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Determination of the Most Effective WiFi Signal Intensity Area in an Enclosed Room

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ABSTRACT

WiFi signal is an electromagnetic wave that in its transmission does not require an intermediary medium used in communication. However, signal intensity can be affected by the medium through which it travels, as is the case in the workplace. So the WiFi signal no longer provides the same strong intensity. Therefore, it is necessary to research how to determine the area with the most effective WiFi signal intensity due to fluctuating signal propagation in a closed workspace. This research is conducted by showing the source point of the router and receiver that will be used as a trip to the position function, then measurements will be made on the WiFi signal depending on the change in position. In addition, the influence of temperature and humidity in the room is also related. The results showed that the highest WiFi signal intensity was at a distance of 0.5 m from the router with a power loss of -47 dBm. While the value of the lowest WiFi signal intensity is in the range of 3 m with a power loss of -25 dBm.

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1. INTRODUCTION

The internet is a communication service that provides convenience in the process of sending data online and in real-time [1-3]. The world of information technology continues to lead to the use of wireless technology. Internet access can also be done in various ways, including using a cable or a wireless local area network (WLAN) [4, 5]. In a WLAN using the air as the delivery medium. The use of WLAN-based networks is widely used in offices, schools, campuses, cafes, restaurants, malls, and even public facilities such as public libraries and city parks equipped with WLAN. WLAN campus environment is widely used in classrooms and lecture buildings [6-8].

However, in use, we often experience lagging or malfunctions. Lagging and malfunctions are caused by a decrease in the signal from the signal source or damage to the WLAN device. The decline in signal quality that occurs is caused by the disruption of the signal transmission process due to many factors [9, 10]. WLAN uses electromagnetic waves to transmit signals, many factors cause the transmission process is not optimal [11, 12]. Like other electronic devices that operate on the same frequency as the WLAN access point, this causes interference in humidity and temperature conditions [13], environmental topology [14], wave reflections [15], and room location [16].

Conditions and topology of closed rooms always use AC. This is indicated to be a factor in disrupting WiFi signal transmission and causing a decrease in WiFi performance. In addition, there are other electronic devices that cause variations in the thermal state of a room. Therefore, this study was conducted to determine the characterization of the WiFi signal in terms of normal temperature and humidity in a closed room and to obtain the optimal WiFi reception distance in the thermal conditions of the room so that the accuracy of the access point as a WiFi source can be more optimal and efficient.

2. RESEARCH METHODS

This study uses a WiFi network component, where the signal source comes from the router and on the other hand, the receiver acts as a detector. The WiFi signal is transmitted to the receiver through air media with certain humidity and temperature conditions. In this case, the influence of the medium on signal transmission and other influencing factors will be seen.

Figure 1. Simulation of router and receiver device design preparation in research

The process of measuring and collecting data in a closed room with a size of 2.5 × 3.5 m^2 with the signal source located at 1.75 m in the x-axis direction and 1.5 m above the floor. The preparation includes the preparation of equipment and rooms and the creation of a grid to determine the location (point) where the signal strength data will be taken. The distance between one study point is 0.5 m. The source of humidity serves as a tool to regulate humidity in the room as a process in research. This receiver is useful as a detector to retrieve signal strength data that is connected directly to the laptop. While the hygrometer is used to monitor the temperature and humidity in the room.

3. RESULTS AND DISCUSSION

The results of processing the intensity of the signal strength in the room can be seen in Figure 2. Where there are variations in the distance to take signal strength data. There are differences in WiFi signal intensity depending on the data collection point. The highest intensity is at a radius of 0.5 m from the router with a power loss of -47 dBm or 85% of the WiFi signal is successfully received by the receiver. While the lowest WiFi signal intensity is in the range of 3 m with a power loss of -25 dBm or the signal received by the receiver is only 45% of the total WiFi signal emitted by the router. In addition, various fluctuations in the WiFi signal intensity can be caused by interference from the interaction of metal objects, temperature, and humidity of the room [17, 18].

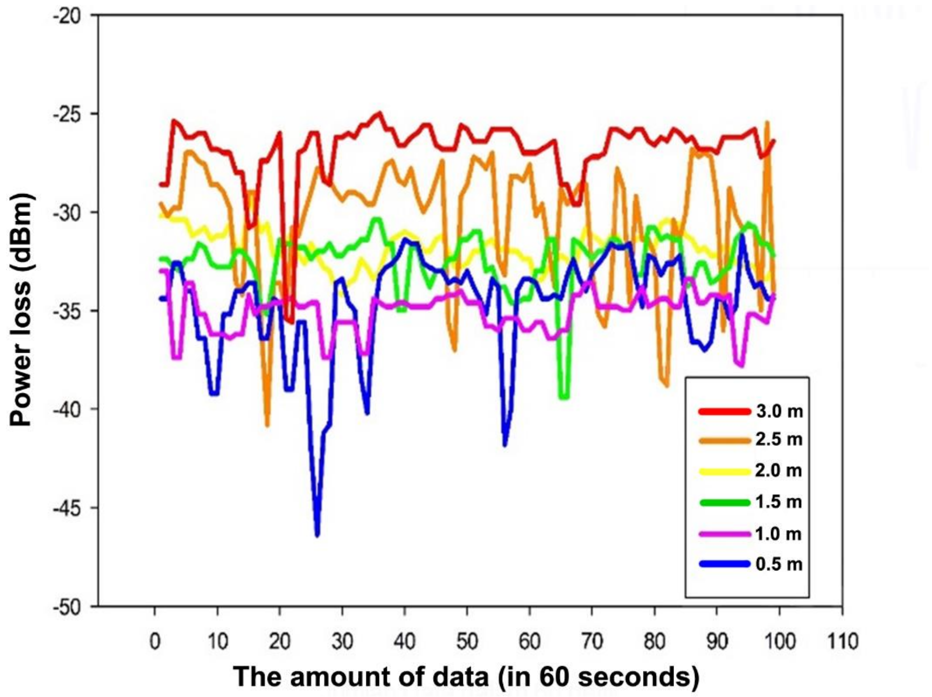

Figure 2. WiFi signal intensity for each receiver position

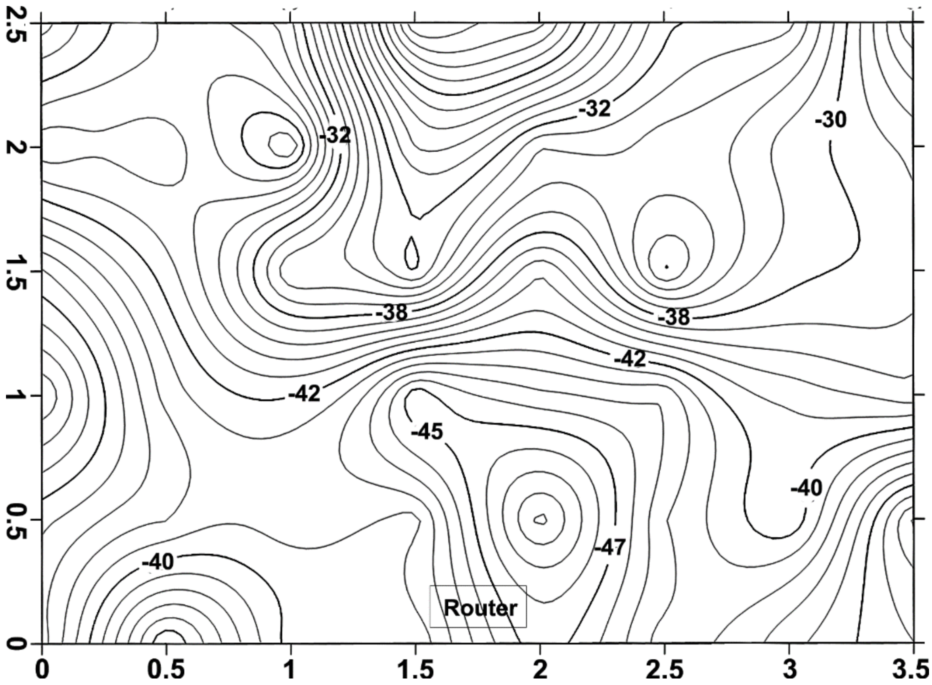

Figure 3. Contour area results from the realization of WiFi signal intensity

Figure 3 shows the contours of the WiFi signal distribution under normal conditions in the room. The highest intensity is obtained with the receiver's closest distance from the router, with the intensity area within reach of the receiving center. It is also seen that some points far from the source have a greater value than points close to the signal source. This can be caused by several factors such as the presence of other electronic devices or other objects that affect signal propagation and reception. This can lead to unavoidable and unpredictable absorption or reflection [19, 20].

4. CONCLUSION

The results showed that the influence of metal objects, temperature, and humidity of the room at each point can cause the intensity of the received WiFi signal to vary. The highest WiFi signal intensity is obtained at a distance of 1 m from the router with a power loss of -47 dBm, while the lowest is -25 dBm from the furthest distance. The further away the signal source is from the receiver, the lower the signal quality. The presence of electronic devices can interfere with signal propagation. In addition, humidity and temperature conditions are also factors that need to be considered in influencing the WiFi signal.

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