CHAPTER I
INTRODUCTION

I.1 Background

Epilepsy is a disorder that occurs in the nervous system of the brain and is caused by excessive patterns of electrical activity. This can cause sufferers to experience excessive seizures in part or all of the body [1]. Epilepsy occurs due to disorders of the brain's nervous system in humans, which can be seen in electroencephalogram signals [2]. However, in cases of epilepsy, there are no specific symptoms or signs to indicate that someone has epilepsy. For this reason, a person can be said to have epilepsy if several special checks have been carried out using medical devices. Although the exact source of this condition is unknown, the majority of individuals have a family history of epilepsy, making it a genetic disease. Epilepsy can also be caused by other conditions that affect the brain [3]. Epilepsy is the most common neurological condition. According to WHO statistics, epilepsy affects 1% of the global population. Anyone can have epilepsy anywhere in the world, regardless of race or social status. Epilepsy still has a high incidence, especially in underdeveloped countries, where it is 114 per 100,000 people annually. The prevalence of epilepsy is high in infants and young children, decreases in young and middle adulthood, and then increases again in the advancing age group [4]. In Indonesia, epilepsy is more commonly diagnosed using tools such as MRI and EEG. fMRI (functional magnetic resonance imaging) is a special tool used to check brain performance. This fMRI will also describe brain activity waveforms and can measure blood flow in every small change, in addition to brain performance [5]. Electroencephalography (EEG) is a tool used to detect abnormal brain activity that can trigger nervous system disorders or other diseases. This tool is equipped with two metal discs that will identify other activities from brain waves [6]. This tool is equipped with a computer that will record every brain wave. However, there are differences between the two tools, including the cost. An MRI examination is significantly more expensive than an EEG. As a result, more EEG examinations are performed in Indonesia.

Epilepsy does not have specific characteristics as a target for suffering. Sufferers can include both children and the elderly (elderly). Retno Jayantri Ketaren, a neurologist, was quoted in the SINDONEWS news. "Of the approximately 250 million Indonesian population, there are 1.5 million to 2.4 million people with epilepsy who must be treated." From this statement, it can be concluded that many people with epilepsy are Indonesian and spread in various regions.

From the problems above, the authors conclude that a system is needed that can process EEG signals into outputs that are simpler and faster to read and diagnose in patients. The output of this processing is data that proves the patient has a change in the EEG signal, which is usually done for 4–10 minutes. The output of the processing results will be distributed through the website with a network flow that will be secured by a firewall. Broadly speaking, this system will make it easier for doctors to diagnose patients and assist in conveying the results of an EEG examination that has been carried out by an individual and can assist in diagnosing a patient, whether the patient has epilepsy or not, by looking at the information that has been processed.

This system will be based on a website that can input data that will be received by doctors. This website will make it easier to deliver information on the results of an EEG examination. It is hoped that this website can be accessed throughout health services in Indonesia, which will make it easier for doctors who are thought to be far from the examination location and can assist in identifying whether a person has epilepsy. This website will have a display where one can input examination results, and doctors can access data on the website.

On this website, signal processing can be performed for epileptic patients where the data will be processed or read using an application with several programs including function edfread, header, function mean, 2D plot function, multi channel plot function, seizure extract function, and SVM classification. After we run all these programs, we get results in the form of 2D plot images, multichannel plots, and notepad txt. We also retrieve ten identity specifications of EEG patient data that are stored in txt format, which will later be uploaded to a web server and used to diagnose epilepsy.

A security system is a system that works to check and prevent unauthorized users from accessing a computer network. The purpose of a security system is to prevent data theft and damage to computer systems [7]. This website will be equipped with a security system in the form of a user login and will also use a security system in the form of a firewall. A firewall is security system software on a computer that aims to protect against viruses, spam, malware, and other types of attacks that can occur [6]. A firewall can also be defined as software that prevents unauthorized or illegal access to a private network. There are various types of firewalls from various generations. In making this website, the author will use the type of firewall from the latest generation, or NGFW (Next-Generation Firewall). NGFW (Next-Generation Firewall) is part of the 3rd generation of pre-existing types of firewalls.

I.2 Problem Formulation

Based on the background that has been explained previously, several problem formulations are obtained as follows:

1. How to process EEG signals using multiple programs in Matlab ?
2. How do you distribute epilepsy detection and health information using the website ?
3. How to secure the e-health system website for Epilepsy Detection Health Information Distribution using a firewall ?

I.3 Purpose

The aims of this research are as follows:

1. Processing EEG signals using several programs in Matlab
2. Building an e-health system for the distribution of website-based epilepsy detection health information
3. Securing the website using a firewall using the rules used

I.4 Problem Limitation

The limitations of the problem in this study are as follows:

1. The system that has been built is not real time.
2. Website-based information distribution

3. Menarik sepuluh spesifikasi data yang diolah berbentuk notepad.txt.
4. EEG data classification using the SVM program, which generates results for normal and seizure conditions.
5. The website will run on a LAN (local area network) network that can be accessed by different devices on one LAN.
6. Using the LOIC application for DDoS attacks
7. The tools used in building a firewall are OPNSense.

I.5 Research Methods

At this writing, several methods are used that are carried out systematically, namely as follows:

1. Problem Analysis

   At this stage, an analysis of the problems that occur around them is carried out; based on the research title, the researcher analyzes problems related to epilepsy.
2. Literature Study

   The next stage is a literature study from books, journals, and previous studies related to research. The study conducted is related to the system.
3. Designing System Design

   At this stage, the system design framework is designed.
4. Looking for Alternative Solutions

   Looking for several alternative solutions and deciding on an alternative system solution
5. System Implementation

   Build the system according to the design of the system and the alternative solutions chosen at the previous stage.
6. System Testing

   Perform system testing that has been built, such as system functional testing.
7. Conclusion

   Summarize the final results of the system development that has been carried out.

I.6 Writing Systematics

This research is structured with the following systematic elements:

CHAPTER I INTRODUCTION

Chapter I contains an explanation of the background of the problem, which is the basis for the development of the e-health system for the distribution of health information for epilepsy detection. By formulating the problem according to the background, making research objectives according to the existing problem, and determining the research method and writing systematics,

CHAPTER II LITERATURE REVIEWS

Chapter II contains the basic theory and supporting theories related to research.

CHAPTER III PLANNING SYSTEM

Chapter III contains the system design process that starts with making a system design, looking for alternative solutions, and choosing the best solution to build the system.

CHAPTER IV TESTING AND ANALYSIS OF SYSTEM WORK

Chapter IV contains the overall system development test results as well as an analysis of the test results.

CHAPTER V CLOSING

Chapter V contains conclusions based on the research that has been done and suggestions for future researchers.