

## Raspberry Pi Controlled Electronic Signboard

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### ABSTRACT

In this study, an embedded system has been developed to provide remote control of dot matrix signboards widely used nowadays. With this developed system, it is possible to control and use one or more signboards anywhere. The developed electronic signboard can be in the desired dimensions by connecting the unit modules in many different forms. Thanks to the electronic circuit realized for the dot matrix display. The electronic circuit of the unit modules can be controlled with Raspberry pi and Tinker mini computers. In addition, three different application software (desktop, mobile and web) have been developed to control the electronic signboard by both desktop computer and mobile devices with Android or IOS operating systems. The system is executed by realizing the prototype.

**KEYWORDS** - electronic signage, dot matrix, Internet of Things, Remote Control, Web Application embedded system.

Date Of Submission: 27-12-2018

Date Of Acceptance: 11-01-2019

### I. INTRODUCTION

Signposts for various purposes throughout history used [1]. Nowadays in almost every field many different types of LED signage are used. It [2] [3]. In this study, using dot matrix indicators, electronic create a signage and visualize it over the internet computer control. It is aimed. First computer circuit system partition and it has been designed and simulated as a whole. These tests will result in success the first example of the entire system (prototype) application is done.

In many institutions and organizations, LED signs are used and even around us when walking on the street. A lot of LED signage is seen. This is dynamic Significant supervision is required on the signs. It to be remote from the auditing institutions and organizations time and work saving power. In addition to this easy and autonomous information is among the current needs. From this it can be seen that the remote LED to change the current of the content the need for signage is on the agenda.

Targeted in this study, our study in [3] to develop mobile devices with Android operating systems and can be controlled from desktop platforms It is the realization of LED sign.

### II. GENERAL STRUCTURE OF THE SYSTEM

Combining multiple dot matrix and as a whole to be used as a signboard electronic regulation is needed. This electronic control the layout and signals needed to point matrices a motherboard is

needed. Internet of this motherboard smart software to process and process data and internet connection. The computer on which the remote control is to be internet connection in mobile device is required. The computer then remote content via the visual interface in the device. The audit is carried out over the internet.

In this study, Raspberry to manage LED signs Pi and Asus Tinker cards are used. Raspberry Pi and Asus. The Tinker card is always on the server at the end of each scenario make a request. The response returned as a result of this request announcements and scenarios of the sign. All announcements and scenarios stored in the database on the server it kept.

All applications (mobile, web, desktop) all actions to the database on the server It is recorded. This means that the applications and all data from the server Attract. In this way, the IP addresses of signs. Without the need to know, all signs of the server IP As long as you know the address, this communication continues. Fig.1 shows the general structure of the system in Table 1 the elements of this structure are given. Followings equipment used in the system is shown.

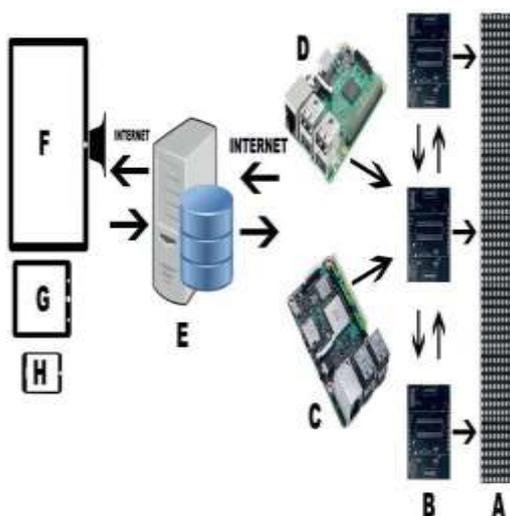


Figure.1. General Structure of the system

Table1. Material list used in the system

A	Dot Matrix Indicators
B	Unit module board
C	Asus Tinker Kart
D	Raspberry Pi 3
E	Server
F	Desktop Computer
G	Tablet
H	Telephone

On Raspberry Pi 3 card by Broadcom produced BCM2837 SoC (system-on-chip), 1.2 GHz 64-bit. There are 4 core ARM Cortex-A53 processors. It about 10 from the first model of Raspberry Pi It is possible to perform more operations. Fig.2 .An overview of the Raspberry Pi 3 card is also available.

The design of the card is almost complete with B + and Pi 2 models. it is exactly the same. GPIO pins, CSI (camera) and DSI (display) connectors, 4 USB2.0 ports, 100 M bit Ethernet port, HDMI and composite image outputs(Over 3.5mm TRRS jack) and for power connection USB micro-B connector used from B + / Pi 2 is located. On different cards Ceramic in the area of PWR and ACT LEDs Wi-Fi / Bluetooth antenna is available. These LEDs are DSI connector on the other side of the connector. Card slot Micro SD card slot. [4].



Figure.2. Overview of the Raspberry Pi 3 card

## 2.1 Asus Tinker Card

Asus Tinker card on the Raspberry Pi 3 card alternatively, an alternate cartridge. Tinker card, Unilateral, it is bilingual card. Tinker card, IoT enthusiasts, hobby enthusiasts, PC to DIY lovers and others reliable and highly skilled to convert platform offers. Figure 3 shows the Asus Tinker card. General view is available.



Figure.3. Asus Tinker card overview

Powerful and modern quad-core ARM-based Tinker card using Rock chip RK3288 significantly higher than other popular SBC cards offers improved performance. Different structures and projects recognizing their ever increasing demands, the Tinker card LPDDR3 offers dual-channel memory. Tinker card also for operating system, applications and file storage faster than expandable micro SD cards used with an SDIO 3.0 interface offering read and write speeds.

Powerful yet efficient in terms of power consumption Tinker card with new generation graphics and It supports GPU calculation APIs. ARM based Financial T764 GPU powered Tinker card, graphics chip and stationary processors, high-quality media playback, game, computer vision, motion recognition, image including fixing and handling and computer photography It has a wide range of usage areas. The Tinker card for multimedia enthusiasts is also available in HD and UHD video, H.264 and H.265 playback support with fixed function presents [5].

## 2.2 Point Matrix Indicator

LED display in the system the matrix is built using indicators. LED matrices, LEDs in one order with one color or 4x4, 8x8 LED generated units using RGB LED are indicators. These indicators can be larger-sized signage display can be achieved. LED matrices in floating applications or LEDs by means of integrals or microcontrollers the creation of various forms and expressions. The connection of the dot matrix in Fig.4 has a visual structure.

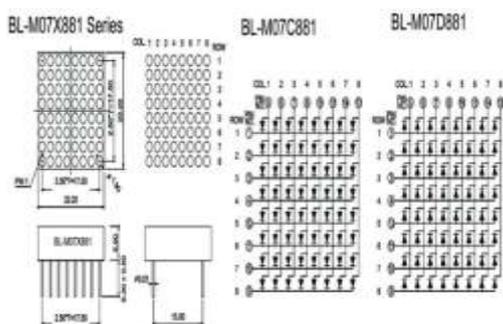


Figure.4. Dot matrix LED display connection structure [6]

LED matrices are common anodes or common cathodes can. A common anode dot matrix is a GND (Logic 0) for its associated ends voltage value must be given. Fig.5 boyutde8x8 there are images of the leg structure of the point matrix. Indents and distances on the indicator to provide mechanical coupling with matrices. It get larger-sized signage display with the assemblies It may be. But these indentations are in the leg structure can be used to find a sequence [7].

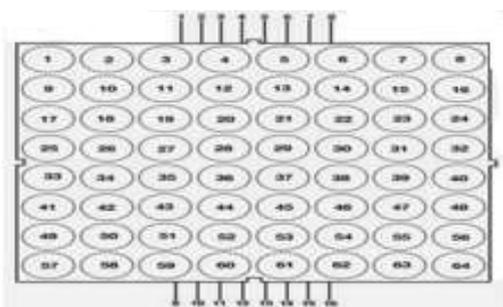


Figure.5. Example of an LED dot matrix leg structure

### 2.3 Max7219 Integration

Dot matrix used with Max7219 integration supervision / version of the indicators. DIG and The point matrix connection with the SEG legs is performed. Then the necessary data and time signal legs microcontroller. Power connection of the integration after you have done this, the dot matrix is in the desired format. It can be operated [8]. Pin of the Max7219 connector in Figure 6 output is seen

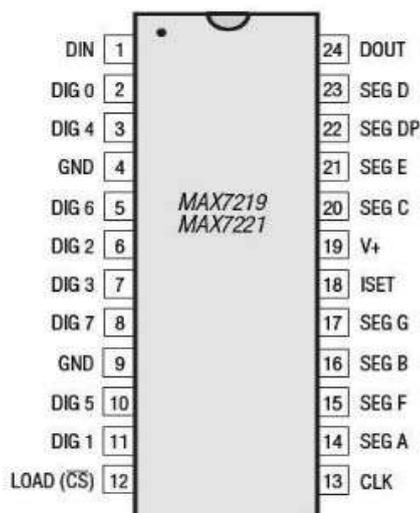


Figure.6. Max7219 integration pin outputs

### III. SYSTEM REALIZATION WEARS

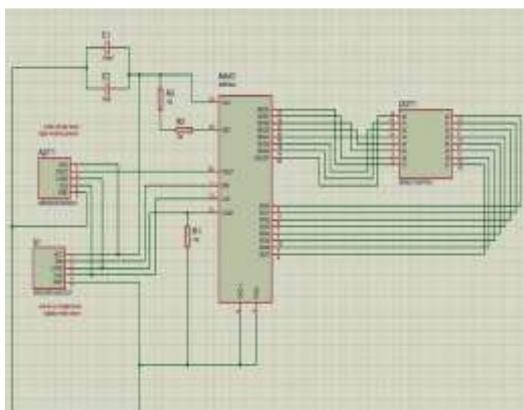
The construction of the embedded system in this work amalgamate; circuit board design, schematic and printed circuit (PCB) drawing, circuit boards, circuit components on the circuit board, checking the system web site, mobile device application and desktop application can be summarized as the implementation. Each stage is briefly explained below.

#### 2.1 Unit Module Circuit Board Design

In this study, in the system, each dot matrix unit module circuit board to drive indicator. This card is designed and primarily working on a dot matrix test was performed. Run the circuit successfully printed circuit board after monitoring. In this phase, especially if there is a modular structure is considered. For this reason, the communicate different dot matrices with each other quality. Number of consecutive dot matrix added interlocking management via code in the microprocessor; complete the dot matrix circuit boards Raspberry Pi or Tinker card. The control of the text on the LED signs will be ensured.

#### 2.2 Unit Module Circuit Board Drawing

Fig.7 shows the protease schematic drawing of the circuit board. The view is available. Point to use the matrix, MAX7219 integration and communication pins libraries are designed and printed circuits are designed. The reason for this is a more convenient and unique use is based on a breadboard to be able to see exactly the same circuit in the screen.

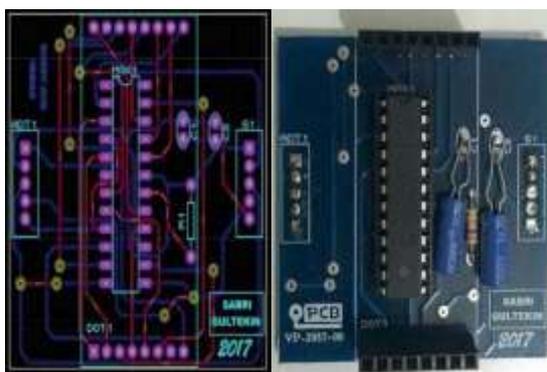


**Figure.7.** The proteus of the circuit diagrammatic drawing

MAX7219 integration of SEG and DIG pins The LEDs will be connected to control the LEDs. ADT1 package is output from the module and is it is connected to the other module. S1 package of the module by input and Raspberry Pi3 for this first module or The Tinker is the second to receive the input signal from the card and for other modules, you can al .p is the part they will handle. In this way with each other modules will be designed. The circuit feed input from VCC and GND pins of package S1 It comes.

### 2.3 Unit Module Circuit Board PCB

On the left side of Fig. 8, you can see the drawing of the printed circuit board. View is given. S1 on the right side of the card package, left-hand ADT1 package and body the first pins of the DOT1 package in the square the other pins are drawn with round pads. This is possible prevention of errors and errors. Scratched the size of the circuit board is 5cmx5cm.



**Figure.8.** Unit module circuit board

Circuit elements after the circuit board is pressed soldered to the circuit board. Fig.8. Right of the soldered circuit elements.

### 2.4 Desktop Control Software

Desktop application in the Net Beans IDE Java programming language. Also with server the web service that provides communication is written with the PHP language. User name and password on the desktop application login page input is entered. Entered user name and password with the web service written to the server query for the user table by establishing a connection. In this way, the entered name and password is correct is determined.

After entering the application, the first page is the page manager panel (see Fig.9). Manager panel for all processes that can be done in the system buttons are available. Exiting from the application click on the cross sign in the upper right corner.

Announcement Add
Table Add
User Add
Scenario Add
Scenario Chapter Add
User List Add
Table List Add
Scenario List Add

**Figure.9.** Admin panel page view.

Clicking each button on the Admin panel Interaction with the user designed for processing. For example, Display of user add and listing pages in 10. Here, the information and authority of the determined. As the manager, one of the member options, each authority performs different operations. User listing message when you click on the user on update and delete process button is available for making. Update clicking on the user update page It is passed.



**Figure.10.** User insertion

### 2.5 Web Site Software

The website is written in the PHP language. In Fig.11 There is a picture of the Add an announcement page. Internet is located on the server and in the database on the server the web site directly from the database accessibility. Announcement included here sign means the summer. Sign the name of the entered content in the

name is used in selection. If the announcement is working mode the entered content is shown as active means that it will not be shown. Announcement if active sign on pass passport while notice board shall not exceed.



Figure.11. Add website announcement page

Image of the add sign page in Fig.12. It is convene. On this page signage name signboard which mini you have a name given to the computer card. it means. MAC address in the section means the MAC address of the card it is connected to. Is the operating mode scrolling mode - scenario mode closed mode.



Figure.12. Adding a website signage page

Image of the nameplate listing page in Fig.13 It is convene. This page has been added to all A list of information belonging to the signs is listed. Each an edit button and a delete button It is convenient. When you click Edit button the user is directed to the update page. Announcements to display on a similar page - it is also prepared to list and edit.

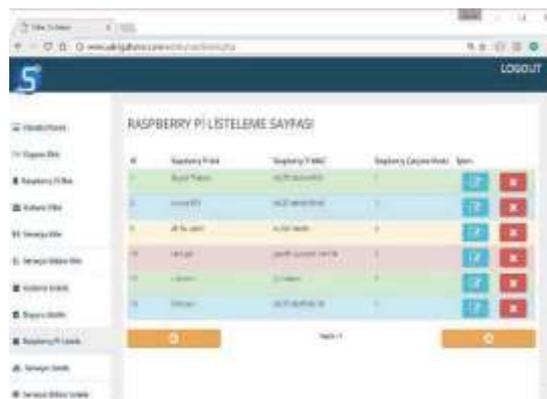


Figure.13. Website signage listing page

## 2.6 Android App Control

With the application created in Android Studio remote control of signs in various places. It also allows you to communicate with the server. web service is written in the PHP language. Desktop application with the web service written in the Android application such as accesses the database and queries.

In this application the user can various opportunities to dominate pages are created.

## IV. RESULT

Remote controllable electronics in this work signage system has been developed. With each other in the system intelligent circuit boards designed and communicated. Desktop for remote control software, website software, and mobile software. With these software users want the system on the platform they want ground control.

Modular in many areas with the system developed in operation easy to create and easy to control signs as required be provided in a way. Other LED of the system modular has a structure. This allows the user to communicating with each other according to peer to peer length and size to obtain a LED signage it is possible. How much is the size of LED signs If there is no change in the software system usage is provided. Fig.15 shows the There is a picture of the working state.

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Ramesh Banoth" Raspberry Pi Controlled Electronic Signboard" International Journal of Engineering Research and Applications (IJERA), vol. 9, no.1, 2019, pp 42-47