Advanced Research in Electrical and Electronic Engineering
p-ISSN: 2349-5804; e-ISSN: 2349-5812 Volume 6, Issue 2 April-June, 2019, pp. 56-61

http://www.krishisanskriti.org/Publication.html

An Efficient, Reliable FM based Campus Notification Dissemination System

Sumaiya Rashid Magray, Mantasha, Syed Atqa Qadri, Sauleh Shah, Bushra Manzoor, [1]Liyaqat Nazir and Rouf ul Aalam Bhat

IOT, Universiy of Kashhmir
E-mail: [1]liyaqat_02phd13nitsri.net, roufulalam@uok.edu.in

Abstract—*An efficient notifying system is backbone for efficient communication of an organization or an institution. Many traditional systems are quite dominant and existing despite of having many loopholes present in them. Although many better systems have been proposed in the past that are working efficiently with the help of World Wide Web technology. Still with the advancement in technology there is always a need to revise many existing systems and propose an efficient solution for various drawbacks present in them. The work carried in this paper proposes a system that ensures timely reception of notifications by the users without being connected to the World Wide Web all the time. Current notification and announcement reception depends on web portals, groups on social media or short message system. The use of web portals and other mentioned techniques has many limitations such as high data usage and high-power consumption thereby making the current system inefficient and uneconomical. This paves a way to look for the alternate options. Hence a system is proposed that will broadcast notifications uploaded on the campus website automatically in some specified time slots via FM. The users have to tune into the specified radio frequency on their mobile phones to use this service. The proposed system is further equipped with Multicast system communication mode that is realized by integrating both piloting and auto broadcast on the same transmission channel. The system also facilitates text document narration into audio through FM band using various web scrapping protocols. The aim is to ensure that the probability of missing the notifications by the users is significantly reduced and also to provide the cheaper alternative to the users for receiving notifications as FM radios are cheaply available on all the mobile phones.*

Index Terms*: DTMF, nRF, FM, Notification System, mobile communication, Broadcasting.*

1. INTRODUCTION

Internet is a system architecture that has successfully revolutionized communication by interconnecting various computer networks around the globe. Internet has a wide range of applications especially in colleges, schools and universities. Currently it is the only way through which students can be notified about examinations, admissions and other campus related important notifications. However, in some scenarios internet may not be available to the users at all times, increasing the probability of important notifications being missed. Also, it is not efficient in terms of power to use cellular data as it drains the battery resulting in greater power consumption. Also, Communication between lecturers and students is very important in universities or colleges which may occur in two types; verbal or written. The issue that attracted our attention is the information such as postponement of classes, changes in class's venues et cetera that needs to be delivered urgently and immediately from one party to another. The common methods used for notifying students with this kind of information are either posting messages in the e-learning or via short messaging service (SMS). As mentioned earlier, internet has its own disadvantages, hence rendering the former method useless. The latter method of communication has certain inhibitions such as higher charges while communicating with different Telco operators.

Keeping this in view, we have proposed a system that uses FM to broadcast the notifications scrapped from the college website and serves as an alternative to the users to receive the notifications without being connected to the world wide web. FM provides a lot of advantages over SMS or web portals in terms of cost, power consumption and availability. It is a Cheaper Media and is available on all basic mobile phones.

Another addition to this system is a Smart announcement system that is realized by integrating both piloting and auto-broadcast on the same transmission channel. This is achieved by using DTMF technology. Piloting can also be done using nRF. A comparative study between the two has been done.

2. RELATED WORK

In this research we took notification broadcasting and announcement dissemination as our main objective. This is due to the fact that notification broadcasting & announcement are carried out using traditional methods. As a result, the proposed system is better in terms of power consumption, data usage, & is cost efficient. However, many related works have already been carried out and a number of notification systems have already been proposed in our real world. In research paper [1] notification messages are sent direct to the staff mobile phones via SMS & thus helps in timely reception of notification by the staff. However, SMS is costly & huge number of SMS transfers from server causes network congestion. Also, another research paper [2] is proposed where the system is developed using jabber protocol, distributed client-server architecture to ensure that the notification messages are conveyed in real time. This uses GPRS and is less costly than SMS.

Our proposed is different from above mentioned examples as it uses FM which is cost efficient compare to above mentions techniques. The system aims at delivering the notifications present on the website as well as important announcement in the campus using only FM. The users have to tune into a specific radio frequency to access notifications & announcements that are carried out via speakers which turn on & off using DTMS signals.

3. METHODOLOGY

The proposed system uses FM broadcast to transmit notifications present on the campus website after conversion into audio. The centers of interest for implementation of the project are organizations like universities, hospitals and schools. Both the transmission of audio signals and selection of receivers for announcements are controlled by designing a console.

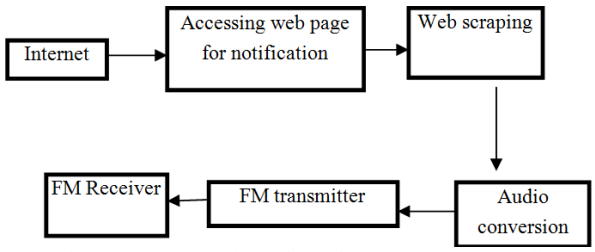

Figure 1: Block Illustration of notifications broadcast System

On the transmitting side internet is used to access the notifications present on organization website and are to be transmitted. After the notifications have been accessed, the data to be transmitted is scrapped and converted into audio. The Audio signal is given to FM transmitter which broadcasts these notifications as illustrated in fig 1. On the receiving side, users do not need access to the internet for reception of notifications but are required to tune into the FM station.

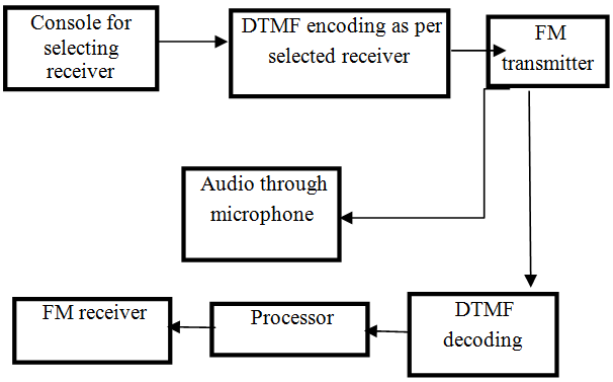

Figure 2: Block illustration of smart Announcement system(using DTMF)

For smart announcement system, a soft console provides an interface that allows user to select a particular receiver just by clicking a button on console as shown in fig 2 and fig 3. In smart Announcement system we use a microphone, DTMF encoder followed by FM transmitter. On the receiving end, DTMF decoding circuitry integrated with FM receiver is used for reception on selected receivers.

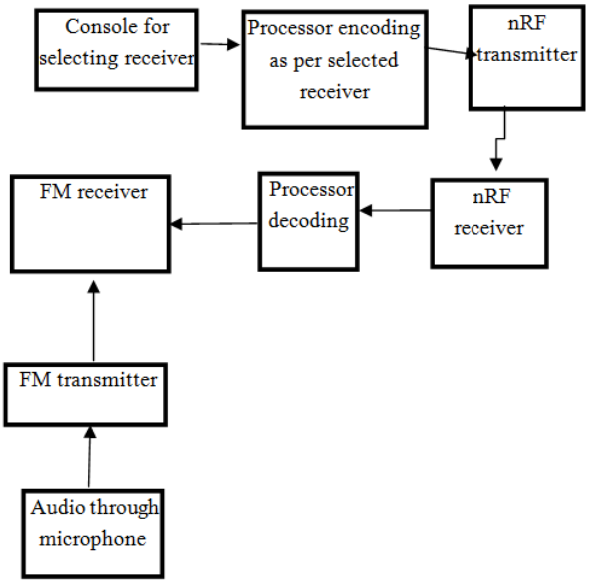

Figure 3: Smart announcement system(using nRF)

4. HARDWARE DETAILS

The hardware used in the implementation of Campus Level Notification Dissemination System is Raspberry Pi which performs the task of processing and handling of data. It also performs the task of controlling the hardware connected to it.

In Broadcasting System, we used FM transmitter for broadcasting the web scrapped notifications. On the other side, we used mobile phones as FM receivers for the reception of broadcasted notifications. We choose FM transmission and reception frequency to be 87.5MHZ.

In Smart Announcement System we used Microphone, DTMF Encoding Circuitry followed by FM transmitter. On the other side we use DTMF Decoding Circuitry followed by FM receivers which are installed at various locations inside campus for the reception of announcements.

As for the software, we choose IDLE which is the standard python development environment. It works well on both UNIX and Windows platform. It has a python shell window, which gives us access to the python interactive mode. In IDLE we use Python programming language which is suitable for developing GUI , scrapping data from web and text to audio conversions .Besides, we used Raspbian as a software platform for Raspberry Pi.

5. RESULTS

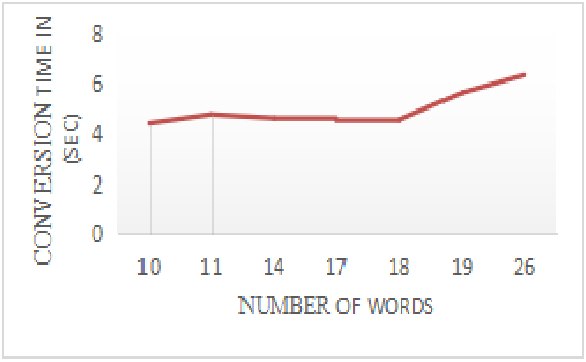

Figure 4: Graph showing conversion time depends on no of characters

TABLE 1: DELAY IN AUDIO CONVERSION

S. No	No. of Words	Conversion time(in sec)
1.	10	4.4
2.	11	4.75
3.	14	4.6
4.	17	4.52
5.	18	4.54
6.	19	5.63
7.	26	6.34

6. POWER CONSUMPTION RESULTS

In this section, we describe the demonstration of running of the system. As described earlier in this paper, the system is designed so that the probability of missing online notifications by the users gets decreased. Also, important announcements in the campus are conveyed immediately and efficiently.

The controlling section is considered as an essential component which controls broadcasting of audio signal and selection of receivers for immediate delivery of announcements. The console is programmed using high level general purpose language, hence following results are inferred from it :

A. *A. Reliability*

Reliability is the degree to which research method produces stable and consistent results. This project is 100% reliable on transmitting and receiving end. In other words, whole data is successfully broadcasted to receiver and receiver succeeds in attaining the information completely.

B. Delay

Table 2: Scrapping time and conversion time for Sleep = 2 sec

Notification Number	No. of words	Web Scraping time(sec)	Audio Conversion time (sec)
01.	11	5.9	4.14
02.	10	2.75	4.98
03.	19	3.21	5.90
04.	17	2.4	4.78
05.	14	2.72	4.92
06.	26	3.16	6.24
07.	18	2.12	5.12
08.	11	2.61	5.24

Table 3: Scrapping time and conversion time for Sleep = 1sec

Notification Number	No. of words	Web Scraping time(sec)	Audio Conversion time (sec)
01.	11	4.86	3.90
02.	10	1.82	4.18
03.	19	1.89	5.78
04.	17	1.41	4.91
05.	14	1.38	4.98
06.	26	1.82	6.98
07.	18	1.02	4.47
08.	11	1.87	4.71

Table 4: Scrapping time and conversion time for Sleep = 0 sec

Notification Number	No. of words	Web Scraping time(sec)	Audio Conversion time (sec)
01.	11	3.10	3.61
02.	10	0.9	4.52
03.	19	0.1	5.67
04.	17	0.1	4.80
05.	14	0.1	4.82
06.	26	0.1	5.98
07.	18	0.1	4.21
08.	11	0.1	4.56

TABLE 5: POWER CONSUMED BY THE TRANSMITTER

Power Consumed by Notification Broadcasting System	5.4 W

As shown in the table 2, table 3, table 4, the delay in the program that is the Sleep time (number of seconds for which the code is required to be stopped) does not effect the reliability of the system. However, the time taken for scraping the data is increased as sleep is increased. Also, the time delay between scraping data and its conversion into audio signal for same notifications is approximately constant as shown in figure.

It was also seen that the speed of internet effects the time in which the data is received.

3.Power Consumption- The given idea of Notification Broadcasting uses Raspberry Pi and FM Transmitter and the calculated power consumed by the transmitter side is given in the table 5.

Also, we have implemented the idea of Announcement system using two technologies i.e, using nRF and DTMF. And a comparative study of Power Consumption has been done.

From table 6, it is easily inferred that power consumed in Broadcast mode is same for both the technologies. Both of them consume same Power in Broadcasting mode. From this observation, it can be concluded that DTMF technology is more efficient in our system as it uses less hardware for same power consumed.

Also, nRF has limited range of approximately 100m in LOS , thus DTMF technology was seen to provide a better range as it broadcasts via FM.

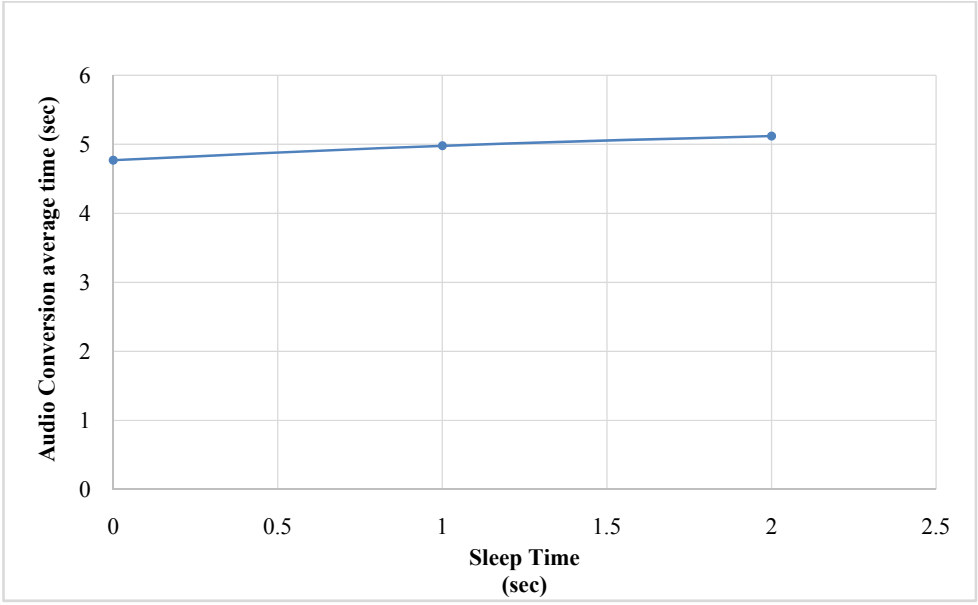

Fig. 5: Audio conversion time for varying sleep time

TABLE 6: POWER CONSUMED ON RECEIVING END

nRF	PILOTING	0.202W
	BROADCASTING	6.425 W
DTMF	PILOTING	6.429 W
	BRPOADCASTING	6.425 W

7. CONCLUSION

Our System uses FM broadcasting as it's key technique. In our research , relevant information is scraped from the specific website and is then converted into an audio signal. The converted signal is then broadcasted with some range using FM transmitter. Hence it would be inexpensive for users to access the notifications in the form of audio without having to access the World Wide Web. The notification system developed by us during this research requires access to the Internet by the administration for the system to operate ensuring a nearly real time reception of the notifications. The system being fully functional on the mobile devices as well provides the users an advantage of getting notified anywhere and at anytime. Furthermore, the system usage costs far less than a SMS based system or a jabber based system making it a more suitable choice for students and authorities. Today, a majority of mobile devices are equipped with tab technology which allows the students to still get notified while using other mobile applications such as a calculator. For mobile phones that do not support this technology. The notification system needs to be the active window. Furthermore, another module of Announcement System is added to the existing system. For further improvisation of the announcement system, the earlier used nRFs were replaced by DTMF technology. Although the amount of power consumed by both the technologies was found to be same, however a major difference is observed in terms of cost. DTMF technology requires less hardware in comparison to nRF based technology hence making the system less complex and more cost effective. Moreover DTMF tones are broadcasted via FM which also compensates for the limited range of nRF .

References

[1] QMI al-Zoubi, " Mobile-Based Notification System for University's Events." available at etd.uum.edu.my, acessed on 16th june 2019

[2] Hasan, MOHD HILMI, E. E. Mustapha, and H. R. Baharuddin. "Mobile University Notification System: A Jabber-based Notification System for Educational Institutions." Advanced Applications of Electrical Engineering (2015): 64-69.

[3] Sanmorino, Ahmad, and Ricky Maulana Fajri. "The Design of Notification System on Android Smartphone for Academic Announcement." International Journal of Interactive Mobile Technologies (iJIM) 12.3 (2018): 192-200.

.[4] "time.sleep in Python", Retrieved June 19, 2019, from http://www.geeksforgeeks.org/

[5] "Research Reliability", Retrieved June 18, 2019 from http://www.research-methodology.net/

[6] "Nrf24L01", available at https://lastminuteengineers.com Retrieved June 13, 2019,

[7] Agrawal, Ashish, et al. "SMS Based Notification System For Identifying The Faulty Equipment's Of Blast Furnace."

[8] T. Supe, A. Shinde, A. Shetty and M. Sonawane, "SMS based remote mobile phone data access system", International Journal of Advanced Research in Computer and Communication Engineering,

[9] S. Ismail and M. N. Husen: "Adoption of SMS and web based system to measure usability and effectiveness of text alert system as broadcast communication for managing and disseminating information", International Journal of Computer and Communication Engineering

[10] .Neny Rostiati Suzan Agustri Nining Ariati, "Implementation of hubs as a medium to broadcast academic notifications in a college", Feb 2019