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Design & Development of Smart Digital Notice Board based on IoT Platform

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***Abstract*— Smart Digital Notice board is primary requirement in any institution, organization or public sectors like airport, bus station, railway stations, schools, colleges etc. The traditional method of sticking notices day to day on the notice board is a difficult process. In order to provide a better communication which is easy to use and which is based on the advance technology, the proposed system is IoT based smart digital notice board system is presented here. The whole system is designed using the known as NodeMcu which is also easily connected with the cloud. The designed webpage is used to send the message which will be displayed on to the notice board. The message which is send from the webpage is received by the IoT device. The will push this message on to the remote LCD. To send the message onto the remote LCD, the user have must login to the webpage, type the message which is sent to the remote LCD and publish that message through the submit button. At another side NodeMcu will subscribe the message and push it on the remote LCD.**

Index Terms — Smart Notice Board, NodeMCU, IoT, LCD

I. INTRODUCTION

A notice board is a traditional way of communication in any Institute, Organization or public sector which is used to notify the message to the respective person or group of persons. In conventional notice board the messages are to be pinned up and the message has to be physically changed whenever required. It also required so many resources like wooden / standby notice board, paper, ink, pin etc. In addition to this traditional system, it requires human resource whenever it wants to add the notice paper or remove the notice paper from notice board.

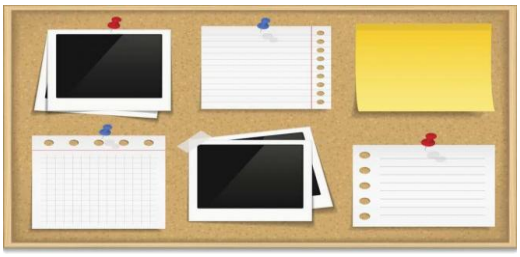

Fig. 1 Traditional Notice Board

To overcome the cones of existing system, the smart digital notice board is required which is operated remotely. The proposed system is IoT based smart digital notice board in which user who want to send the notice message has to login on the official page of the system. After login on to the page, user has to write the notice message and publish that notice message from the cloud. On another side, the i.e. NodeMcu will subscribe that message and send the message to one of its peripheral i.e. 16 * 2 LCD to display that message. For creating the official page along with the login system and publish the notice message from the cloud, here HTTP protocol is used. Message will be subscribed through the NodeMcu using the MQTT protocol and then it will be display on LCD. The whole system is build up on the cloud, so anyone can remotely send or remove or update the noticed message. At the subscribe side, the updated notice message can be received via and it will be displayed on LCD. The moment, at which the notice message is updated at the cloud, simultaneously it will be updated on the display also.

II. EXISTING SYSTEMS

Motivation for designing such a system comes from the following listed existing notice board display system.

A. Manual Notice board system

Manual notice board requires human resources for updating the notice. It is time consuming process and wastes the resources like paper, ink etc.

B. GSM Based Wireless Notice Board

GSM based Wireless notice board system is SMS based which display message on the notice board via user's mobile phone. This system is better than manual notice board but it requires GSM module interface with microcontroller and SIM card which does not considering as Cost effective system [1].

C. RF Based Wireless Notice Board

RF based wireless notice board system is better as compared to the manual Notice board and GSM based system but it has a limited range of communication as RF module is used to transmit and receive the notice message [2].

III. OBJECTIVE

By observing the recent trends in IoT technology and to overcome the lacking features of traditional notice board system, the objective of the proposed model is To Design & Development of Smart Digital Notice Board based on IoT Platform.

IV. LITRATURE REVIEW

As system is design using the IoT platform, it must fulfill the following essential requirements.

A. – Wi-Fi based
B. IoT Protocol – HTTP
C. Scritipting language to design the webpage – HTML & PHP
D. Arduino C
E. Remote Display as Notice board Display – LCD
F.

A. – Wi-fi Based

As shown in Fig,.2, NodeMCU is a Wi-Fi module comes with a built in Wi-Fi chip as ESP8266, USB connector and rich assortment of general purpose Input-output Pins.

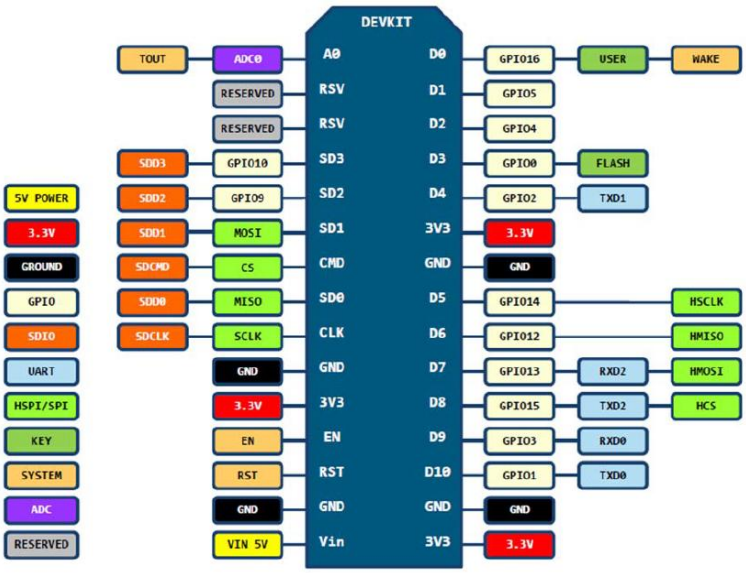

Fig.2 NodeMCU Pin-Out Diagram [3]

The Technical Specification of NodeMCU is as follows [3]:

- Voltage: 3.3V.
- Wi-Fi Direct (P2P), soft-AP.
- Current consumption: 10uA~170mA.
- Flash memory attachable: 16MB max (512K normal).
- Integrated TCP/IP protocol stack.
- Processor: Ten silica L106 32-bit.
- Processor speed: 80~160MHz.
- RAM: 32K + 80K.
- GPIOs: 17 (multiplexed with other functions).
- Analog to Digital: 1 input with 1024 step resolution.
- +19.5dBm output power in 802.11b mode
- 802.11 support: b/g/n.
- Maximum concurrent TCP connections: 5.

B. IoT Protocol – HTTP

There are basically two types of architecture available in IoT, One is 3 layered architecture and another is 5 layered architecture. The 3 layered architecture consist of Application layer, Network layer and Perception layer.

HTTP stands for *Hyper Text Transfer Protocol* which is an application layer protocol. It is used mainly to send and receive information to the webpage and from the webpage. HTTP is the beginning of the Modern day internet which was invented around 1990s. HTTP is a connectionless protocol, thus the information sent between the client and server does not require a constant connection. The client can make request to any remote server and then the connection is terminated as soon as the request is met. Once the server is ready with the response connection is re-established and the data is transferred. Another feature of HTTP which adds to the versatility of the protocol is that any type of data can be sent over it. This makes the job of designer much easier as any data can be sent to any server without any external needs being met, thus HTTP is media independent. The server and client are aware of each other only when the data transfer between them is taking place, and the rest of the time they have no information about each other, so HTTP is a stateless protocol. A typical HTTP request will be look like [4]

String ("GET ") + /output.php + "HTTP/1.1\r\n" +"www.iotnb.com" + host + "\r\n" + "Connection: close\r\n\r\n"

C. Scripting Language to esign the Webpage – HTML & PHP

HTML stands for Hyper Text Markup Language. An HTML file is a text file containing small Markup tags. The markup tags tell the web browser how to display the page. An HTML file can be created using a simple text editor. An HTML file must have an .htm or .html file extension.

PHP stands for Hypertext Preprocessor which is a programming language that allows web developers to create dynamic content that interact with database. PHP is server side scripting system.

D. Arduino C

Arduino C is the derived programming language from C/C++ which contains in built hardware based libraries.

E. Remote Display as Notice Board Display – LCD

In the proposed system, 16 * 2 size Liquid Crystal Display (LCD) is used as the remote notice board display. The pin-out diagram of 16 * 2 size LCD is shown in Fig. 3.

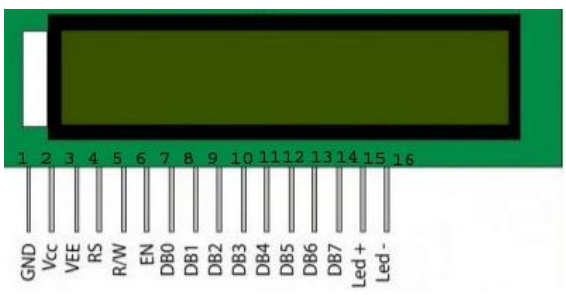

Fig. 3 The 16 * 2 LCD Pin-out Diagram [5]

V. PRAPOSED SYSTEM DIAGRAM

The Proposed block diagram of the system is shown in Fig. 4 which contains Wi-Fi module as NodeMcu which is use to communicate webpage and LCD. Whatever the message is published from the webpage is subscribes by the NodeMcu and display on to the remote display board as LCD.

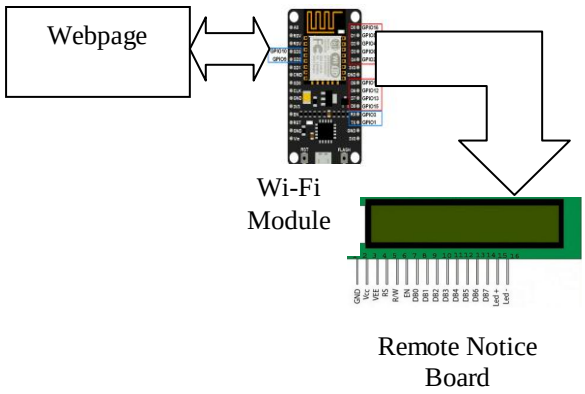

Fig. 4 Proposed Block Diagram

The functional flow diagram of the system is shown in Fig. 5. The whole system will work as follows:

- User must login onto the web application.
- The webpage shows textbox to enter the message (notice) to be displayed on remote display as LCD.
- The message than published from the webpage and subscribes by the NodeMcu.
- The subscribed message will transfer on to the remote display as LCD which is interfaced with NodeMcu.
- Finally the desired message gets printed onto the Remote Display - LCD.

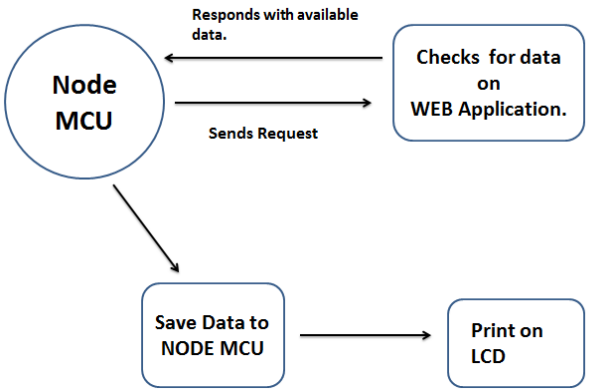

Fig.5 Functional Flow Diagram

A. Backend Functionallity

The backend functionality of the system is based on the scripting language PHP & HTML. PHP script sends a HTML request which is received by the NodeMcu and sends it to the browser. The browser in turn sends the request to the server which responds to the request and sends the data back to the PHP file. The data received in PHP file is read by the NodeMcu and then displayed on to the LCD. The detail flow of backend functionality is shown in Fig. 6.

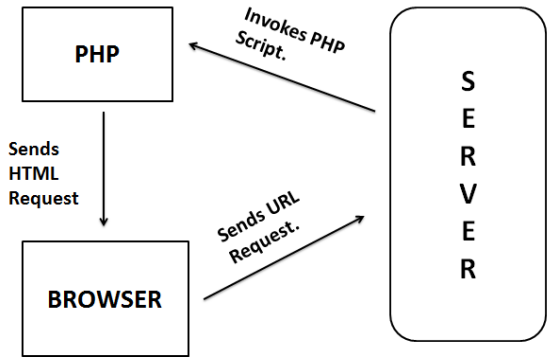

Fig.6 Backend Functionality

B. Software Flow Diagram

The software environment is created using Arduino C, HTML & PHP scripting language. The details software flow diagram is shown in Fig. 7.

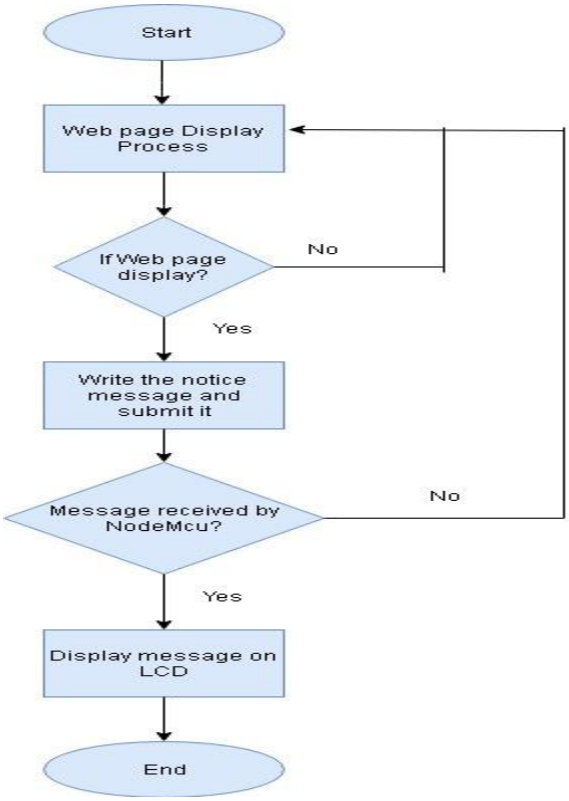

Fig. 7 Software Flow Diagram

VI. EXPERIMENTAL SETUP

NodeMcu Display Board

Notice Board Web Page

Fig. 8 Experimental Setup

The experimental setup of the suggested system is shown in Fig. 8. It contain hardware as NodeMcu – Wi-Fi Module and remote display as LCD. Another part of the experimental setup is webpage display on the host system.

VII. TEST RESULTS & DISCUSSION

The test results of the suggested system are presented in this section. Test results are bifurcated in three different processes.

A. *User Login onto the Webpage.*

Fig. 9 User Login onto the Webpage.

Once the system is started, first user need to login on to the webpage. The webpage is shown in Fig. 9. When login on the webpage, it shows the tab “Enter Your text for notice board:”. User need to write the message as the notice and then need to press the submit button. Here as shown in the Fig. 9, “message” is written as the notice.

B. *Posted Message Successfully*

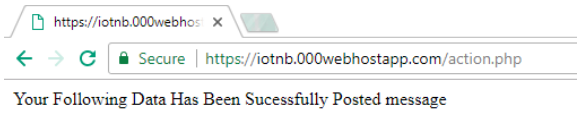

Fig. 10 Posted Message Successfully

Once the message is written, user needs to press “Submit” button as shown in Fig. 9. If the message is posted successfully, it shows the acknowledgement as shown in Fig. 10.

C. *Display message on LCD*

Fig. 11 Display Message on LCD

Once the message is posted successfully from the webpage, NodeMcu will subscribe that message and then display the same message on to the LCD which is interface with it. Display message mecghanism is shown in Fig. 11. If user wants to chane the message, once again he/she has to login the webpeg, enter the message as text, after that message will be changed on the LCD.

VIII. CONCLUSION

The smart digital notice board based on IoT platform is presented here. The suggested system is better than other traditional system as its associated with Wi-Fi module and internet connectivity. The system is considered as faster and reliable as anybody can write, send & update the message in a fraction of time. The designed can be enhanced in form of the multiple message can be send in a single short also display device can be improved from LCD to Touchpad display. Notice message can be extract in the handheld devices by using IoT protocol like MQTT. The system can be applied as online sign board or online notice board in real time application.

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