

Design of Semi Automatic Announcement System In The Public Address System Part of The Main Branch Office Soekarno-Hatta International Airport Angkasa Pura II, Inc.

1stPutra Maulaa Yusuf
Dept. Electrical Engineering
Universitas Sebelas Maret
Surakarta, Indonesia
putramy18@student.uns.ac.id

2ndIrwan Iftadi
Dept. Electrical Engineering
Universitas Sebelas Maret
Surakarta, Indonesia
iftadi@gmail.com

3rdAgus Ramelan
Dept. Electrical Engineering
Universitas Sebelas Maret
Surakarta, Indonesia
agusramelan@staff.uns.ac.id

Abstract—Facilities and services are needed reliable for the comfort of airplane passengers. One of the important facilities in airport services is the Public Address System (PAS). PAS is a notification system using sound electronically distributed with amplifiers, loudspeakers and microphones. PAS functions to provide information from the airport and airlines to be conveyed widely to airplane passengers. In order to reduce the possibility of misinformation or delivery of unclear information from the operator, the author aims to create Semi Automatic Announcement System (AAS) website where someone no longer needs to speak directly but only needs to enter a notification sentence, then the system from the website will speak or also can be referred to as text to speech. The system is expected to reduce misinformation so that information can be clearly understood by passengers.

Keywords—announcement, electronic, public address system

I. INTRODUCTION

Soekarno-Hatta International Airport is one of the largest airports in Indonesia with an area of 2,555 hectares, in addition to being the widest airport Soekarno-Hatta International Airport is the busiest airport in Indonesia, in 2020 the number of aircraft movements arriving will reach 90,800 and departures for 88,447 aircraft. for passenger movements departing through Soekarno-Hatta airport, namely 8,608,581 people and for passenger movements arriving 7,653,277 people on domestic or domestic flights [1].

Soekarno-Hatta International Airport has three passenger terminals, one cargo terminal, an airport train station (SKB) and an office building. The capacity of Soekarno-Hatta International Airport is able to accommodate as many as 65 million passengers per year [2]. With the large number of passenger and flight movements as well as airport service users, an information technology system is needed to assist in the smooth operation of airports both in terminal and non-terminal, one of which is the Public Address System (PAS) [3].

Public Address System (PAS) is a voice delivery system using electronic devices, namely a microphone as input, an amplifier as a process system, and loudspeakers as an output. By making Soekarno-Hatta International Airport the largest airport in Indonesia, Soekarno-Hatta International Airport is equipped with a Public Address System (PAS) in each building.

To improve the quality of service at the airport in the form of delivering flight information and other transportation such as airport trains and buses, the Semi Automatic Announcement System (AAS) was designed. With the Semi AAS, it is hoped that it will reduce errors in interpretation, increase clarity in conveying information, and deliver good intonation.

II. TECHNICAL APPROACH

A. Definition of Facilities

Facilities are anything that can facilitate and serve certain purposes such as objects, buildings, and infrastructure to facilitate certain activities. Soekarno-Hatta International Airport is the largest and busiest airport in Indonesia as well as being one of the exits and entrances to both domestically and abroad. Therefore, facilities play an important role in supporting, simplifying, and facilitating all activities at the airport [4].

B. Public Address System (PAS)

Public Address System (PAS) is a voice delivery system using electronic devices, namely a microphone as input, amplifier as a process system, and loudspeakers as output. Public Address System (PAS) functions as a notification of certain information that is heard thoroughly in a building such as airport terminals, offices, train stations, and bus terminals [5].

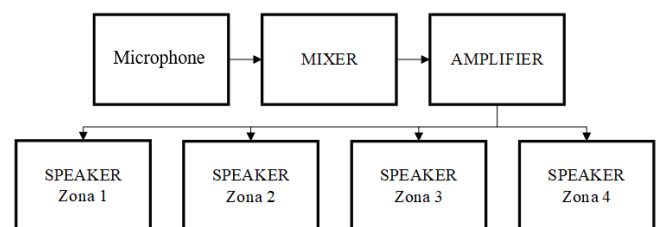


Fig. 1. Simple PAS Block Diagram

Public Address System (PAS) is a very important system for commercial areas such as airports. PAS is useful as a communication tool to airport service users, as well as to support airport operational activities such as flight information, emergency situations, and other information that can be conveyed [6].

C. Microphone



Fig. 2. TOA Chairman Unit TS-901

Microphone is a device that converts acoustic energy or sound waves into electrical signals such as a transducer. The microphone also functions to convert low-intensity sounds into high-intensity ones. Microphones are found in many electronic devices such as telephones, recording devices, and laptops. There are many types of microphones, namely reluctance microphones, carbon microphones, ribbon microphones, piezoelectric microphones, capacitor microphones, electret microphones, and moving coil microphones[7].

In the Public Announcement System (PAS) the presence of a microphone device is very important to convey good information to airport service users, besides that the microphone also functions as input from the Public Address System (PAS) so that the selection of specifications and characteristics of the microphone to be used is also very important.

D. Amplifier



Fig. 3. TOA PA Amplifier ZA-230W

Amplifier in the audio system serves to duplicate the signal as accurately as possible, the amplifier must be able to double the incoming signal and will amplify the signal and endeavored to keep the sound output clear or unchanged[8].

In the mixer, loudspeaker management, system amplifier which functions to contain one circuit to another and as additional power to minimize signal strength loss due to distance and other processes. Each signal to be sent through an amplifier is called a line amplifier or line drivers.

E. Mixer

Mixer is a tool that mixes a lot of input signals, and can perform signal acquisition. The use of the mixer itself is to

adjust the incoming signal to several parts to maximize the circuit path, adjust tone control that has been provided on each input channel (input channel) then sent with the sound output, adjust the incoming electronic signal and give effects to improve sound quality and modify the sound, the incoming signal to the mixer can be separated and duplicated which is then processed by the power amplifier [9].



Fig. 4. Yamaha MG10XU

F. Loudspeakers



Fig. 5. TOA Speaker ZS-1030 B

Loudspeakers are a transducer that convert electrical signals into audio signals with the principle of vibrating coils and other components in the form of a membrane to produce air vibrations so that sound waves can be heard. Loudspeakers have another function, namely as directing the sound issued so that it can be heard in a balanced and evenly distributed manner[8].

G. Automatic Volume Control

Public Address System on terminal 1, terminal 2, and terminal 3 already supports the Automatic Volume Control , namely the adjustment of decibel sound strength (dB) when paging or notification is made. At Soekarno-Hatta Airport, the sound power value has been predetermined, for sound power in buildings such as terminals is rated at 80dB to 87dB, while for outside buildings such as carcalls , the sound power value is determined from 87dB to >90dB. The provision of these values can be calculated by the average noise level of the sound [10].

$$L_{eq} = 10 \log \frac{1}{T} \left[\left(\frac{L_1}{10} \right) + \left(\frac{L_2}{10} \right) + \dots + \left(\frac{L_n}{10} \right) t \right] dB(A)$$

Where L_{eq} is the average noise level, T (seconds) is the length of time for data collection for noise, L_n is the number of data taken per second, and t is the lag time for data collection.

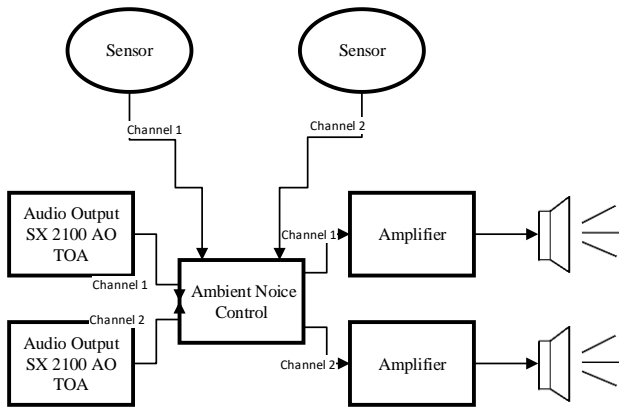


Fig. 6. Automatic Volume Control usage Chart

H. Speech Synthesis

Speech Synthesis is a change from text input to speech output. This change converts the text into a voice guide (Synthesis) which accurately resembles the original voice. Text to Speech (TTS) is used to read electronic texts as well as to voice text using voice chorus [11][14].

I. HTML

Hypertext Markup Language which is abbreviated as HTML is a programming language used to create the structure or foundation of a website. HTML as the standard language for hypermedia displayed on web applications, a website can be displayed on web browser applications by getting HTML files from the server. With HTML, users can arrange paragraphs, images, links, audio, video, headings, and so on so that they can show information to many people through web pages [12].

J. Java Script

JavaScript is a programming language for the web user side (Web Client Side), JavaScript is used in web development to make it look dynamic and interactive as well as optimize the functionality web of pages. JavaScript is included in the interpreter so that its users do not need a compiler to run the language program. JavaScript code is embedded in an HTML document with a `<script>` element and can interact with the document. All web browsers have a JavaScript engine that executes JavaScript code on the user's computer when the HTML is opened. JavaScript files have a ".js" file extension [13].

III. DESIGN AND IMPLEMENTATION

A. Design System

The Automatic Announcement System (AAS) Website Server at the Main Branch Office (KCU) of Soekarno-Hatta International Airport has three design stages, namely:

1. Input

Input is for the Automatic Announcement System obtained from the text value, rate value, and pitch value in the script program.

2. Process

At this stage of the process the script program reads the text value, gets the rate and pitch values from the set values and the server computer is connected with a 3.5 mm aux stereo jack cable to the amplifier.

3. Output

At the output or output reading process value is issued in the form of speech synthesis in which the text value, rate value, and pitch value loudspeaker are connected to an amplifier.

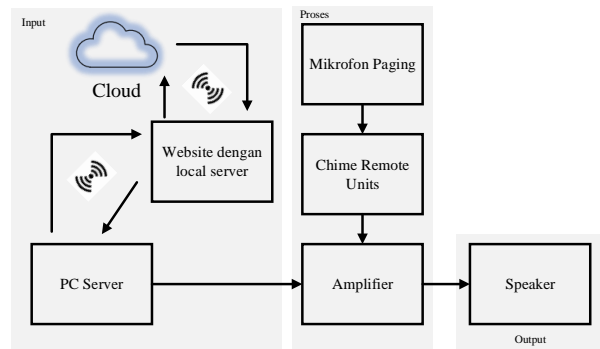


Fig. 7. System Block Diagram

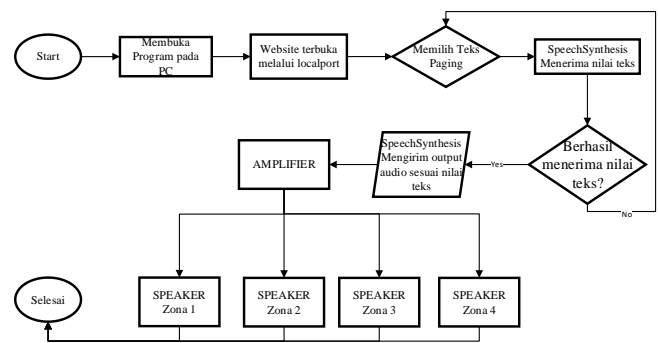


Fig. 8. System Flow Chart

B. Design Hardware

In the design of the Semi Automatic Announcement System components hardware, namely devices in the Public Address System (PAS) system. The hardware used is a computer as a server, an amplifier as a sound amplifier, and loudspeakers or speakers. For the addition of automatic volume control (AVC), a noise sensor with ambient noise control (ANC) is used. Noise level parameters are needed both outside the building and inside the building using a decibel (dB) meter.

1. To find the average noise value, the following formula is used

$$L_{eq} = 10 \log \frac{1}{T} \left[\left(\frac{L_1}{10^{10}} \right) + \left(\frac{L_2}{10^{10}} \right) + \dots + \left(\frac{L_n}{10^{10}} \right) t \right] dB(A)$$

2. In the level of sound pressure produced by loudspeakers, the greater the sound pressure issued, the louder output will be higher and vice versa, then

the value of sound pressure and loudspeaker output is directly proportional.

$$L_{Speaker} = 10 \log (10^{0.1L1} + 10^{0.1L2} + \dots + 10^{0.1Ln})$$

- To find out the value of the addition of sound power (dB) in the value of the difference between the average noise and the average sound pressure produced by the speakers.

$$\Delta \text{sound pressure} = L_{eq} - L_{speaker}$$

C. Electrical System

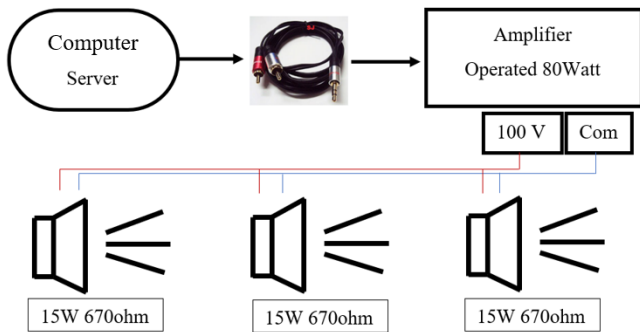


Fig. 9. Wiring Diagram Hardware

On the server computer that produces audio from speech synthesis, the computer is connected with a 3.5 mm aux jack cable to the RCA jack, then from the amplifier it is connected to the speakers located at the location. If you use more than one speaker, the speakers are paralleled and then set to 15 watts of power with an impedance of 670 ohms on 1 device. In the network between the amplifier and speakers at the location, the network impedance must be known by using an impedance meter from the amplifier to the speaker position using a cable. output impedance Amplifier \leq speaker impedance means that the impedance of the speakers cannot be less than the amplifier or equal to or greater than.

$$Z_{Impedance\ Total} = \frac{Resistance}{number\ of\ Speakers}$$

$$P_{Total\ Power} = P1 + P2 + \dots + Pn$$

D. Design Software

Design Software design for Automatic Announcement System website-based Text-to-Speech Application Programming Interface (API). By using Visual Studio Code, the programming language used is HTML as the structure and body for the website and JavaScript as the backend [15].

IV. RESULT AND DISCUSSION

By using HTML programming code as the structure and body of the website, the picture above is a semi-automatic website announcement system consisting of text data values, language selection, and sound settings for rate and pitch.



Fig. 10. Dashboard Website

The Fig. 11 shows the column for selecting the text data value that will be sent and will be made into a voice through Speechsynthesis, where the selected text data value will be read and made into a voice (Task to Speech) with the help of the API, and the test data value is in the HTML script code.



Fig. 11. Voice Data Column

The Fig. 12 is a column for language selection, where this language selection serves as a translation of the text data value which will then be issued in the form of sound according to the desired language, because the airport is a gateway for entry and exit from foreign countries, it takes quite a lot of language so that workers and passengers understand the information to be conveyed.

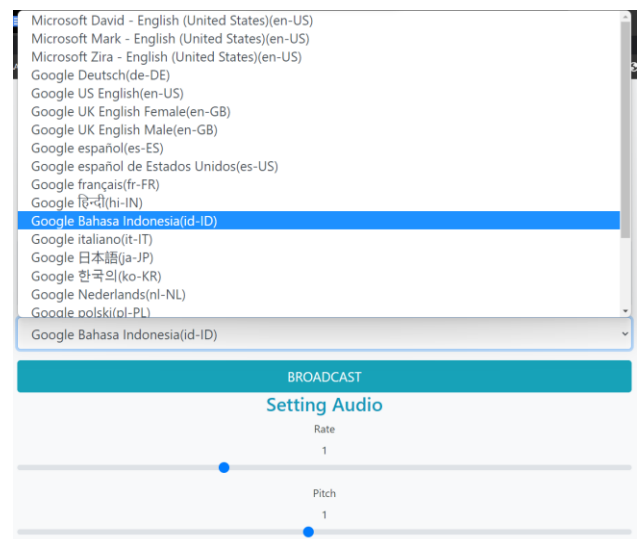


Fig. 12. Language Selection Column

V. CONCLUSION

Based on the results that have been obtained and the data obtained at PT. Angkasa Pura II Main Branch Office Soekarno-Hatta Airport can be concluded, Public Address System is a very important information notification system, especially at Soekarno-Hatta Airport. The design of the Semi Automatic Annoucement System at the Main Branch Office (MBO) of Soekarno-Hatta Airport is one solution to reduce problems in the information distribution system. Text data that is in the Semi Automatic Annoucement System must be static because data entry is still conventional through a web program. As well as the addition of a database on this web is highly recommended to facilitate the entry of changing information such as flight schedule data.

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