The comparative Study of the Effective Performance of Wireless Sound Transmission in five selected devices

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ABSTRACT

The comparative performance of five selected sound transmission devices has been achieved through successful installation of microphone, Bluetooth, headphones, live video transmitter and voice transmission in a multipurpose lecture hall (500 seaters capacity). A pop ulation of fifty (50) students was sampled out of five hundred (500) during the study, the analysis was prolonged up to one week with a view to obtain efficient data and result. It has been confirmed that microphone is found to have higher sound transmission efficiency while headphones with lower sound transmission efficiency compared to the rest of the other selected devices.

Keywords: Wireless, Sound, Transmission, Communication, Network, System.

1.0 INTRODUCTION

Wireless communication plays a significant role in day to day life. Besides communication, wireless technology has become an integral part of our daily activities. The transmission of data or information from one place to another witlessly is referred as wireless communication. This provides an exchange of data without any conductor through RF and radio signals. The information is transmitted across the devices over some meters to hundreds of kilometres through well-defined channels. The term wireless refers to communication without wires. In order to transmit information (voice or data) using wireless communication we need antenna. The antenna is the device which couples RF energy from one medium (i.e. wave guide, transmission line, etc.) to the other medium (i.e. air). We require two systems viz. transmitter and receiver to complete end to end wireless link. Wireless communication uses electromagnetic waves as medium for carrying the information through the channel between transmitter and receiver (Prashant, 2009). The term wireless refers to communication without wires. In order to transmit information (voice or data) using wireless communication we need antenna. The antenna is the device which couples RF energy from one medium (i.e. waveguide, transmission line etc.) to the other medium (i.e. air). We require two systems viz. transmitter and receiver to complete end to end wireless link. Wireless communication uses electromagnetic waves as medium for carrying the information through the channel between transmitter and receiver. The wireless communication revolution is bringing fundamental changes to data networking, telecommunication, and is

making integrated networks a reality. By freeing the user from the cord, personal communications networks, wireless LAN's, mobile radio networks and cellular systems, harbour the promise of fully distributed mobile computing and communications, anytime, anywhere. Focusing on the networking and user aspects of the field, Wireless Networks provides a global forum for archival value contributions documenting these fast growing areas of interest. The journal publishes refereed articles dealing with research, experience and management issues of wireless networks. Its aim is to allow the reader to benefit from experience, problems and solutions described. The primary and important benefit of wireless communication is mobility. Apart from mobility, wireless communication also offers flexibility and ease of use, which makes it increasingly popular day – by – day. Wireless Communication like mobile telephony can be made anywhere and anytime with a considerably high throughput performance (Linebaugh and Kate, 2013). Another important point is infrastructure. The setup and installation of infrastructure for wired communication systems is an expensive and time consuming job. The infrastructure for wireless communication can be installed easily and low cost. In emergency situations and remote locations, where the setup of wired communication is difficult, wireless communication is a viable option.

Communication in its simplest form is the transmission of information from one point to another via a medium either wired or wireless and is a bidirectional process (Anokh and Chhabra, 2007). Wired networks establish connection between various devices through connecting media such as cables and routers. Whether wired or wireless communication systems, all have network topology, which is the schematic form of switching elements, transmission links, routers and other peripherals. Network topologies are categorized into two distinct classes namely: physical network layout and logical network layout (Rajput, 2009). Wireless local area networks are commonly implemented using the Institute of Electrical and Electronic Engineers (IEEE) 802.11 standard. Wider area coverage is made possible by utilizing General Packet Radio Service (GPRS) the existing mobile phone infrastructure for the transmission. The integration between packet use and voice communication further evolved with the deployment of Third Generation and Universal Mobile Telecommunications Service (3G/UMTS), (Keren, 2011). This system is specially designed to carry packet data, video and voice communication with much higher capability, than previous wide area coverage networks. With the adoption of network technologies for the purpose of, education, business, banking and defence etc., these interconnected set of computer systems permits interactive resource sharing between connected pair of systems (Sharma, 2007). Rapid advances have taken place in the field of wired and wireless networks. The traditional wired transmission medium provides high speed connectivity but poses constraints like immobility and extensive cabling. Wireless communication is a flexible data communication system implemented as an extension to or as an alternative to wired communication (Randhawa and Hardy,

2002). The wireless technologies employ infrared, spread spectrum and microwave radio transmission techniques with varying data rates. Though wireless technology provides convenience and advantages like ease of mobility, scalability and flexibility, it has certain drawbacks like speed, range, reliability, security, bit error rate (BER) and hidden terminal problems (Tamar, 2000). The Wireless Local Area Network (WLLAN) is based on IEEE 802.11 standard using Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA) MAC protocol as access method. The wired Local Area Network (WDLAN) is based on IEEE 802.3 (Ethernet) standard with carrier sense medium access with collision detection (CSMA/CD) MAC protocol, as access method. In this research work the performance analysis of wired and wireless communication networks was carried out using some performance metrics, such as throughput, Packet Delay, Bit Error Rate (BER) and Signal to Noise Ratio (SNR) as a basis for comparison. In more recent times most researches on network performance were centred on TCP. A holistic view encompassing both throughput, delay and bit error rate in TCP, IPV4 and IPV6 remained relatively unstudied and this motivated this work. Several works have been done in different aspects of performance characterization of the IEEE 802 Standards. High quality services in both wired and wireless networks environment, accurate tracking and location prediction is one of the ways to significantly improve the performance and reliability of networks protocols and infrastructure. (Satish, 2012) compared wired and wireless networks in the area of installation, cost reliability and performance.

The performance parameters evaluated were throughput, data dropped, traffic received and collision counts. The authors analysed the wired and the wireless networks using OPNET simulator but, no physical measurement were made. (Rahul, 2011), the author cantered his performance analysis of wired and wireless computer networks on congestion control mechanism. The congestion control mechanism, is an important issue in designing any good network. The congestion control involves two factors that measures the performance of networks, i.e. delay and Throughput and the author analysed the two performance metrics using OPNET simulator. This work was purely simulation. Traffic patterns have significant impact on network performance. Analytical models for the performance evaluation of wired interconnection networks and integrated wireless network have been widely reported. However, most of these models are developed under simplified assumption of non-bursty poison process with uniform distributed message destinations. In light of the above, the author developed analytical model and propose it to evaluate end to end delay and throughput of wired and wireless local area networks under traffic patterns exhibited by real word applications. (Yulei and Dhobale, 2014), investigated the performance of wired and wireless networks. The performance of both networks were evaluated on the basis of a common parameter, throughput, to know how both networks behaves.

The evaluation analysis was done using OPNET simulation environment. In (Rahul, 2010), the authors carried out performance analysis of IEEE802.11b wireless and IEEE802.3 wired LANs standards using soft computing techniques for their performance comparison by varying the attributes of network objects such as traffic loads, file size, RTS/CTS, customizing the physical characteristics to vary BER, slot time to determine their impact on throughput and delay. In (Salam, 2007), the authors evaluated the performance of IEEE 802.116 wireless LAN applied in E-learning classroom. They used OPNET IT 9.1 simulator in their simulations to study E-learning classroom area network scenario. They build a model of browsing behaviour of E-learning and web client and investigated the performance of ELearning classroom area network based on these performance metrics, delay, throughput and web object size. And their results showed that IEEE 802.11b WLAN have a minimum delay, high throughput and can support up to 50 clients. In (Abdul, 2006), the authors carried out performance comparison of TCP and UDP over wired and wireless LAN. They used DSDV routing protocols to evaluate their performance. They compared TCP and UDP in terms of throughput using network simulator-2. Their results showed that the wired network has better performance than the wireless network in terms of throughput. The objective of this paper is to evaluate the performance of wired and wireless communication systems by carrying out measurement of throughput, delay and bit error rate in both networks

2.0 MATERIALS AND METHODS

Design of Study

The design used in this research work is the descriptive/correlative research design using the correlation study type, so as to find out the most effective wireless sound transmission out of the five selected devices: (Wireless microphone, wireless Bluetooth, wireless headphones, wireless line video transmitter, wireless voice transmission). All the five selected wireless sound transmission devices have been installed in multipurpose lecture hall, the data collected is used for comparative analysis.

Area of the Study

The research work is carried out in Mai Idriss Alooma polytechnic, Geidam by choosing a multipurpose. Fifty (50) people has been sample for this study.

Population

A population of 500 students has been researched on, 50 students from the study area i.e. multipurpose hall.

Sample and sampling procedure

The students sampled is done using the simple random sampling method.

Students sampling

The sample is drawn from a multipurpose hall.

Instrument for data collection

The instrument used for collecting data in this research study is questionnaires through network modelling.

3.0 RESULTS AND DISCUSSION

The result of network modelling of Throughput (T), Delay (D) and Bit Error Rate(BER) are presented in Table 1, 2 and 3. The wireless devices has a Throughputs values of $15*10^2$ Kbps with overall average of $52*10^2$ Kbps.

Table 1: Average values of Throughput for the five sound transmission devices (Wireless network)

		Device Name					Sound Transmission efficiency				
Hall Name	**Number of Days**	**D1**	**D2**	**D3**	**D4**	**D5**	**D1**	**D2**	**D3**	**D4**	**D5**
Multipurpose Hall	1	Microphone	Bluetooth	Headphones	Line video transmitter	Voice Transmission	$28*10^2$	$79*10^2$	$33*10^2$	$26*10^2$	$43*10^2$
	2						$44*10^2$	$13*10^2$	$27*10^2$	$48*10^2$	$12*10^2$
	3						$14*10^2$	$21*10^2$	$28*10^2$	$33*10^2$	$62*10^2$
	4						$12*10^2$	$30*10^2$	$18*10^2$	$48*10^2$	$40*10^2$
	5						$95*10^2$	$19*10^2$	$11*10^2$	$76*10^2$	$22*10^2$
	6						$84*10^2$	$15*10^2$	$64*10^2$	$80*10^2$	$29*10^2$

Table 2: Average values of Delay for the five sound transmission devices (Wireless network)

		Device Name					Delay in Sound Transmission efficiency				
Hall Name	**Number of Days**	**D1**	**D2**	**D3**	**D4**	**D5**	**D1**	**D2**	**D3**	**D4**	**D5**
Multipurpose Hall	1	Microphone	Bluetooth	Headphones	Line video transmitter	Voice Transmission	3	9	5	3	58
	2						2	5	4	4	20
	3						3	3	5	10	31
	4						5	4	5	15	55
	5						4	8	6	42	26
	6						4	5	0	80	28

Table 3: Average values of Bit Error Rate for the five sound transmission devices (Wireless network)

		Device Name					Bit Error Rate Sound Transmission efficiency				
Hall Name	**Number of Days**	**D1**	**D2**	**D3**	**D4**	**D5**	**D1**	**D2**	**D3**	**D4**	**D5**
Multipurpose Hall	1	Microphone	Bluetooth	Headphones	Line video transmitter	Voice Transmission	$14*10^{-3}$	$57*10^{-7}$	$61*10^{-7}$	$28*10^{-7}$	$11*10^{-4}$
	2						$23*10^{-3}$	$16*10^{-3}$	$25*10^{-7}$	$54*10^{-7}$	$68*10^2$
	3						$8*10^{-4}$	$16*10^{-3}$	$44*10^{-7}$	$15*10^{-4}$	$62*10^{-6}$
	4						$19*10^{-3}$	$20*10^{-3}$	$89*10^{-7}$	$31*10^{-6}$	$22*10^{-6}$
	5						$1*10^{-4}$	$17*10^{-6}$	$94*10^{-6}$	$66*10^{-6}$	$32*10^{-6}$
	6						$23*10^{-3}$	$10*10^{-6}$	$40*10^{-7}$	$24*10^{-4}$	$17*10^{--6}$

From table 1 above, D1 (microphone) is said to have higher sound transmission efficiency compared to the rest of the selected sound transmission devices. While, D3 (headphones is found to have lowest sound transmission device.

With regard to delay from table 2, D5 (voice transmission) is found to be higher delay in terms of sound transmission compared to the rest of four sound transmission devices. While D1 (microphone) is found to have less delay in terms of sound transmission.

Finally, from table 3 i.e. Bit Error rate (BER), D3 (headphones) is confirmed to record higher frequency compared to the other four selected sound transmission devices. While, microphone estimated to have lower Bit Errow Rate compared to the rest of wireless sound transmission.

Wired networks establish connection between various devices through connecting media such as cables and routers. Whether wired or wireless communication systems, all have network topology, which is the schematic form of switching elements, transmission links, routers and other peripherals. Network topologies are categorized into two distinct classes namely: physical network layout and logical network layout (Rajput, 2009). Wireless local area networks are commonly implemented using the Institute of Electrical and Electronic Engineers (IEEE) 802.11 standard. Wider area coverage is made possible by utilizing General Packet Radio Service (GPRS) the existing mobile phone infrastructure for the transmission. The integration between packet use and voice communication further evolved with the deployment of Third Generation and Universal Mobile Telecommunications Service (3G/UMTS), (Keren, 2011). This system is specially designed to carry packet data, video and voice communication with much higher capability, than previous wide area coverage networks. With the adoption of network technologies for the purpose of, education, business, banking and defence etc., these interconnected set of computer systems permits interactive resource sharing between connected pair of systems (Sharma, 2007).

4.0 CONCLUSION

In a nutshell, in this study the application of wireless technology in academia (Teaching and learning) has been analyse using five selected wireless sound transmission devices such as Wireless microphone, wireless Bluetooth, wireless headphones, wireless line video transmitter, wireless voice transmission with a view to ascertain their efficiency, effectiveness and durability through a comparative analysis. Results obtained from this investigation will be beneficial to academicians, press and media.

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