CHAPTER I
INTRODUCTION

1.1 Background

Initial examination of patients or so-called vital signs is a technology that facilitates the implementation of patient monitoring and diagnostic systems anywhere: home, hospital, and outdoors (on the go). Physiological parameters are essential for assessing the patient's state of health and the type of possible disease. The proposed vital signs monitoring system can help the doctor by describing traces of critical physiological parameters, generating early warnings/warnings, and indicating any significant changes to the data. In addition, it can help patients to monitor their health status and communicate their concerns with health care providers [1]. Vital signs examination is essential to monitor the condition of patients who are in the nursing period, both inpatient and outpatient. The principle ofconducting this examination is not always the same for every patient, depending on the patient's condition. In patients with emergencies, of course,vital signs examinations are carried out more often to observe the patient's condition [2]. Changes in vital signs indicate the presence of organ disorders that play a role in maintaining hemodynamic balance. These vital signs include blood pressure, pulse rate, respiratory rate, and body temperature.

The rate of heart rate is one of the fundamental parameters in the human cardiovascular system. Everyone has a different heart rate depending on fitness, age, and genetics. When the heartbeat rate is irregular, it can be a critical sign. Medical experts use heart rate measurements to diagnose the patient's condition. A normal adult heartbeat rate ranges from 60 to 100 bpm. Heart rate abnormalities can occur when the rate is less than 60 bpm, known as bradycardia. In addition, heart rate abnormalities can also occur when the rate exceeds 100 bpm, known as tachycardia (Dena Anugrah et al., 2016) [3].

At this time, countries worldwide are experiencing problems that are very detrimental to the country and every individual in the world with the emergence of Covid-19. This outbreak has made all countries in the world.

roll out lockdown rules to break the chain of the spread of Covid-19. This outbreak indeed increased hospital patients, which also impacted the time medical personnel responded to patients because Covid-19 is a severe disease. Safety is needed during physical examinations for patients. So that hospitals still need a system that can quickly and accurately determine the results of the patient's initial examination.

Fuzzy Tsukamoto is a consequence of the rule that IF-THEN must be represented by a fuzzy set with monotonous membership functions. The output of the inference results of each rule is given strictly (crisp) based on the α- predicate (fire strength). The final result was obtained using the weighted average [6].

LoRa is a proprietary spread spectrum modulation scheme derivative of Chirp Spread Spectrum(CSS) modulation that exchanges data rates for sensitivity in fixed channel bandwidth. LoRa has the characteristics of low bandwidth with a wide range of coverage and uses low power [8]. When the patient moves to a location outside the connection, the interruption of monitoring data from the patient to the doctor's monitoring center results in the monitoring system data not being appropriately monitored, threatening the safety of patients in the hospital, the weakness of the previous system is that in general, the hospital has not implemented an interconnection system between the patient and the doctor who maintains it so that if the patient is in an emergency sometimes, it cannot be appropriately serviced, resulting in critical patients or even death because it requires time to receive data that is still manual. This system can interconnect without wires between the patient and the medical team and display the patient's condition remotely on the monitor screen in real time.

The system can also determine the patient's health condition based on heart rate, body temperature, respiratory rate, and blood pressure. Then with the addition of the LoRa protocol using the LoRa SX1278 module, data transfer communication becomes faster. The quality parameters of use of the LoRa SX1278 module are located at the lag time of data receipt, and the quality of the data received.

1.2 Problem Identification

By the explanation above, in this study, the author formulated the problem of how to model Tsukamoto's fuzzy algorithm for real-time data decision-making of initial examination of patients based on LoRa SX1278. With the application of Tsukomoto's fuzzy logic, the system assists users in determining the proper patient handling from the results of body temperature and heart rate measurements. Long-range (LoRa) protocol transmission is expected to solve the problem of data movement in two far-flung places so that users get fast and accurate results.

1.3 Research Objectives

The purpose of this study was to model Tsukamoto's fuzzy algorithm for real-time data decision-making of initial examination of patients based on LoRa SX1278 on the patient's condition classification system. Furthermore, a reference for the development of hospital equipment can later speed up the handling of patients. It can also minimize the transmission of covid 19 because there are no crowds when the initial examination can be done quickly.

1.4 Limitations Of The Issue

The limitations of the problems in this study are:

1. Performance testing using QOS. Not discussing specific diseases
2. Research is carried out in the form of prototypes
3. It does not discuss data security
4. Accuracy testing using MAPE
5. Fuzzy moto de used using fuzzy Tsukamoto
6. Only measure heart rate, SPO2, and body temperature
7. Performance testing using QoS.

1.5 Hypothesis

In this study, a system is designed and built that can classify patient conditions based on sensor data and health criteria and can communicate remotely using the long-range (LoRa) protocol of the SX1278 module. The expected result is that the classification given conforms with the measured patient's condition and can communicate between transmitters. and recievers

within the capacity distance from the SX1278 module. This research contributes to doctors or health nurses in helping monitor patient conditions to interact indirectly and more effectively and efficiently for the transmission of patient data (body temperature, blood pressure, respiratory rate, heart rate) using a LoRa-based real-time patient initial examination monitoring system with the Tsukamoto fuzzy method to speed up monitoring. This study provided construction using the Fuzzy method and implementation of vital signs using LoRa as transmission. LoRa has an extended range of specifications.

1.6 Research Methodology

In this study, the methods used were Tsukamoto's fuzzy logic method and the long-range protocol (LoRa) communication method. In this system, Tsukamoto's fuzzy logic analyzes the input results from temperature and heart rate sensors to classify the patient's condition and determine the treatment given to the patient. Then, using the LoRa protocol communication media, the built system can communicate at a long distance or be in a separate location. Thus, the system built can implement an intelligent system of patient condition classification that can communicate over long distances using the LoRa protocol through radio waves.

This thesis is divided into two parts of a working package to produce results. The division is :

1. This thesis identifies and calculates the results of Arduino-based vital signs
2. The design in this study uses the Fuzzy Method in classifying implemented with Arduino and uses the Lora communication module.
3. This thesis made a prototype of a vital signs gauge tested using MAPE and QoS.

1.7 Writing Systematics

The systematics of writing this research report is compiled into several chapters as follows:

- CHAPTER I INTRODUCTION

This chapter contains an introduction that explains the background, problem formulation, objectives, limitations of the problem, research methodology, and writing systematics.

- CHAPTER II THEORETICAL FOUNDATIONS

This chapter contains the theoretical basis as a reference parameter for the implementation of this research. The theoretical basis is the results of related research, simulation, initial examination of patients, Fuzzy Tsukamoto Logic.

- CHAPTER III SYSTEM DESIGN

This chapter explains the stages of research design and the framework of research concepts used for system modeling. With this research methodology, it is hoped that it can provide instructions in formulatingresearch problems.

- CHAPTER IV IMPLEMENTATION AND TESTING

This chapter includes system and application implementation. Application test results include test scenarios, test results, and functional testing.

- CHAPTER V CONCLUSIONS

This chapter contains the conclusions of the system created and suggestions for other purposes.