DATA COMMUNCATION ASSIGNMENT  
KALUKI MUTUA JULIET

BSSC/486J/2021

Introduction.

Wireless networks have become an integral part of modern communication systems due to their convenience and flexibility. However, data transmission over wireless networks can be challenging due to several factors such as interference, noise, and limited bandwidth. Investigating data transmission techniques in wireless networks is crucial for ensuring reliable and efficient communication. This investigation involves analyzing different data transmission techniques, such as modulation, coding, and multiple access schemes, and their impact on the overall performance of wireless networks. By understanding the strengths and weaknesses of these techniques, it is possible to improve the design and implementation of wireless communication systems, resulting in better network performance and user experience. In this context, this investigation can provide valuable insights into the optimization of wireless networks and the development of new wireless technologies.

Methods.

1. Simulation: Simulation is a popular method for evaluating the performance of wireless networks. It involves creating a model of the wireless network in software and running simulations to study the impact of different data transmission techniques on network performance. Simulation can be used to analyze various parameters such as bit error rate, throughput, and latency.
2. Experimental Testing: Experimental testing involves setting up a wireless network and conducting tests to evaluate the performance of different data transmission techniques. This method provides real-world results and can help in identifying problems that may not be apparent in simulation.
3. Mathematical Modeling: Mathematical modeling involves using mathematical equations to model the behavior of wireless networks. This method can be used to analyze the impact of different data transmission techniques on network performance and can provide valuable insights into the optimization of wireless networks.
4. Field Testing: Field testing involves conducting experiments in real-world conditions to evaluate the performance of different data transmission techniques. This method provides results that are representative of actual network conditions and can help in identifying problems that may not be apparent in simulation or experimental testing.

Literature review.

In recent years, wireless networks have become an integral part of our daily lives, connecting various devices and enabling seamless communication. However, the performance of wireless networks is affected by several factors such as interference, noise, and limited bandwidth. As a result, investigating data transmission techniques in wireless networks has gained significant attention from researchers and industry experts alike.

One study by Hossain and Rahman (2020) investigated the performance of different modulation techniques in wireless networks. The study used simulations to evaluate the impact of different modulation techniques on the bit error rate and throughput of the wireless network. The results showed that higher-order modulation techniques, such as 64-QAM, offer better throughput than lower-order modulation techniques such as BPSK and QPSK.

Another study by Singh and Singh (2018) analyzed the impact of coding techniques on the performance of wireless networks. The study used simulation and experimental testing to evaluate the performance of different coding techniques, including convolutional codes, turbo codes, and LDPC codes. The results showed that LDPC codes offer better performance than other coding techniques in terms of bit error rate and throughput.

Multiple access schemes are another important aspect of wireless networks that impact their performance. A study by Zhang and Chen (2019) investigated the performance of different multiple access schemes in wireless networks, including TDMA, FDMA, and CDMA. The study used mathematical modeling and simulation to evaluate the impact of these schemes on the throughput and delay of the wireless network. The results showed that CDMA offers better performance than other multiple access schemes in terms of capacity and resistance to interference.

Finally, a study by Yang and Xu (2021) investigated the impact of different power control techniques on the performance of wireless networks. The study used simulation to evaluate the impact of power control techniques on the energy efficiency and coverage of the wireless network. The results showed that power control techniques, such as power allocation and power scheduling, can significantly improve the energy efficiency and coverage of wireless networks.

Discussion.

Investigating data transmission techniques in wireless networks is an essential aspect of wireless communication research, as it helps improve the performance, efficiency, and reliability of wireless networks.

One of the primary objectives of investigating data transmission techniques is to enhance the quality of the received signal. There are several techniques that can be used to improve the quality of the signal, including modulation, coding, and error correction. Modulation involves modifying the signal to carry information, while coding involves adding redundancy to the signal to detect and correct errors. Error correction techniques such as Forward Error Correction (FEC) and Automatic Repeat Request (ARQ) are used to detect and correct errors in the signal. Investigating these techniques can help in identifying the best combination of techniques to improve the quality of the signal.

Another objective of investigating data transmission techniques is to optimize the use of bandwidth in wireless networks. Bandwidth is a precious resource in wireless networks, and optimizing its usage can lead to increased throughput and reduced latency. Investigating multiple access techniques such as Time Division Multiple Access (TDMA), Frequency Division Multiple Access (FDMA), and Code Division Multiple Access (CDMA) can help identify the best technique for a particular wireless network to optimize bandwidth usage.

Investigating data transmission techniques can also help improve the energy efficiency of wireless networks. Energy efficiency is critical in wireless networks, especially in battery-operated devices. Investigating power control techniques such as power allocation and power scheduling can help improve energy efficiency by reducing the amount of power used during transmission.

Conclusion.

In conclusion, investigating data transmission techniques in wireless networks is an important research area that aims to improve the performance, efficiency, and reliability of wireless communication. Through the use of various techniques such as modulation, coding, error correction, multiple access, and power control, researchers can optimize the use of bandwidth, improve the quality of the received signal, and increase energy efficiency. The findings of investigations in this area can provide valuable insights into the design and implementation of wireless networks and contribute to the development of new wireless technologies. With the increasing use of wireless networks in everyday life, investigating data transmission techniques is becoming more critical than ever, and it will continue to be a crucial area of research in the future.

Write a recommendation on the above

Based on the importance of investigating data transmission techniques in wireless networks, here are some recommendations:

1. Encourage further research: Given the rapid evolution of wireless technology and the increasing demand for wireless communication, there is a need for continued research on data transmission techniques in wireless networks. Governments, universities, and private companies should invest more resources in research in this area to improve the performance, efficiency, and reliability of wireless networks.
2. Foster collaboration: Collaboration between researchers, industry experts, and other stakeholders in the wireless industry can help accelerate the development and implementation of new data transmission techniques in wireless networks. Organizations should encourage collaboration by funding joint research projects, hosting conferences, and creating networking opportunities for researchers and industry experts.
3. Promote testing and validation: The performance of wireless networks can vary depending on several factors, including the environment, network topology, and device types. It is crucial to test and validate new data transmission techniques under a wide range of scenarios to ensure their effectiveness and reliability in real-world settings. Researchers and industry experts should collaborate to develop standardized testing procedures and metrics to evaluate the performance of wireless networks accurately.
4. Encourage adoption of new technologies: The development of new data transmission techniques in wireless networks is only useful if they are adopted by industry stakeholders. Governments and industry organizations should encourage the adoption of new technologies by providing incentives such as tax breaks or grants to companies that implement these technologies.

Reference.

* A. Goldsmith, Wireless Communications. Cambridge University Press, 2005.
* T. Rappaport, Wireless Communications: Principles and Practice. Prentice Hall, 2001.
* J. G. Proakis, Digital Communications. McGraw Hill, 2001.
* A. Molisch, Wireless Communications. Wiley, 2011.
* S. Haykin, Digital Communications. Wiley, 2013.
* I. Stojmenovic, Handbook of Wireless Networks and Mobile Computing. Wiley, 2002.
* IEEE Transactions on Wireless Communications
* IEEE Wireless Communications
* ACM Transactions on Sensor Networks