Smart Display Notice Board Using Raspberry Pi

ISSN (e) 2520--7393
ISSN (p) 5021-5027
Received on 22nd Feb, 2018
Revised on 26th Mar, 2018
www.estirj.com

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Abstract: The project make use of Raspberry Pi2 a pocket size computer to propose and demonstrate an Display notice board that will display a JAVA SWING application on the screen which is divided into different sections like images, slider images and a notification bar with date and time and it will be controlled by our website. This report begins with the background technologies and motivation behind the project, and takes the reader through the concrete details of the project components both hardware and software, their basic workflow, structure and operation of the project as whole, conclusion, and finally the future work that can be carried out by taking this project as a foundation. Proper references have been given where some external resource has been exploited, program listings have been admitted in the report for a better understand, and last but not least, all programs and source-code material has been included on a DVD that accompanies the report.

Keywords: *Raspberry Pi2; GSM SIM 900A; Java Swing; Website; Notice Board*

1. Introduction

We live in a world where the number of devices with the capability or the potential to interconnect and communicate with each other is increasing with each passing day. The ultimate benefits are too significant to be ignored. With the advent of efficient communication protocols and advancements in both wired and wireless communication, a new field of research known as the Smart Display Notice Board Using Raspberry pi was born.

The under-discussion project, 'Smart Display Notice Board Using Raspberry Pi' combines several technologies, both classic and modern, to offer a cost-effective automation system for academic, office and advertisement use which can be dynamically expanded and extended for usage in more sophisticated applications, hence the central idea behind the project is to give its user the power to control digital notifications and components remotely by harnessing the power of network.

The project uses a Java Swing application to display the notifications in the form of pictures and texts to keep update with the current schedule. The application and the actions are replicated in the real-life scenario after being carried through to the remote setting after passing through a database server.

Smart Display Notice Board Using Raspberry pi [1] is trying to change the classical structure of Notice Boards. This project uses the Raspberry pi for displaying Java swing application and with the application features displays notes in the form of pictures notices and texts with the help of GSM module. These objects contain, or are closely associated with, embedded technology to interact with internal states or the external environment. In other words, it is complete package of digital notice board.

One of the latest advancements in the field of Technologies has been powered by the manufacturing of low-cost microprocessor such as Raspberry Pi, GSM module, and local server. This small-sized single-board computer is perfect for experimental and prototyping purposes and their advanced versions are used in practical applications. Controlling Devices is one of these applications which are taking off thanks to such cost-effective solutions. Moreover, the ability of such development boards to connect and communicate with different other technologies such as touch-screen displays, SQL database servers, wireless communication.

2. Related Work

A number of products and systems exist in the market that serves the purpose of automation to varying degrees of reliability, speed and cost. Most of them are functional only for products within the brand ecosystem of the manufacturer/designer that sells the system as a whole, but some are compatible with other existing technologies as well. Which have gained some standard reputation overtime. Some systems require a software running on PC, other are web-compatible which makes it easy to control the connected devices from any mobile with Local area network connectivity and some are the android based application which can be controlled by smartphones. Most of the system uses Raspberry pi as their main element and include many other features like temperature k2sensors, Bluetooth etc. [2]. In comparison our project is cheap and effective.

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Bhawna Siani [3] proposes a model of LED based smart notice board which aims to be display information on daily basis. That is GSM based system and provides daily updates via mobile on all over the world.

3. Methodology

3.1 Flow Chart

In our project we have used following flow chart:

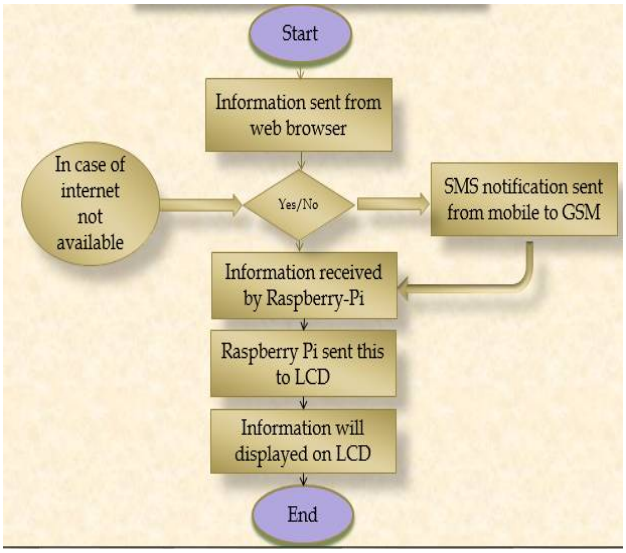

Figure.1. Flow Chart

3.2 Block Diagram

Below figure shows the block diagram of our project.

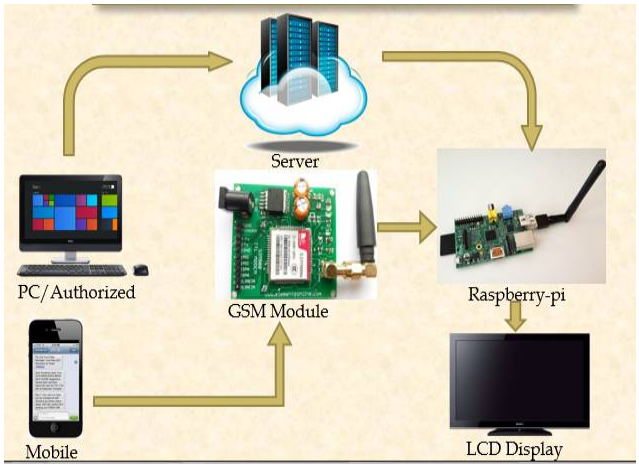

Figure.2. Block Diagram

Taking it from the top, we have a desktop application developed for operating system (Raspberry pi or PC). User sent request to the desktop application from website are shown on-screen after verification from the online web-server. This ability to send request to the server and the authorized. ID will be used to add into the database. Once the authorized id added into website the user will be logged in to the website and now can upload the files and manage the database and thus the recent files in the database are fetched by java swing application and will be shown to the screen for audience.

4. Components Used

4.1Raspberry pi2

The project uses a Raspberry pi2 [4] a small computer as its central controller. Raspberry pi has been tested for prototyping and testing purposes, *Raspberry pi* is a Small computer SoC: Broadcom BCM2836 (CPU, GPU, DSP, SDRAM), CPU: 900MHz quad-core ARM Cortex A7 with 4 USB ports 40 General Purpose Input/output plus specific functions, and HAT ID bus. Have Storage on MicroSD and Memory 1GB (shared with GPU) [5].

Figure.3. Raspberry pi2

The reasons for choosing the Raspberry pi board over all the alternatives was:

- **Price**: Low cost 5200Pkr
- **Availability**: Raspberry PI Now Available in Pakistan
- **Wi-Fi Chip**: Attached, Built in RPI3
- **Working**: Small Computer
- **USB** :4 USB Ports

4.2 TL-WN725N Wireless Nano USB Adapter

Sleek miniature design so small that once lugged in, can be left in a laptop's US Port. Speedy wireless transmission at up to 150Mbps ideal for video streaming or internet calls. Advance Security: Support 64/128 WEP, WPA, PA2/WPA-PSK/WPA2-PSK (TKIP/AES) [6] .Connect in no time with easy setup utility in 14 languages.

Figure.4. TL-WN725N Wireless Nano USB Adapter

4.3 GSM SIM900A

The SIM900a [7] is a complete Quad-band GSM/GPRS solution in a SMT module which can be embedded in the customer applications. Featuring an industry-standard interface, the SIM900 delivers GSM/GPRS 900/1800/1900MHz performance for voice, SMS, Data, and Fax in a small form factor and with low power consumption. With a tiny configuration of 24mm x 24mm x 3 mm, SIM900a can fit almost all the space requirements in your M2M application, especially for slim and compact demand of design. ”

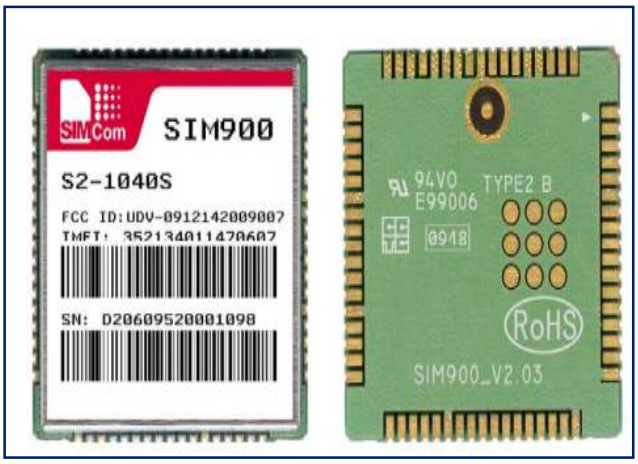

Figure.5. GSM SIM900A

GSM modem duly interfaced to the MC through the level shifter IC Max232. The SIM card mounted GSM modem upon receiving digit command by SMS from any cell phone send that data to the MC through serial communication. While the program is executed, the GSM modem receives command ‘STOP’ to develop an output at the MC, the contact point of which are used to disable the ignition switch. The command so sent by the user is based on an intimation received by him through the GSM modem ‘ALERT’ a programmed message only if the input is driven low. The complete operation is displayed over LCD display.

5. Interface

5.1 GSM interface with Raspberry pi:

We used RXTX API for interfacing GSM Sim900a with Raspberry pi for serial communication, with this API a text message is received by GSM Sim900a and RXTX API will decode this message and will be shown on java swing application.

5.2 Website Interfacing

PHP applications are created utilizing and ionic structure HTML5
That helps you construct local feeling versatile applications utilizing web Innovations like HTML5, CSS, and PHP.

Figure.6. Front view of website

Figure.7. Website

6. Programming Interface

6.1 Programming the Raspberry Pi

The Raspberry pi boards can be programmed using a free IDE provided in raspberry pi java language. The language in raspberry pi modules are programmed is based on Java language, and includes several many additional libraries and functions which let this computer expand its functionality.

The Raspberry pi has the job of receiving the toggle commands from user agent (Android app) and undertaking the action which it signifies. Hence, a rough workflow of the program can be outlined like this: Raspberry pi set-ups Local network connection, and waits for a command to be received from user-agent. As it receives the command, it decodes where exactly will the change take place, undertakes the command on hardware level (onto the actual device) and also on the software that the action has indeed taken place.

6.2 NetBeans

NetBeans is a software development platform written in Java. The NetBeans Platform allows applications to be developed from a set of modular software components called modules. Applications based on the NetBeans

Platform, including the NetBeans integrated development environment (IDE), can be extended by third party developers. We are using NetBeans as desktop Application name as ABBadmin, ABBweb.

NetBeans IDE is the official IDE for Java 8. With its editors, code analyzers, and converters, you can quickly and smoothly upgrade your applications to use new Java 8 language constructs, such as lambdas, functional operations, and method references.

An IDE is much more than a text editor. The NetBeans Editor indents lines, matches words and brackets, and highlights source code syntactically and semantically. It lets you easily refactor code, with a range of handy and powerful tools, while it also provides code templates, coding tips, and code generators. The editor supports many languages from Java, C/C++, XML and HTML, to PHP, Groovy, Java doc, JavaScript and JSP. Because the editor is extensible, you can plug in support for many other languages.

6.3Apache MYSQL:

Apache is an open-source portable improvement system. It permits you to utilize standard web innovations.

Applications execute inside wrappers focused to every stage, and depend on principles. Agreeable API ties to get to every gadget's capacities, for example, sensors, information, Organize status, and so forth.

6.4 MySQL:

MySQL is an open source relational database management system. Information in database is stored in the form of related tables. MySQL databases are typically used for web application development (often accessed using PHP).

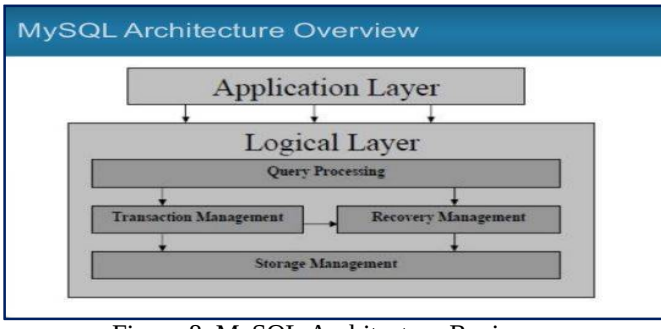

Figure.8. MySQL Architecture Review

6.5 PhpMyadmin

PhpMyadmin is a open source and the tool written in the Php, is for handling for the MYSQL for web. JAVA PhpMyadmin supports a large amount of operation on MySQL and other database like MariaDB, SQLite and so many others.

Normally use of operation like managing database, creating tables, indexes and the permission which authenticate from the master, creating column and the relation can be done via the user crossing point, while you immobile have the capability and the directly implement the any SQL statement

7. Results

1st page shows the login page. As shown in below figure

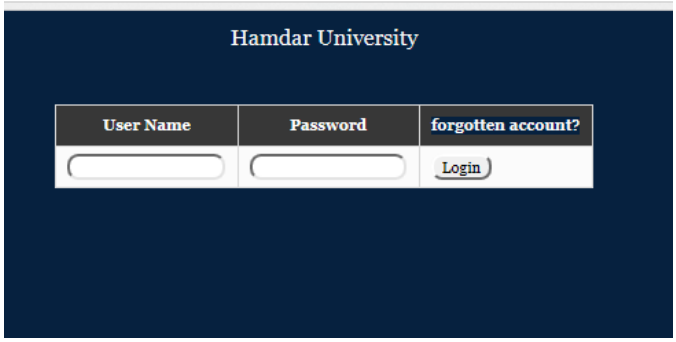

Figure.9. Login Page

Now below figure shows the interface which changes after every minute. These figures are save in database which will be changes after a time delay.

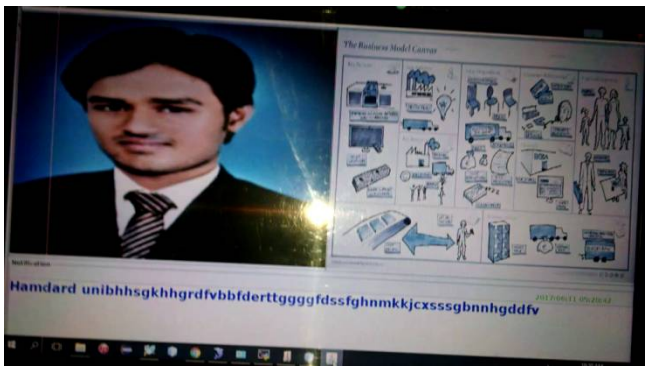

Figure.10. Interface

Below figure describes that we are able to change the information of a page also. That will change via mobile. If net is not available then we will change information by text message also.

Figure.11. Text Information

As new information will be add that appear in highlights. Old news comes below to that information. Below figure shows the result.

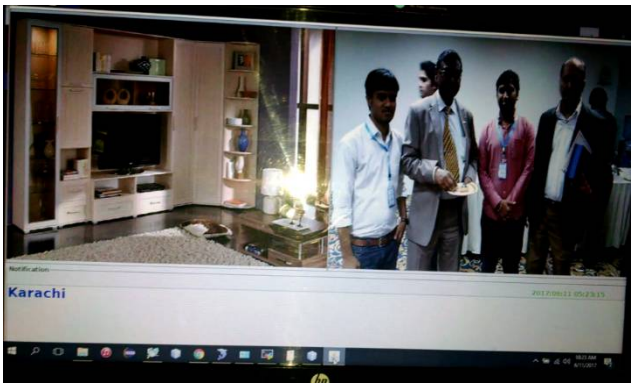

Figure.12. New Information

Now last figure shows the setup of Raspberry pi which is connected to the GSM Module.

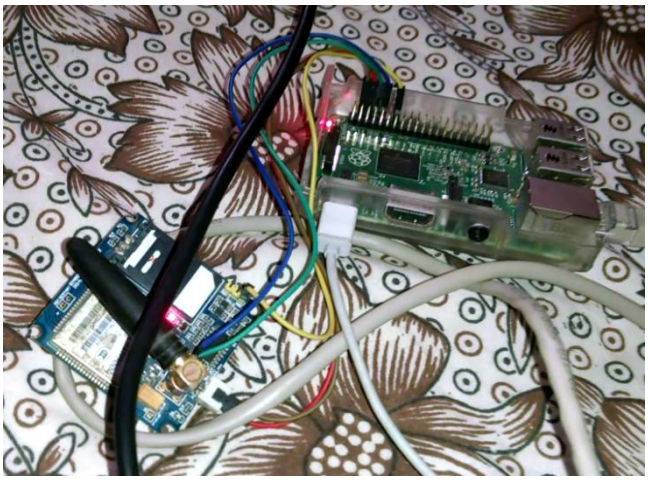

Figure.13. Raspberry Pi Setup

8. Conclusion

The project under review follows a reproducible solution for surveillance which can be followed for similar applications in University, Market stall, Super Market, Mall, any Company, Hospitals, Sports, office, and industrial environments. The project, being an application-based approach, relies predominantly on several components and their interconnection, which may not always be perfect. Nevertheless, there are several advantages posed by the project as well.

Some of the advantages of the *'Smart Display Notice Board Using Respberry-pi2'* are that it:

- uses free and open-source technologies as constituent components for the most part, e.g. JAVA SWING and Raspberry Pi;
- In Airports for flight schedules.
- In offices for notification.
- Super Markets (for display of product price).
- Education-Universities and Colleges.
- Banking and trading purposes.
- Advertisement: in shopping malls.
- Provides an easy-to-use and user-friendly central dashboard in the form of application.
- implements a user-based privilege system to ensure not everyone can control every single device.

Like any other surveillance solution, *''Smart Display Notice Board Using Respberry-pi2'* is not all-in-one or a perfect solution. There are certain points that should be kept in mind while considering this project as well:

- As mentioned earlier, the project has been meant to be application-based instead of being research-based right from the beginning. It makes use of several technologies readily available in the market and relies on their interconnection and communication for operation. Tradeoffs of these individual components are one thing to consider while dealing with the project as whole.
- The project requires consistent local network connectivity for operation.

The project under review offers a number of opportunities for future research and experimentation work. Here are some of the ideas and proposals which offer room for improvement and future work.

- Addition of screening (Required input Trough Android Application).
- Addition of Alerts Service.
- Addition videos section for notice.
- Addition of audio input for notice.
- Addition of Camera for monitoring.

Complete program code listings, source files and schematics have been provided with the report's hard-copy for anyone interested to follow and expand on the already-accomplished objectives.

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