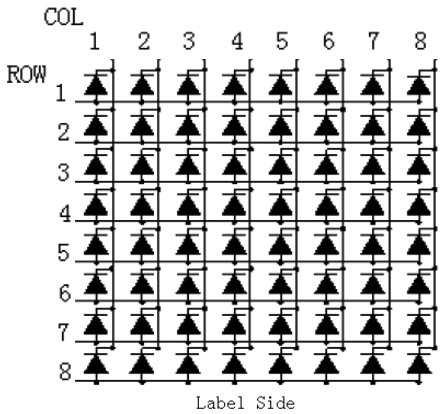
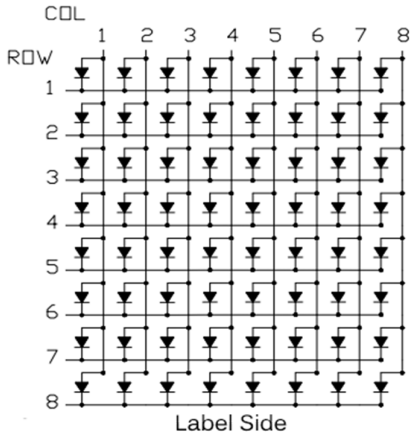


Fig. 3. The 8x8 Led Matrix

Below is the internal structure. You can see that in the common anode dot matrix, ROW is the anode of LED and COL is the cathode, while the situation in the common cathode one is opposite. Though for both types, the columns are the pin 13, 3, 4, 10, 6, 11, 15, and 16 and rows are the pin 9, 14, 8, 12, 1, 7, 2, and 5 in the dot matrix. If you want to turn on all the LEDs at the first. To light up the first LED on the upper left corner, you need to set pin 9 as high level and pin 13 as low level in the common anode dot matrix; for a common cathode one, set pin 13 as high and pin 9 as low. In a common cathode dot matrix, set pin 13 as low level and ROW 9, 14, 8, 12, 1, 7, 2, and 5 as high level. In a common anode one, set pin 13 as high level and those rows as low level. See the figure below for better understanding [52].



(a)



(b)

Fig. 4. Internal structure of 8x8 Led matrix

Based on Figure 4, Table 1 shows the pin connection matrix.

Table 1. Units for Magnetid Properties

Matrix pin no.	Row	Column	Arduino pin number
1	5	–	13
2	7	–	12
3	-	2	11
4	-	3	10
5	8	–	16 (analog pin 2)
6	-	5	17 (analog pin 3)
7	6	–	18 (analog pin 4)
8	3	–	19 (analog pin 5)
9	1	–	2
10	-	4	3
11	-	6	4
12	4	–	5
13	-	1	6
14	2	–	7
15	-	7	8
16	-	8	9

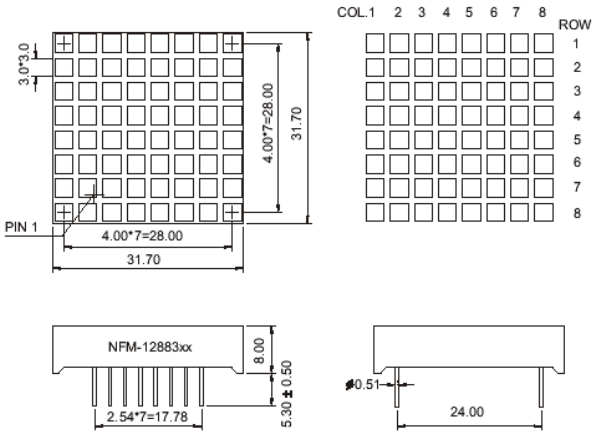


Fig. 5. The main connection of 8x8 Led Matrix

2.3.2. Jump wire

Jump wire or jump wire: There is a group of electrical wires inside the cable, each end of which has a connection to the pin. The connections are usually soldered, figure 6 shows the jump wires. The jump wires are connected and installed separately by connecting the cable to the test version [22,24].

Fig. 6. The Jump

Champer wires are highly versatile and have different connections, but some have the same connections [53]. Common connections include solid points: the arrangement of the jump wire elements increases the installation density of the two pieces and the short circuit level. Jump wires usually come in different colors and sizes due to their different performance [54].

- Crocodile clip: Other elements that are used:
- Temporary bridge of sensors
- Buttons
- Basic elements
- Equipment that has the desired connection:
- The wire
- Screw bases
- Banana connections: Commonly used in laboratory equipment and low frequency signals.
- Registered jack:
- Uses: Telephone and computer networks
- Interfaces RCA:
- Uses: Audio, low resolution composite signals, low frequency applications that do not require a shielded cable.
- Connections RF:
- Uses: Transmitting radio frequency signals, laboratory equipment, antennas.
- Blues Cables: A flexible cable used to connect antennas and other network components.

2.4. Android

An opensource operating system that focuses on the Linux kernel. Java is for touch screens [55][56]. Google Play is an essential Android store [57]. By 2012, it had introduced approximately 7,000 applications. Android has a multi-layered structure that transfers data to different layers and then to the destination to exchange data [58], [59].

3. Results And Discussion

The idea of this work is to create a connection between the mobile phone and the display matrix by Bluetooth. This type of communication creates an effective and accurate system.

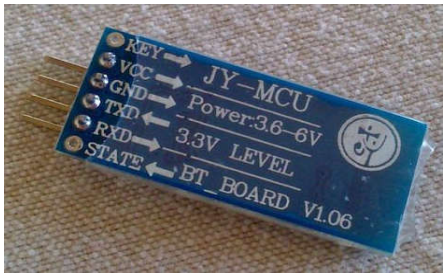
The Bluetooth module looks like this:

- Receive messages from an authorized Android application.
- Extract message from modem by microcontroller
- Display information

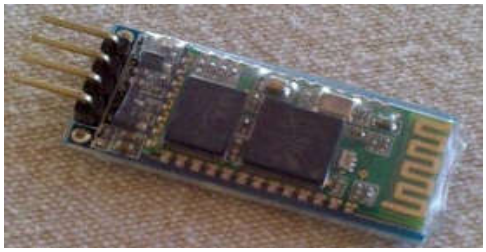
The SI unit for magnetic field strength H is A/m. However, if you wish to use units of T, either refer to magnetic flux density B or magnetic field strength symbolized as $\mu_0 H$. Use the center dot to separate compound units, e.g., "$A \cdot m^2$"

3.1. Project Component

Arduino Card: In some cases, it can use Uno and use a level converter.



(a)



(b)

Fig. 7. The Arduino

Bluetooth serial module: Web searchable with quick access. Matrix module: Search and mark it on the web, then use them as a complaint plan or ready-to-solder kit.

3.2. Work Step

- The Arduino starts with a sample message in the matrix.
- The message is saved if nothing happens.
- The message rotates until the serial port is connected to the Bluetooth module.
- If data is available in the port, the new message replaces the previous message.

The Bluetooth module is a client. This module checks security and connections due to having two signals RX and TX and acts as a computer port. The connection is controlled by a Bluetooth client base.

If the chip is on the left, the Verdi pins are on the left.

VCC: 5V base, use of bread board.
GNC: Use of breadboards
DIN: pin 12
CS: Pin 10
CLK: Pin 11

3.2.1. Wiring the Bluetooth Module

Bluetooth module wire:
VCC: 5V pin
GNC: Ground pin
TX: Arduino pin 8
TX: Arduino pin 9
Warning: Only logic modules are controlled on TX and RX pins.
The module light flashes when turned on but stays on after connection.

3.2.2. The Project codes

The design is done by the library. The information is loaded and decompressed in the library folder and in the main Arduino folder.

- Connect the Arduino to the computer
- Ensure the correct page is selected.
- Change the number of matrices, at least 8 modules.
- Line 48 related to speed change
- Compile and load applications
  It is normal for the module to blink when loading.

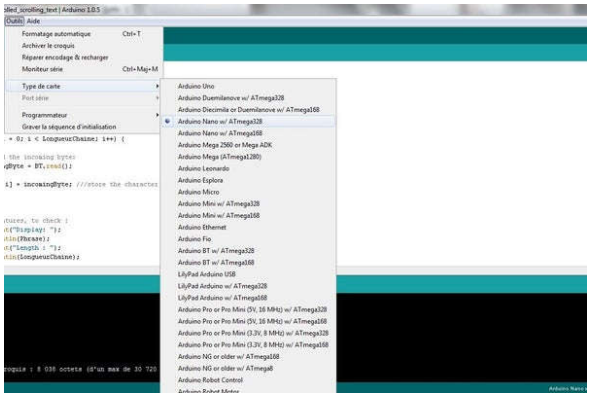


Fig. 8. The Computer Terminal

3.3. Mobile Phone Application

Fig. 9. Mobile Phone Application

Operating process :

- Turn on Bluetooth
- Find Bluetooth release solution by phone
- Select the connection type and enter the input.
- Launch the Bluetooth app
- Real time selection
- Confirm correct connection by phone.
- Bluetooth module light on (important and mandatory)
- Phone check
- Select send after writing the message.
- Display message on LED

4. Conclusion

Today, monitors are used in many public places, such as shopping malls and public transportation stations. In recent years, the use of cell phones has been increasing, and we are often faced with the problem of communication control. Therefore, this paper presents a Bluetooth and matrix wireless bulletin board with an Android application with specific advancement. The matrix can display information in public places and can also be combined with many colors to form a large screen

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Author Contribution

The activity plan is control method of LED matrix bulletin board that can be connected to Bluetooth mobile phone.

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Conflict of Interest

The authors declare no conflict of interest.

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