**Chapter 1**

**INTRODUCTION**

Digital display board is a common sight today. Advertisement is going digital in recent days. The use of digital display boards at railway station, bus stands, shopping malls, educational institutions and public places are becoming an effective mode of communication in providing information to the people. Notice Board is used in various institutes to display notices and these boards are managed manually. It is a long process to put up notices on the notice board. This wastes a lot of resources like paper, printer ink, man power and also loss of time and these off-the-shelf units are somewhat inflexible in terms of updating the message instantly. If the user wants to change the message it needs to be done using a computer and hence the person needs to be present at the location of the display board. It means message cannot be changed from wherever or whenever. Also, the display board cannot be placed anywhere because of complex and delicate wiring.

Digital notice board using IoT overcomes these drawbacks. The main objective is to design an automatic, self-enabled highly reliable electronic notice board. In this project we have proposed a system which will enable people to wirelessly transmit notices on notice board using Wi-Fi. Here we have proposed a system by which only authorized person can accesses the notice board. It require less time due to fast data transmission through Wi-Fi. Less cost and save the resources like paper. A display connected to a server system should continuously listen for the incoming messages from user, process it and display it on LCD screen. Message displayed should be updated every time the user sends new information. Only authenticated people should update the data to be displayed on the monitor. Digital smart board is an automatic self-enabled, highly reliable wireless electronic board. The information can be text, images, audio and video. It makes use of a mini computer, which is commonly termed as **Raspberry Pi.**

**1.1 Related Work:**

Several works have used GSM to monitor several application such as cell phone operated robot, SMS based voting system, SMS based security system, GSM based automatic meter reading system using ARM controller, SMS based teaching and learning system and so on.

Also, several researches have been done on GSM based e-notice board, where, SMS sent from authorized mobile phones, via a GSM network, were displayed on a digital e-notice board. These several works have proven to be efficient and fast. With greater efficiency, messages were displayed with less error and less maintenance, though there is need for few modifications for better performance. In 2013 an SMS driven automatic display using ARM-LPC2148 to interface multiple graphical display was designed. With this technology, a single notice could be sent to several e-notice boards via ARM-LPC2148. Again in 2013 a GSM based multiple LED display boards using AT89S52 microcontroller, GSM module, LCD and several moving LED displays was designed and developed. Multiple moving LED displays were connected via different GSM modules at different geographical locations such that the same SMS sent was displayed on all the moving LED displays. Though with few limitations, this work proved to be cost-effective, secured and efficient as compared to previous works. In 2014 development of GSM based digital notice board was proposed.

The complete system would have a dual system in terms of changing message display, dual power supply switchable between solar power system and alternating current (AC) from the utility supply, and inbuilt motion detector that could automatically switch OFF the whole system after working hours and would automatically switch ON if any motion is sensed by the motion detector after the programmed working hours. This work would probably prove highly efficient in terms of ensuring better communication and continuous power supply.

**1.2 Proposed System:**

This project, aims to increase the usability of electronic notice boards, deals with wireless reception and display of messages using Raspberry pi. Practically, all output resolutions are supported. It aims at designing a LED Monitor based message display controlled through a laptop. It is simple, easy to install, user-friendly system which can receive and display information in a particular manner with respect to date and time which will help the user to easily keep the track of information every day and each time he uses the system.

**Chapter 2**

**DETAILED LITERATURE SURVEY**

**2.1 Large Screen Wireless Notice Display System. [June 2015]:**

**Authors: Yash Teckchandani, G. Siva Perumal, Radhika Mujumdar, Sridhar Lokanathan.**

Wireless electronic notice boards are a faster alternative to conventional pin-up type notice boards. A major constraint of the methods used so far is the small size of the 16x2 Liquid Crystal Displays (LCD) used to display the notices. This paper proposes a method in which large screens like computer monitors or televisions can be used for displaying notices sent as text messages from a mobile phone. The proposed method uses Hypertext Markup Language (HTML) to present the output since it offers many customization options. To give high resolution output, the credit-card sized computer Raspberry pi has been used. This HTML output can be displayed by a web browser running on the Raspberry pi. The notice to be displayed is sent as a Short Message Service (SMS), which is received by a Global System for Mobile Communications (GSM) modem, making the reception of the message wireless. The GSM modem is polled at regular intervals by the Raspberry pi to display the latest messages.

**Methodologies Used:**

* Since GSM network is being used, the notice can be sent from practically any location on the globe and it will be displayed on the screen.
* The Global System for Mobile Communications (GSM) network is digital. This makes it immune to noise. Also, GSM networks are relatively free of errors.

**Drawback of the proposed system:**

* Use of GSM modem limits the application to text messages.
* The use of GSM limits the range of connectivity to the remote location.

**2.2 GSM Based Wireless Electronic Notice Board Display through ARM7 and LED. [May 2016]:**

**Author:** **P. Sampath Kumar, V. Priyanka, Lakshmi Surekha, Y. Harish Reddy.**

This paper is developed a GSM based notice board display using ARM7 controller along with LED array. The microcontrollers provide all the functionality of the display notices and wireless control. The Display is obtained on a 7X96 Light Emitting Diode (LED) dot matrix display. A desired text message from a mobile phone is sent via a Global System for Mobile Communication (GSM) to the GSM module located at the receiving end. The GSM modem is connected, through MAX 232 Integrated Circuit (MAX 32 IC), to the ARM7 microcontroller. The message that is stored in the Electrically Erasable Programmable Read Only Memory (EEPROM) is then displayed on the LED dot matrix display. This hardware uses regulated 5V, 500mA power supply. A three-terminal LM7805 is employed for regulation of the voltage. A bridge type full-wave rectifier is used to rectify the AC output of the secondary of 230/12V step down transformer. The system was tested to work according to specification.

**Methodologies Used:**

* In this project we have proposed a system which will enable people to wirelessly transmit notices on a notice board using GSM.
* The project mainly focuses on transmission of textual data through air interface by the use of GSM through asynchronous serial communication.

**Drawback of the proposed system:**

* The SMS is deleted from the SIM each time it is read, thus making room for the next SMS.
* The major constraints incorporated are the use of „\*‟ as the termination character of the SMS and the display of one SMS as a time.

**2.3 Wireless Electronic Notice Board Using Raspberry Pi 3. [June 2017]:**

**Author:** **Er. G. Jalalu, Er. Polepogu Rajesh.**

Notice boards can change the way communication with each other, using notice boards is a constructive method of promoting important information to a large number of people. Notice board is ideally useful tool for organizing and displaying information, these are used in multitude of businesses such as schools, colleges, hospitals, railway station, bus station, hotels, shopping malls etc. As they can be used over and over again to display important notices or advertise forthcoming events or meeting. In this paper, we proposed an advanced wireless notice board in which at any time we can add or remove or alter the message according to our requirement. The main aim of this proposed project is to drastically reduce the cost involved, consume smaller amount of power and help in achieving quality of service. For this we need a computer/laptop as a transmitter, Raspberry PI 3 model B as a receiver, Wi-Fi for data transmission and a LED/LCD screen as a display

**Methodologies Used:**

* We have used the laptop as transmitter to send the notices and Raspberry Pi 3 model is used as receiver.
* When both the transmitter and receiver are connected to the same network, then the notices are displayed on the monitor.
* They are displayed one after the other after 5 seconds time gap.
* The software which is used in this project is FileZilla.

**Drawback of the proposed system:**

* The proposed system limits the client and server to be confined to a single network.
* The use of Transmitter and Receiver limits the range of connectivity to the remote location.

**2.4** **An IOT Based Web Page Controlled Digital Notice Board. [August 2017]:**

**Author: P. Bhaskara Chary, Dr. T. Srinivasulu.**

GSM – an advanced versatile communication framework, which is internationally gotten to by nearly 212 nations and domains. Worldwide framework for versatile work is totally upgraded for full duplex voice communication. At first produced for the substitution of real (1G) innovation, now GSM is accessible with heaps of hitting highlights with the consistent up degree of third era (3G) innovation Likewise, in trains and transports the data like stage number, ticket data is shown in computerized loads up. Individuals are presently adjusted to the possibility of the world readily available. The utilization cell phones have expanded definitely finished years. Control and correspondence have turned out to be imperative in every one of the parts of the world. This undertaking is a Web Controlled notice board with a GSM modem at the recipient’s end. So, if the client needs to show any message, he can send the data by Web server (Thingspeak.com) and hence refresh the LCD show appropriately.

**Methodologies Used:**

* Receiver section contains power supply, microcontroller, LCD display and GSM800L GSM module. Initially the GSM800L module programmed with AT commands and microcontroller is programmed by using embedded C language in KEIL software. A sim is inserted into the GSM module, once the power supply on AT commands executes one by one.
* The GSM800L module will download the data from the web server and transmitted to the microcontroller block. Now the microcontroller fetches and executes the information from the GSM module and displays in the LCD.

**Drawback of the proposed system:**

* This proposed system uses the very old and slow technology i.e. C language in KEIL software.

**2.5** **IoT based web-controlled notice board. [April 2018]:**

**Author:** **Divyashree M, Harinag Prasad S, Sandeep G T, Bhavya S N, Poornima S.**

IoT is the network of physical “things” or object that contain embedded technology to interface and sense to move with their internal states or the external setting. Automation is the most often spelled term within the field of electronics. The hunger for automation brought several revolutions within the existing technologies. Notice board could be a primary factor in any establishment or public places like bus stations, railway stations, colleges, malls etc. Sticking out numerous notices day to day could be a tough method. A separate person is needed to take care of this notice display. This project is regarding advanced wireless notice board. In IoT based Web Controlled Notice Board, Internet is employed to wirelessly send the message from Browser to the liquid crystal display. A local web server is created, this could be a global server over net. At the Raspberry Pi, LCD is used to display message and flask for receiving the message over network. Whenever Raspberry receives any wireless message from Web browser, it displays on the liquid crystal display.

**Methodologies Used:**

* Client: Authorized user.
* Server: Raspberry pi.
* Raspberry pi interfaces with router using a Wi-Fi adapter.
* Users enters SSID (router name) a password of router.
* Routers allot IP address to raspberry pi.
* TCP server is made on raspberry pi which listens for incoming calls.
* A TCP client is made on PC which interfaces with TCP server.
* When a connection is established the client sends message to server the message sent to by the client is stored in a text file on raspberry pi and hard disk (SD card).
* The text file is prepared by another program which displays the text on LCD screen connected on HDMI interface.

**Drawback of the proposed system:**

* Remote activities allow administrations, for example, long-go interchanges, that are inconceivable or illogical to execute with the utilization of wires
* Electronic Notice Board is one of the applications where WIFI and Raspberry pi can be utilized successfully but this system is limited to the specific uses.

**Disadvantages of the Current System:**

* Use of GSM modem limits the application to text messages.
* The use of GSM limits the range of connectivity to the remote location.
* The SMS is deleted from the SIM each time it is read, thus making room for the next SMS.
* The major constraints incorporated are the use of „\*‟ as the termination character of the SMS and the display of one SMS as a time.
* The proposed system limits the client and server to be confined to a single network.
* The use of Transmitter and Receiver limits the range of connectivity to the remote location.
* This proposed system uses the very old and slow technology i.e. C language in KEIL software.

**Problem Statement:**

**“In the existing system developers have used old and inefficient technologies which makes use of GSM, Transmitter/Receiver and wired connection using C language in KEIL software to display their content on the smart board.”**

**Chapter 3**

**OBJECTIVES AND METHODOLOGY OF THE PROPOSED SYSTEM**

**3.1 Proposed system:**

The proposed system will be a moving message display, which might be utilized as the digital notice board, and moreover a Wi-Fi transceiver, that will be that the most recent innovation utilized for communication between the mobile and the embedded devices. System can work like once the user desires to display or update the notice board that is unimaginably useful to show the circulars, day by day occasions, plans are to be shown.

At that point the WI-FI will receive the message in notice board system, the Raspberry Pi chip has been inside the system is programmed in such a way that when the coding is written in embedded system Language receives any message it will browse the message form serial port through WI-FI transceiver, if the message is writing in any PC then it will begin displaying the information within the display system.

The messages are displayed on the liquid crystal display. This system is to cut back the time wastage and update with any time is to terribly simply. The serial WI-FI has been utilized it can be used to transmit an information from serial port communication. It implies that to display the information from to a tiny bit at a time to get the notice load up then stores it, messages are then shows it in the LCD/LED module.

**3.2 Objectives of the proposed system:**

The main objective is to design an automatic, self-enabled highly reliable electronic notice board. A display connected to a server system should continuously listen for the incoming messages from user, process it and display it on LCD screen.

To develop a wireless notice board that display message sent from the user and to design a simple, easy to install, user friendly system, which can receive and display notice in a particular manner with respect to date and time which will help the user to easily keep the track of notice board every day and each time he uses the system. Wi-Fi is the wireless technology used.

Message displayed should be updated every time the user sends new information. Only authenticated people should update the data to be displayed on the monitor.

**3.3 Advantages of the proposed system:**

* Data is more secure.
* It provides faster and dynamic displaying of messages.
* User can send data anywhere in the world.
* IT is Eco Friendly, using IOT notice board we can reduce paper usage
* It can likewise be utilized as a part of Malls and Highways for Advertisement reason.
* A moving showcase with variable speed can likewise be utilized as a part of place of static display.
* IOT notice board can be used in various organisations like hospitals, schools, colleges, Offices etc.
* IOT notice board can be used in various organisations like hospitals, schools, colleges, Offices etc.
* Electronic Notice Board is one of the applications where WIFI and Raspberry pi can be utilized successfully.

**3.4 Methodology of the Proposed System:**

**3.4.1 Introduction:**

The methodology used in this project is IoT. The Internet of Things (IoT) is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction.

* **Intelligence:**

Together algorithms and compute (i.e. software & hardware) provide the “intelligent spark” that makes a product experience smart. Consider Misfit Shine, a fitness tracker, compared to Nest’s intelligent thermostat. The Shine experience distributes compute tasks between a smartphone and the cloud. The Nest thermostat has more compute horsepower for the AI that make them smart.

* **Connectivity:**

Connectivity in the IoT is more than slapping on a Wi-Fi module and calling it a day. Connectivity enables network accessibility and compatibility. Accessibility is getting on a network while compatibility provides the common ability to consume and produce data. If this sounds familiar, that’s because it is Metcalfe’s Law and it rings true for IoT.

* **Safety:**

As we gain efficiencies, novel experiences, and other benefits from the IoT, we must not forget about safety. As both the creators and recipients of the IoT, we must design for safety. This includes the safety of our personal data and the safety of our physical well-being. Securing the endpoints, the networks, and the data moving across all of it means creating a security paradigm that will scale.

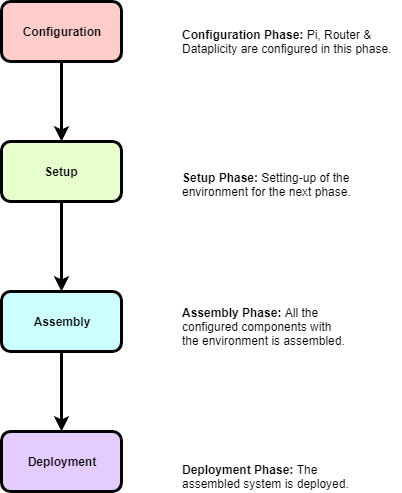
### Dynamic Nature:

### The primary activity of Internet of Things is to collect data from its environment, this is achieved with the dynamic changes that take place around the devices. The state of these devices changes dynamically, example sleeping and waking up, connected and/or disconnected as well as the context of devices including temperature, location and speed. In addition to the state of the device, the number of devices also changes dynamically with a person, place and time.

### Heterogeneity:

### Heterogeneity in Internet of Things as one of the key characteristics. Devices in IoT are based on different hardware platforms and networks and can interact with other devices or service platforms through different networks. IoT architecture should support direct network connectivity between heterogeneous networks. The key design requirements for heterogeneous things and their environments in IoT are scalabilities, modularity, extensibility and interoperability.

**3.4.2 Development Process:**



**Figure 3.1:** Different phases in development process

Development process of this project involves four phases. Configuration Phase, Setup Phase, Assembly Phase & Deployment Phase. Different IoT features are used to support these phases of the project. Below is the figure which explains these phases of project.

**Chapter 4**

**SYSTEM ANALYSIS**

**4.1 Functional requirements:**

It deals with the functionalities required from the system.

This proposed application will help many organizations such as railway stations, shopping malls, educational institutions to display any sort of information and will have the following requirements:

* Only an authorized person can access the application.
* All personnel using the system will be trained and given information about the accessibility of the application.
* The user can push any content that he wants to display on the board through the Dataplicity portal.
* The content can be any information such as text, audio, video, images etc.

**4.2 Non**-**Functional requirements:**

There are some nonfunctional requirements such as:

**4.2.1 Security:**

Security is very useful feature of Dataplicity and Raspberry pi which our system requires. To reduce the scam and unauthorized access to the digital screen.

**4.2.2 Availability:**

Users can access their digital screen by portal website provided to them. This application uses internet as the medium of connection to raspberry pi. So, this system is available 24/7 without caring about handling servers.

**4.2.3 Reliability:**

It means the extent to which program performs with require precision. The application developed should be extremely reliable and secure, hence the information displayed on the board must be correct and as per the user’s requirement.

**4.2.4 Usability:**

This system provides the interface which is very user friendly and it requires least effort to operate. The application will provide services like session management to maintain sessions in order to display the content on the board through our application.

**4.2.5 Portability:**

This system is built on modular design, each component of the system are independent of other. These different components of the system are connected using internet and raspberry pi. The application makes use of Raspbian and Python libraries etc., which are again platform independent.

**4.2.6 Transparency:**

The whole application should be made using independent modules so that any changes done in one module should not affect the other one and new modules can be added easily to increase functionality.

**4.3 Specific Requirements:**

Mainly there are two subjects for this system – Admin/ Users. Some important functions for them are: -

**Admin/ Users:**

* Can add the information or content according to the requirements of the users.
* Can view all the contents to be displayed on the smart board.
* The information to be displayed includes text, images, audio, video, advertisements, notifications etc.
* Can set the sessions of display for each content to be displayed on the smart board.
* Can view the information displayed on the smart board.
* Can view, if the information being displayed is according to their specifications and requirements.

**4.4 External Interface Requirements:**

It includes the following interfaces

* User Interfaces
* Software Interfaces
* Hardware Interfaces

**4.4.1 User Interfaces:**

The interface must be easy to understand. The user interface includes

* **User Registration and Login:** The screen will be the first to be displayed which will allow the users to do the user registration and login.
* **User Query and data upload:** User can upload their data or information with time and synchronization they wish to display on the digital board.
* **End messages:** The information and data entered by user is then displayed on the smart board accordingly.

**4.4.2 Hardware Interfaces:**

**Server-side hardware:**

* Hardware recommended by all the software needed.
* Communication hardware to serve client requests.

**Client-side hardware:**

* Hardware recommended by respective client’s operating system and web browser.
* Compatible operating system: Windows/Linux/IOS

**Client-side software:**

* Web browsers.

**4.4.3 Software Interface:**

The software interface is provided by the Dataplicity portal. The two main programming languages used are Python and Raspbian:

**Python:**

Python is an [interpreted](https://en.wikipedia.org/wiki/Interpreted_language) [high-level programming language](https://en.wikipedia.org/wiki/High-level_programming_language) for [general-purpose programming](https://en.wikipedia.org/wiki/General-purpose_programming_language). Created by [Guido van Rossum](https://en.wikipedia.org/wiki/Guido_van_Rossum) and first released in 1991, Python has a design philosophy that emphasizes [code readability](https://en.wikipedia.org/wiki/Code_readability), notably using [significant whitespace](https://en.wikipedia.org/wiki/Significant_whitespace). It provides constructs that enable clear programming on both small and large scales. In July 2018, Van Rossum stepped down as the leader in the language community

Python uses [dynamic typing](https://en.wikipedia.org/wiki/Dynamic_typing), and a combination of [reference counting](https://en.wikipedia.org/wiki/Reference_counting) and a cycle-detecting garbage collector for [memory management](https://en.wikipedia.org/wiki/Memory_management). It also features dynamic [name resolution](https://en.wikipedia.org/wiki/Name_resolution_(programming_languages)) ([late binding](https://en.wikipedia.org/wiki/Late_binding)), which binds method and variable names during program execution.

## Advantages of Python:

The diverse application of the Python language is a result of the combination of features which give this language an edge over others. Some of the benefits of programming in Python include:

#### Open Source and Community Development:

Python language is developed under an OSI-approved open source license, which makes it free to use and distribute, including for commercial purposes. Further, its development is driven by the community which collaborates for its code through hosting conferences and mailing lists and provides for its numerous modules.

#### Extensive Support Libraries:

Python provides alarge standard library which includes areas like internet protocols, string operations, web services tools and operating system interfaces. Many high use programming tasks have already been scripted into the standard library which reduces length of code to be written significantly.

#### Learning Ease and Support Available:

Python offers excellent readability and uncluttered simple-to-learn syntax which helps beginners to utilize this programming language. The code style guidelines, PEP 8, provide a set of rules to facilitate the formatting of code. Additionally, the wide base of users and active developers has resulted in a rich internet resource bank to encourage development and the continued adoption of the language.

#### User-friendly Data Structures:

Python has built-in list and dictionary data structures which can be used to construct fast runtime data structures. Further, Python also provides the option of dynamic high-level data typing which reduces the length of support code that is needed.

#### Productivity and Speed:

Python has clean object-oriented design, provides enhanced process control capabilities, and possesses strong integration and text processing capabilities and its own unit testing framework, all of which contribute to the increase in its speed and productivity. Python is considered a viable option for building complex multi-protocol network applications.

**Raspbian:**

**Raspbian** is a [Debian](https://en.wikipedia.org/wiki/Debian)-based [computer operating system](https://en.wikipedia.org/wiki/Operating_system) for [Raspberry Pi](https://en.wikipedia.org/wiki/Raspberry_Pi). There are several versions of Raspbian including Raspbian Stretch and Raspbian Jessie. Since 2015 it has been officially provided by the [Raspberry Pi Foundation](https://en.wikipedia.org/wiki/Raspberry_Pi_Foundation) as the primary operating system for the family of Raspberry Pi [single-board computers](https://en.wikipedia.org/wiki/Single-board_computers). Raspbian was created by Mike Thompson and Peter Green as an independent project. The initial build was completed in June 2012. The operating system is still under active development. Raspbian is highly optimized for the Raspberry Pi line's low-performance [ARM](https://en.wikipedia.org/wiki/ARM_architecture) CPUs.

Raspbian uses PIXEL, **P**i **I**mproved **X**-Window **E**nvironment, **L**ightweight as its main desktop environment as of the latest update. It is composed of a modified [LXDE](https://en.wikipedia.org/wiki/LXDE) desktop environment and the [Open box](https://en.wikipedia.org/wiki/Openbox) stacking window manager with a new theme and few other changes. The distribution is shipped with a copy of computer algebra program [Mathematica](https://en.wikipedia.org/wiki/Wolfram_Mathematica) and a version of [Minecraft](https://en.wikipedia.org/wiki/Minecraft) called Minecraft Pi as well as a lightweight version of [Chromium](https://en.wikipedia.org/wiki/Chromium_(web_browser)) as of the latest version.

**4.5 Hardware Requirements:**

* Laptop
* Raspberry Pi
* LCD Screen
* Routers
* WIFI Adapter
* Speakers

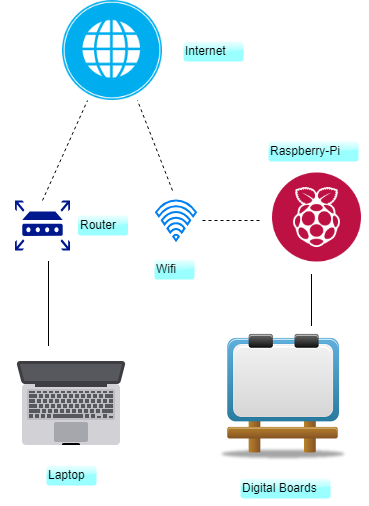
**4.6 Software Requirements:**

* Windows
* Python
* Dataplicity
* Raspbian

**Chapter 5**

**SYSTEM DESIGN**

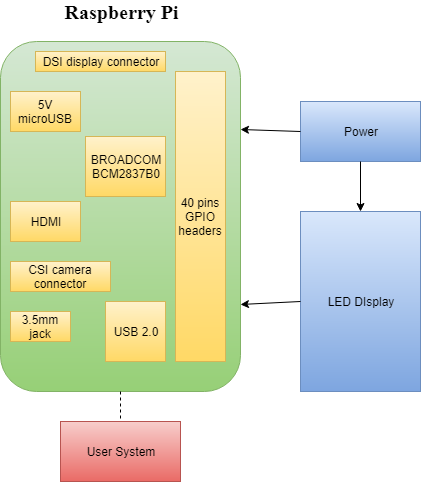
**5.1 Flow Diagram:**

****

**Figure 5.1:** Flow Diagram

This diagram shows that how the components are connected to each other in the local and remote network in the proposed system. Wherein the data is pushed from Laptop to the Digital Smart Board as shown in the above figure.

**5.2 High Level Design:**

****

**Figure 5.2:** High level design

This diagram shows the high-level design of the proposed system containing Raspberry Pi, LED/LCD display, Router and User Personal Computer and also shows that how these components are connected to each other and transferring the data from one unit to other in the network.

**REFERENCES**

1. Large Screen Wireless Notice Display System by Yash Teckchandani, G. Siva Perumal, Radhika Mujumdar, Sridhar Lokanathan [June 2015].
2. GSM Based Wireless Electronic Notice Board Display through ARM7 and LED by P. Sampath Kumar, V. Priyanka, Lakshmi Surekha, Y. Harish Reddy [May 2016].
3. Wireless Electronic Notice Board Using Raspberry Pi 3 by Er. G. Jalalu, Er. Polepogu Rajesh [June 2017].
4. An IOT Based Web Page Controlled Digital Notice Board by P. Bhaskara Chary, Dr. T. Srinivasulu [August 2017].
5. IoT based web-controlled notice board by Divyashree M, Harinag Prasad S, Sandeep G T, Bhavya S N, Poornima S [April 2018].
6. [www.python.org](http://www.python.org/) for details on python programming.
7. www.raspberrypi.org for details on Raspberry Pi.
8. www.raspbian.org for details on Raspbian OS.
9. www.dataplicity.com for details on Dataplicity.