ISSN XXXX XXXX © 2019 IJESC

Research Article Volume 9 Issue No.3

# IoT Based Digital Signage Board

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**Abstract:**
IoT systems allow users to achieve deeper automation, analysis, and integration within a system by improving its reach and accuracy. Digital signage uses screen technologies such as LCD, LED or projection to display content such as digital images, video, streaming media, and information. The implementation of improved hardware with the IoT makes it work as a better Digital signage system. The Raspberry Pi used here act as the heart of the system. Also a PIR sensor is added, to detect the presence of audience and thus helping in ON or OFF the Display. The proposed system will make things run with better performance and power efficiency.

**Keywords:** Digital Signage, Raspberry Pi, Web Interface.

## I. INTRODUCTION

A Notice board is used for displaying messages that are intended to reach the public those approach it. They are also used in industrial and institutional premises to pass the messages to the people present there. Traditional notice board has a problem that a person has to be appointed for changing the information, which is put on the notice board. Also considerable amount of time is taken to update. Digital Signage board is a dynamic display uses a LED/LCD to display the contents. The system works with the help of Raspberry Pi. The data is sent through Wi-Fi to the Raspberry pi, which downloads the information and store's it in its own memory. The system also consists of a PIR sensor used to reduce the power consumption of the system .The PIR sensor can be mounted anywhere depending upon in where the person detection is to be done and it should be interfaced to the Raspberry Pi and programmed to turn ON when PIR sensor detects a person. The user after authenticating using login ID and password can get access into the Web Interface control panel and can upload the content to be displayed which may be image/video/PDF on the display. The complete control over the display unit and what being displayed on the display unit is provided to the user through web interface or Android App.

## II. METHODLOGY

### a. HARDWARE

#### i. Raspberry Pi

The Raspberry Pi is a series of small single-board computers developed in the United Kingdom by the Raspberry Pi Foundation to promote the teaching of basic computer science in schools and in developing countries. The original model became far more popular than anticipated, selling outside its target market for uses such as robotics. It does not include peripherals (such as keyboards, mice and cases). However, some accessories have been included in several official and unofficial bundles. The Raspberry Pi hardware has evolved through several versions that feature variations in memory capacity and peripheral-device support. This block diagram depicts Models A, B, A+, and B+. Model A, A+, and the Pi Zero lack the Ethernet and USB hub components. The Ethernet adapter is internally connected to an additional USB port. In Model A, A+, and the Pi Zero, the USB port is connected directly to the SoC. On the Pi 1 Model B+ and later models the USB/Ethernet chip contains a five-point USB hub, of which four ports are available, while the Pi 1 Model B only provides two. On the Pi Zero, the USB port is also connected directly to the SoC, but it uses a micro USB (OTG) port. Processor, RAM, Networking, Peripherals, Video, Real Time Clock


**Figure.1. Raspberry Pi 3 Model B+ Hardware**

#### ii. PIR Sensor

PIR often referred to as, "Passive Infrared","Pyro electric", or "IR motion" are sensors which allow to sense motion, almost always used to detect whether a human has moved in or out of the sensors range. They are small, inexpensive, low-power, easy to use and don't wear out. PIRs are basically made of a pyro electric sensor which can detect levels of infrared radiation. Everything emits some low level radiation, and the hotter something is, the more radiation is emitted. The sensor in a motion detector is actually split in two halves. The reason for that to look to detect motion change which are not at average IR levels. The two halves are wired up so that they cancel each other out. If one half sees more or less IR radiation than the other, the output will swing high or low. Most PIR sensors have a 3-pin connection at the side or bottom. One pin will be ground, another will be signal and the last pin will be

power. Power is usually up to 5V. Interfacing PIR with microcontroller is very easy and simple. The PIR acts as a digital output so all you need to do is listening for the pin to flip high or low. The motion can be detected by checking for a high signal on a single I/O pin.

**Figure.2. PIR Sensor**

**iii. Display Unit**

The Display Unit used here can be any Monitor/TV which can be mounted as per user convenience. The display unit must support HDMI as the HDMI CEC line is to be used to control the ON/OFF based on motion detection.

**b. SOFTWARE**

**i. Raspbian OS**

Raspbian is a Debian-based computer operating system for Raspberry Pi. There are several versions of Raspbian including Raspbian Stretch and Raspbian Jessie. It has been officially provided by the Raspberry Pi Foundation as the primary operating system for the family of Raspberry Pi single-board computers. Raspbian was created by Mike Thompson and Peter Green as an independent project. Raspbian is highly optimized for the Raspberry Pi line's low-performance ARM CPUs. Raspbian uses PIXEL, Pi Improved Xwindows Environment, Lightweight as its main desktop environment as of the latest update. The scripts and files created are run on the Raspbian OS.

**ii. Bootstrap**

Bootstrap is a free and open-source front-end Web framework. It contains HTML and CSS -based design templates for typography, forms, buttons, navigation and other interface components, as well as optional JavaScript extensions. Unlike many earlier web frameworks, it concerns itself with front-end development only.

**iii. Python**

Python is a wonderful and powerful programming language that's easy to use (easy to read and write) and with Raspberry Pi lets you connect your project to the real world. Python syntax is very clean, with an emphasis on readability and uses Standard English keywords. The easiest introduction to Python is through IDLE, a Python development environment. Open IDLE from the Desktop or applications menu. IDLE gives you a REPL (Read-Evaluate-Print-Loop) which is a prompt you can enter Python commands in to. As it's a REPL you even get the output of commands printed to the screen without using “print”. Two versions of Python are available: Python 2 and Python 3. Python 3 is the newest version and is recommended, however Python 2 is available for legacy applications which do not support Python 3 yet. IDLE also has syntax highlighting built in and some support for auto completion.

## III. WORKING

The Raspberry Pi act as a central processing unit. The protocol used in this system is Secure Shell Protocol (SSH). The SSH protocol is used for secure terminal access and to share the data. In this system, digital signage can be accessed and controlled through both web server and an android application. A local host IP address will be generated to access and control the broadcasting contents. This is a secure gateway as it provides a username and password to the clients or to the user end. No one other than the users cannot alter the contents that are to be published.

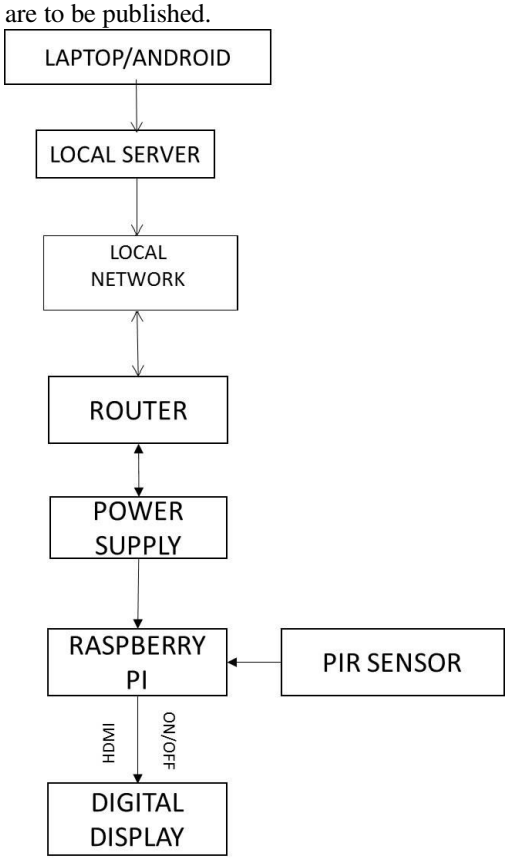


**Figure.3. Working of the System**

In case of accessing through web server, it will request the user for a username and password to allow him/her to access. Then the user can alter the contents need to published. In case of accessing through an android application, the user needs to provide the IP address, username, and password. Then the user can add or remove the contents that need to be published; the user can edit the time interval for a content to be published; the user can also set the time period for how long the content need to be published by setting the start date and end date. The contents that published through this system can be an image file or a video file or some other document files. A digital display is connected to the Raspberry Pi which will be publish the contents to the audience. The digital display is connected to the Raspberry Pi through an HDMI cable. In addition, a special feature is introduced in this system where a PIR motion sensor is installed in this setup and connected to the Raspberry Pi. The Raspberry Pi is programmed in python for the PIR sensor interface. The PIR sensor can detect a person within a range of 6-7 meters and at an angle of 120 degrees. If the PIR sensor detects a motion of a person, the output of the PIR sensor causes the digital display to ON and causes the display to OFF when there is no motion detected for a particular period of time. The PIR sensor stands Passive Infrared sensor. It sends the infra-red radiation and the level of

radiations will be altered with the motion of humans. The changes are observed and the output will be sent to the Raspberry Pi to control the power state of the Display unit. This power state is controlled using the CEC line of the HDMI.

## IV. RESULT

On running the system and using the web interface to display the required information, it was successfully displayed on the monitor on real-time. The time period of how long an image or notice should be present was also controlled from the Web interface.

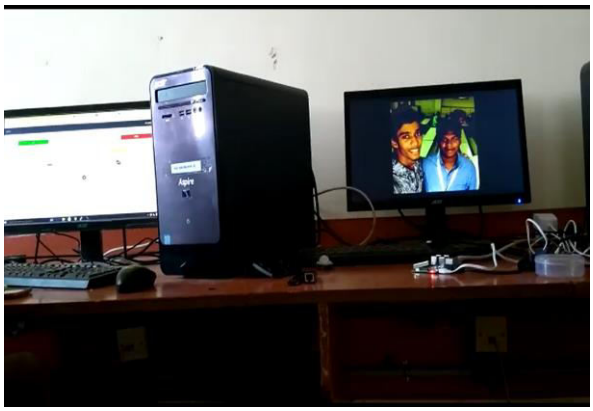

**Figure.4.**

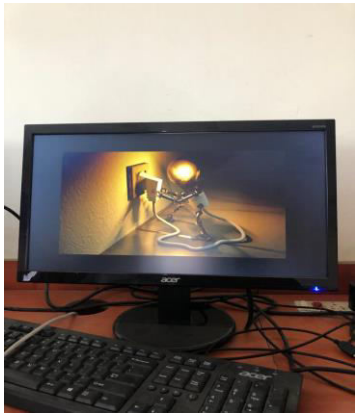

**Figure.5.**

## V. CONCLUSION

By implementing this system there is reduction in the consumption of paper and other stationary required and time taken to update an information. There is no need for a separate person to be assigned to change the content being displayed on a traditional notice board. Updation of the notice which is to be run on the display can be updated from anywhere provided the user is connected to that local network. The inclusion of user authentication make this system a secured one. The storage of the system can be expanded. Power consumption is reduced by implementing PIR sensor to detect the presence of audience.

## VI. REFRENCES


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## VII. ACKNOWLEDGEMENT


We express our gratitude to our Project Guide and Head of the Department, Dr.S.Vishalakshi who provided insight and valuable guidance to us. We would also like to extend our gratitude to the Project Coordinator, Mr.K.R.Ganesh, Assistant Professor, and EIE Department of Valliammai Engineering College.