

## CHAPTER 3

### RESEARCH METHODOLOGY

#### 3.1 Subjects and Research Objects

A research subject is a person, place, or thing considered in the context of a research object, and a research object is a place of a research study.

##### 3.2.1 Subjects Research

This research aims to analyze and implement the security of audio files using the Vigenere cipher and the Playfair cipher. In this study, the objects of the investigation were audio files with wave extensions.

##### 3.2.2 Objects Research

This research was conducted at Universitas Muhammadiyah Kalimantan Timur, Jalan. Ir. H. Juanda No.15, Sidodadi, Kec. Samarinda Ulu, Kota Samarinda, Kalimantan Timur 75124.

#### 3.2 Data Collection

A needs analysis phase is conducted to find devices that will be used to implement security for audio files using the Vigenere Cipher and Playfair Cipher methods.

##### 3.2.1 Hardware

Before building the research system, we need to prepare some hardware. The list of devices used in this study is written in Table 3.1

**Table 3. 1 Hardware**

No	Name	Specification
1	Computer / Laptop	Processor: AMD Ryzen 7 4800H with Radeon Graphics (2.90 GHz) RAM: 16 GB Storage: 500 GB Graphic Card: NVIDIA GeForce RTX 2060 DirectX: 12

### 3.2.3 Software

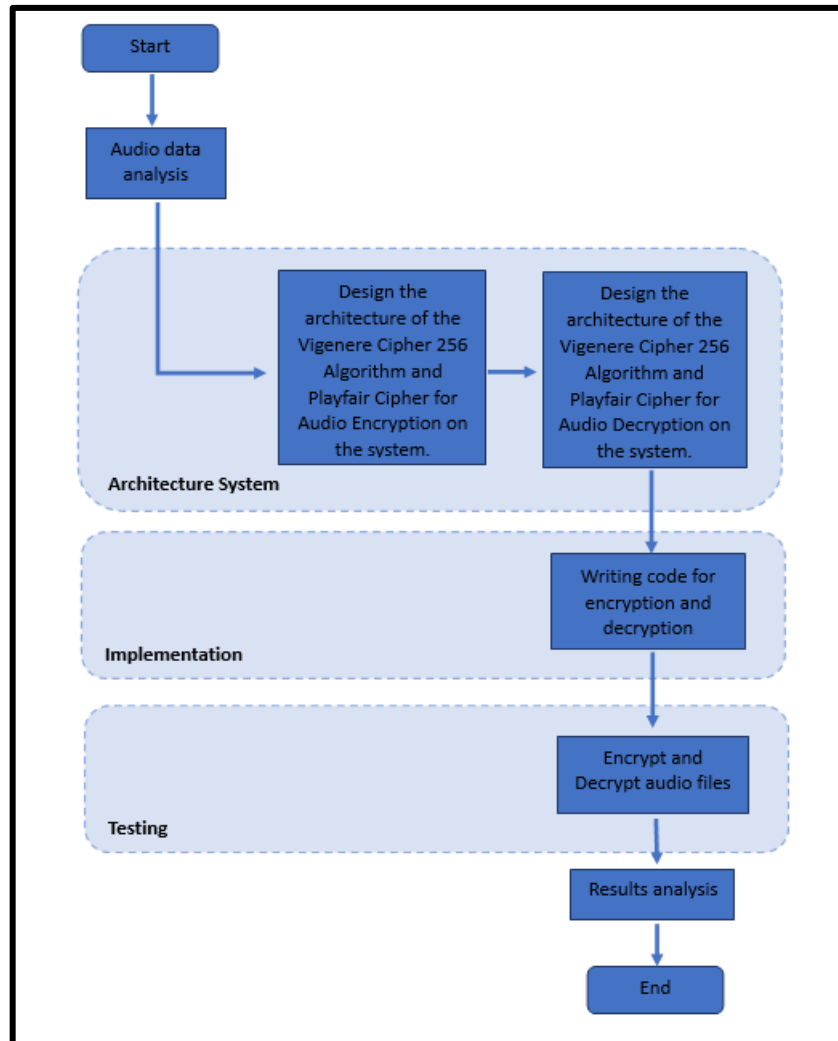
Before building the system, we will use some software. The list of software used in this study is written in Table 3.2

**Table 3. 2 Software**

No	Name	Specification	Function
1	Audio File	Extension *.wav	As the object of research that will be applied to the system to be designed
2	PyCharm Community Edition	Version 2022.2.3	As an editor, write down the Python programming language that will be applied to the system will be designed.
3	Python	Python	As a programming language that will be applied to the research system
4	HxD Hex Editor	2.5.0.0 (x86-64)	As an application to read audio hexadecimal values

### 3.3 Research Methods

This study requires several steps, including Analysis of voice data, determination of system architecture, implementation, system testing, and analysis of results. Figure 3.1 shows the flow chart for this study.



**Figure 3. 1 Research Methods**

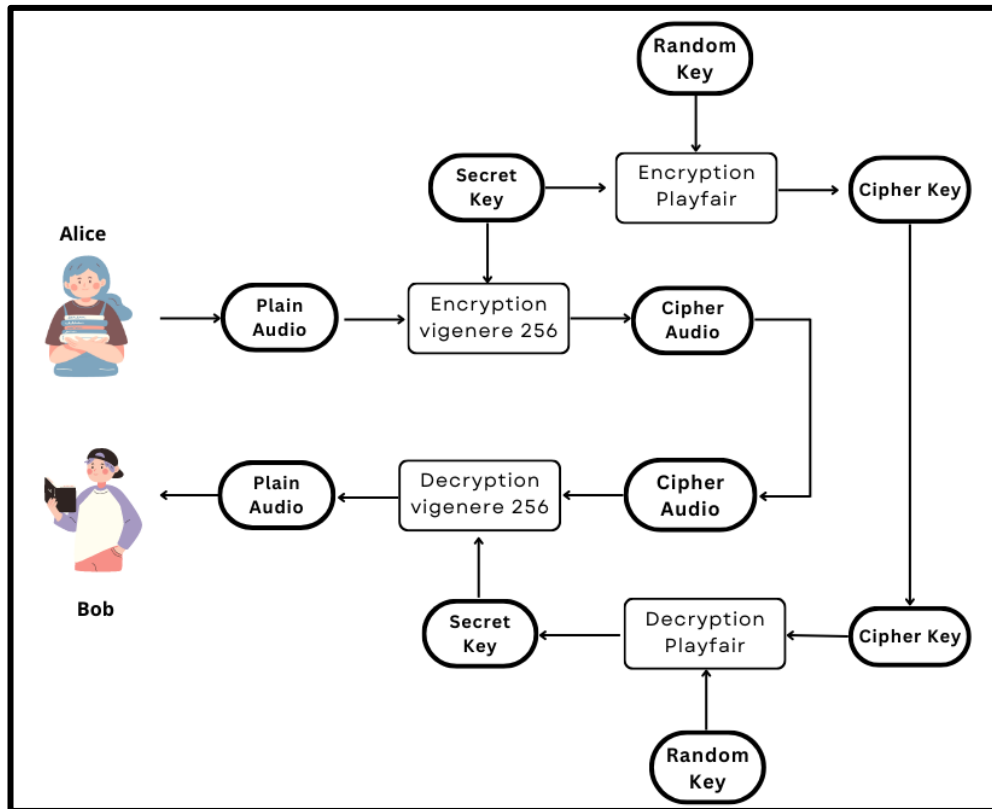
### **3.3.1 Audio Data Analysis**

In audio data analysis, an understanding of the characteristics, architecture, and audio data is carried out at this stage to produce information that will facilitate system design and increase the success of securing audio files.

Because the Wave file is a substance or part of the RIFF file, it inherits the RIFF file structure. This data section uses the Vigenere Cipher and Playfair Cipher methods to perform encryption and decryption.

### **3.3.2 Architecture System**

Determining the architecture system is one way to facilitate building the system described in Figure 3.2. This image explains how the audio file security system works using the Vigenere cipher and the Playfair cipher created.



**Figure 3. 2 System Architecture**

In Figure 3.2, it is explained that when Alice tries to send audio files to Bob, the audio is encrypted using Vigenere Cipher with the key determined by Alice. After that, the Secret Key that Alice has determined will be encrypted using a Playfair Cipher with a random key and produce a cipher Key. Cipher Key and Cipher Audio will be sent to Bob simultaneously. After getting a cipher key and audio cipher, Bob will decrypt the Playfair Cipher method against the Cipher Key first using the Random Key that has been approved by Alice and Bob and will produce a Secret Key, after that Bob will decrypt the audio with the Vigenere Cipher method with the Secret Key and will produce plain audio. Then Bob can find out the information given by Alice to him.

### 3.3.3 Implementation

Writing programming code for encryption and decryption with the Vigenere Cipher and Playfair Cipher using Python is done during the implementation phase.

### 3.3.4 Testing

Audio files are encrypted and decrypted during the test phase using the previously created system with the Vigenere Cipher and Playfair Cipher methods assigned.

### 3.3.5 Results Analysis

In this phase, some encrypted and decrypted audio samples are analyzed, such as time, size, success rate, and errors of encrypted/decrypted audio files.

### 3.3.6 Research Schedule

The survey will be conducted from February to May 2023, shown in Table 3.3.

**Table 3. 3 Research Schedule**

No	Activity	March				April				May				June							
		Week																			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4				
1	<i>Audio Data Analysis</i>	█	█	█	█																
2	<i>System Architecture Determination</i>				█	█	█														
3	<i>Implementation</i>							█	█	█	█	█									
4	<i>Testing</i>											█	█	█	█						
5	<i>Results Analysis</i>													█	█						
	<i>Write a Report</i>																	█	█	█	█