CHAPTER ONE

Introduction

1.1 Background

Some of the earliest references to a communication system using visible light come from ancient tribes, which used smoke signals to convey information, or from the ancient Greeks, who used their polished shields to transmit messages by reflecting sunlight.

Light is in fact very much part of our lives for millions and millions of years and humankind has been utilizing light as a communication medium for many years [1].

Light continues to be of great benefit in the field of communication. After the invention of the electric light bulb by Thomas Alva Edison in the 19th century, new ways were developed to use light to communicate. The invention of the electric bulb led to the invention of the Signal Lamp, a visual signaling device used for optical communication invented by Arthur C. W. Aldis. Typically, the Signal Lamp uses Morse code to give information to the observer by making shutters mounted on the front of the lamp open and close [2].

The idea of using light as a communication medium was implemented by Alexander Graham Bell in 1880 with his invention of the photophone, a device that transmitted a voice signal on a beam of light over a distance of 213 meters, but Bell could not generate a useful carrier frequency nor was he able to transmit the light beam from point to point. Obstacles in nature such as fog and rain — which could interfere with the *photophone* — made Bell stop any future research into his invention.

Visible Light Communication (VLC) is a recent technique in the field of wireless communications which light in the visible range of the electromagnetic spectrum is used as the communication medium for data transmission.

1.2 Problem Statement

The demand for voice and mainly high end data services like VOIP, video calling, instant messaging by the users is rapidly increasing. The existing Radio Spectrum fails to cater this burgeoning need and faces various other issues like scalability and availability.

1.3 Proposed Solution

Visible light is part of the electromagnetic spectrum. However the frequency of visible light is 10,000 times higher which introduces new possibilities for high speed wireless communication. Thus, Visible Light Communication can supplement or be an alternative technology to the existing radio frequency based communication technologies. VLC uses white Light Emitting Diodes (LED), which send data by flashing light at speeds undetectable to the human eye.

1.4 Methodology

Design the transmitter and receiver to transmit data through light. It will be using LEDs, MAX232 level shifter, voltage regulator, DB-9, Photo-Transistor; the software that will be used is Proteus for simulation and Hyper-Terminal for facilitating transmission of data.

1.5 Thesis Outline

This thesis consists of five chapters described as follow:

Chapter Two: Contains the history of the VLC system, a comparison between the VLC system and other traditional communication system, the potential application, modulation techniques and the challenges facing the VLC system.

Chapter Three: Discusses an implementation of VLC system on the existing network, and VLC Block Diagram and its components has been developed and described in details.

Chapter Four: Presents a simulation of a VLC system using Proteus software, a VLC hardware system has been assembled and tested. The results have been documented as well as the hardware development cost. An enhanced VLC system block diagram is presented to increase data rate as well as the simulation of the system has been investigated.

Chapter Five: States the conclusion and proposes recommendation for future work**.**