International Journal of Research in Engineering and Science (IJRES)
ISSN (Online): 2320-9364, ISSN (Print): 2320-9356
www.ijres.org Volume 6 Issue 10 Series I ǁ 2018 ǁ PP. 09-12

Transmission of Network Access Information using Sound Signal

Ye Hoon Lee
(Department of Electronic and IT Media Engineering, Seoul National Universityof Science &Technology, South Korea)

ABSTRACT*:* *Recently, IoT devices are widely used in smart factories and the like. These IoT devices require a network and typically use Wi-Fi. However, devices with Wi-Fi must be certified, and certification costs are high. So businesses are replacing authentication via USB, with the exception of Wi-Fi. However, using this method causes difficulties in setting up Wi-Fi. To solve this problem, we implemented a method of delivering configuration information using a low-cost microphone and speaker. In mobile application, input serial number of IoT device, select configuration information, convert it into binary data, and transmit it by frequency shift keying (FSK) method. At the receiving end, Arduino accepts and interprets the frequency through the microphone, demodulates it into binary data, converts it into serial number and configuration information, and checks it through the LCD.*

KEYWORDS: *Transmission, Network access, Sound signal, Wi-Fi*

Date of Submission: 27-12-2018 Date of acceptance: 12-01-2019

I. INTRODUCTION

Recently, smart factories are widely used. Smart factory can improve productivity, quality and customer satisfaction by installing internet of things (IoT) on facilities and machines. However, if additional IoT devices are installed in the plant, the cost of the plant will be expensive, which will be burdensome for the operator of smart factory. One way to reduce costs is to lower the installation cost of the facility, one of which is to remove the Wi-Fi module and not be Wi-Fi certified. This work exploits the sound signal for this purpose, so it does not need Wi-Fi certification and uses a relatively cheap microphone and speaker, so it has the effect of lowering the production cost.

This work is aimed at reducing the cost by sending Wi-Fi setting information to the sound signal through the microphone and speaker instead of the Wi-Fi which is inherent in the existing IoT device. In general, the sound signal generated by the mobile application comes out well, but it is observed that the sound signal does not come out as set when the frequency goes to the next. Therefore, it is needed to put stop of sound signal in the middle of the sound signal and it is neatly passed from the line which does not obstruct the time of the sequence to the next frequency.

In Arduino, there is a lot of trouble getting Sync signal. In this work, we use the delay functions to match the synchronization, but the times in Arduino and mobile application is not matched. Therefore, we solve this problem by counting how many times the corresponding frequency is obtained within a fixed time and counting it.

II. SYSTEM DESIGN AND IMPLEMENTATION

Basically, it is required to quickly and accurately detect the sound signal and analyzes the signal to obtain setting network installation information.Serial number is input, and the device configuration information is converted into binary data, and a mobile application that transmits by a frequency shift keying (FSK) method is implemented, and it can receive it accurately and read the serial number and setting information by implement ofa process board.IoT technology can be easily applied to various facilities. Smart phones already have built-in speakers, and microphones are cheaper than Wi-Fi certification fees, so they can be implemented at a more economical price.The LCD panel is used to make it easy to see if the desired setting is made with good quality. In our work, the whole operation overview is as follows.

- Launch mobile application
- Enter Serial Number and select setup information
- Convert binary data to two frequencies and transmit
- Receive frequency through microphone module in Arduino
- Data interpretation and transformation
- Data output using LCD board
- Compare input value with output value.

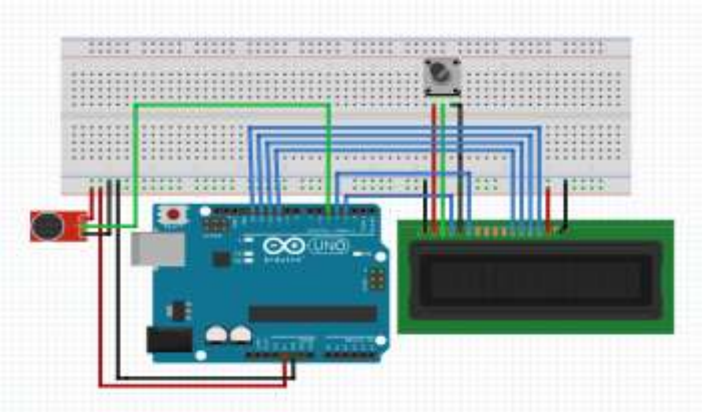

Fig. 1 Receiver side H/W configuration using Arduino

We used a microphone to accept the sound signal, an Arduino to implement the FSK method, and an LCD to check the results. It processes the FSK method which receives the sound signal sent from the mobile application and converts the frequency into binary data, and decodes the converted binary data into serial number and setting information again. It also includes a process to match the sound signal from the mobile application with the receiving Arduino's sync.

When the 800Hz signal came in, we change the values of the variables to match the sync. Then, when 1000Hz and 1500Hz signals are input, FSK demodulation method is used to store data in serial array and data array. The Arduino board used has 164 serial numbers. When the serial number is correct, the data is received until the end and the result is output. When the serial number is wrong, the serial number is received and the error message is displayed.Overall S/W code flow is as follows.

- Receive the sound wave signal of the mobile application through the microphone.
- When a signal of 800Hz is input, the frequency is not read for 5 seconds from the moment.
- After 5 seconds, read frequency again.
- When FSK method is applied and 1000Hz is entered,
- Stored as binary data 0 when 1500Hz is entered
- Convert binary data to serial number and setting information.
- Assume that the used Arduino is an IoT device with a Serial Number of 164.

III. TEST AND PERFORMANCE EVALUATION

We confirm that the sine wave of 800Hz appears properly. The 800Hz signal is used to synchronize the transmitter and receiver data. We also confirm that the 1000Hz sine wave is coming out properly. The 1000 Hz signal corresponds to '1' in the binary data. It is confirmed that a sine wave of 1500 Hz appears. The 1500 Hz signal corresponds to '0' in the binary data.

Since we assume that the Arduino used is an IoT device with Serial Number 164, Serial Number 164 and configuration information are randomly selected for Mode D. I have confirmed that the mobile application has to be equipped with serial number and selection of configuration information. I confirmed that I received the setting information only when the serial number sent from the mobile application was correct, and confirmed that the configuration information received was received properly at that time.

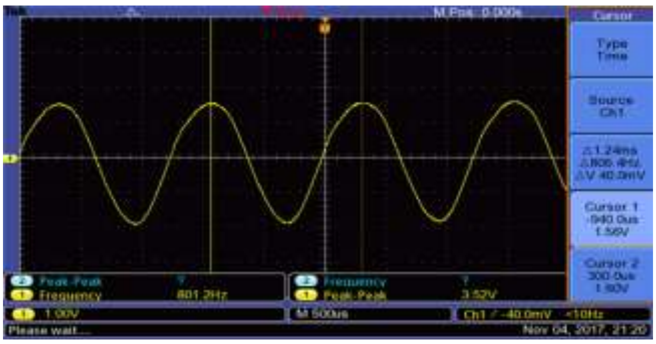

Fig. 2800Hz signal measurement result using oscilloscope

Fig. 3 Enter serial number in mobile application and select setting information and transmit.

Fig. 4Analysis and conversion results using Arduino (Serial Number=164, Mode D).

Since we assume that the Arduino Board you are using is an IoT with a Serial Number of 164, you can enter any serial number other than 164 and arbitrarily select configuration information with Mode G. When the data on the serial number sent from the mobile application is not correct, it is confirmed that the serial number is not outputted rightly. As a result, the subsequent setting information is not received.

Fig. 5 Post-Interpretation and transformation results (Not Matched).

IV. CONCLUSION

In this work, we created a mobile application, entered serial number, selected configuration information, and transmitted data through sound signal through FSK modulation method. On the receiver side, it receives the microphones, synchronizes them, demodulates them into binary data, converts them into serial numbers and configuration information, and confirms the results on the LCD. The binary data '1' selected a frequency of 1000Hz and the binary data '0' a frequency of 1500KHz. We also used a frequency of 800 Hz to match the sync. We assume that the Arduino Board used is an IoT device with serial number 164. Experiment Result When 164 Serial Number was input and setup information was sent, Serial Number was received and the setup information was sent to the LCD and a serial number other than 164 was input. In addition, the receiving distance of the sound signal in the receiving part is about 10 cm. To improve the efficiency, a filter, an amplifier, and an echo canceler should be additionally implemented. However, if you implement it, it will not fit the basic purpose of your work to save money.

V. ACKNOWLEDGEMENTS

This study was supported by the Research Program funded by the Seoul National University of Science and Technology (2017-0817).

REFERENCES

[1]. Y. Seo, Arduino communication project(Korea: Digital Books, 2015).
[2]. K. Y. Kim, J. H. Jung, M. S. Park, Arduino complete conquest (Korea: BokdooPublisher, 2014).
[3]. K. Karvinen, T. Karvinen, Make Arduino DIY project(Korea: Maker Media, 2014).

Ye Hoon Lee" Transmission of Network Access Information using Sound Signal" International Journal of Research in Engineering and Science (IJRES), vol. 06, no. 10, 2018, pp. 09-12