Implementation of Wireless Sensor Network as Fire Detector using Arduino Nano

Andi Ray Hutauruk, Jomen Pardede, Pangeran Aritonang, Rosari Fernanda Saragih, Albert Sagala

Institut Teknologi Del, Indonesia

andihutauruk2@gmail.com, jomenpardede@gmail.com, aritonang1997@gmail.com, rofersa14@gmail.com, albert@del.ac.id

Abstract— **At this time there are still many fires that occurred. One cause of this disaster is human negligence. Fire can cause damage to lives and financial loss. The first indication of fire is smoke and fire, or gases too. This paper presents the application of a fire detection system. This fire system will use Arduino Nano as a microcontroller and the wireless nRF24L01 as communication data. this system has 2 microcontrollers that have different functions. The first microcontroller will be used as the slave that detects fires by using fire, smoke and gas sensors. the second microcontroller will be used as a master that functions as an access point and is used to activate a fire warning in the form of a lamp and a buzzer sound. Tool design has a small size, efficient, easy to use and has met the system that has been designed without reducing the reliability and power of the system. In this study, we will make the slave consist of three parts with different locations.**

Keywords— ***Arduino Nano, Fire Detection, Wireless Sensor Network.***

I. INTRODUCTION

Fire is one of the incidents that often occur during the days. Fire can cause damage to lives and financial loss. It's caused by the lack of active protection and passive protection about the first indication of fire. The first indication of fire is smoke and fire, or gases too. One of the passive protection systems detects the first indication of fire uses wireless sensor network. The wireless sensor network is the main proportion to collect information needed by the initialized network, whether in the industrial buildings or automation systems [1].

Fire detection proposed by the author is to use an embedded system and wireless sensor network. The microprocessor used is Arduino Nano. Arduino Nano is a microprocessor development board that is small, complete and supports the use of a breadboard. Arduino Nano was created based on the ATmega 328 microcontroller (for Arduino Nano version 3.x) or ATmega 168 (for Arduino Nano version 2.x). The use of Arduino Nano is expected to be a smaller and more efficient design. Arduino is an electronic platform open to the public based on easy-to-use software an and hardware. This device is made so that everyone can make a project. Arduino can be programmed using the Arduino Development Environment (Arduino ID). Arduino Nano is also easy to find on the market and low cost. [2] [3].

This fire detector uses a communication system using wireless nRF24L01. The wireless nRF24L01 is a single-chip radio transceiver for the world ISM 2.4 - 2.5 GHz band ISM RF waves (Industrial, Scientific, and Medical). This module uses the SPI interface to communicate. The working voltage of this module is 5 V DC. The transceiver consists of a fully integrated frequency synthesizer, power amplifier, crystal oscillator, demodulator, modulator, and Enhanced Shock Burst protocol engine. nRF24L01 was also developed to overcome the problem of energy consumption. Users of nRF24L01 are developed so that system performance is high but does not lead to a decrease in system reliability [4] [5] [6].

Fire sensors, smoke sensors, and gases sensors are used as a tool to detect fires. The author focuses on sending and receiving data using wireless sensor networks. in this study, two devices have created that function to send and receive data. In the event of a fire, a data notification will be sent. when the data notification is received, the fire alarm in the form of lights and buzzers will be activated. It is expected to accelerate response times to evaluate fire events. And notice to the fire investigation team is the location mark or when the fire occurred. It is expected to make it easier to find locations. In its implementation, the situation to be detected is limited to 3 rooms (15cm x 15cm x 15cm). Sensor placement is done randomly.

II. RELATED WORK

In this section, the current studies are evaluated that have been applied with Zigbee 802.15.4 to detect fire incident by Jusak and Fardhan Arkan in their research about wireless sensor networks. Zigbee uses a WiFi network (Wireless Fidelity) as the communication media with the frequency 2.4 GHz [7]. On the other side, the research about wireless sensor network has been done with Parallax 433MHz using radiofrequency. The range of that Parallax is 250 meters (NLOS / No Line Of Sight) and 350 meters (LOS / Line Of Sight) [7] [8] [9]. In general, all of that related works is difficult for the user to get the data.

During the last decade, the number of mobile phones has increased rapidly in the developing world [10]. By this increasing, it will be possible to use a smartphone's feature for many good things, also as the communication media for fire detectors. Communication system in mobile phones is using GSM (Global System for Mobile