HIGHER TECHNICAL INSTITUTE

ELECTRICAL ENGINEERING DEPARTMENT

DIPLOMA PROJECT

TITLE:

WIRELESS COMMUNICATIONS

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This diploma project report is submitted in partial fulfillment of the requirements for award of the Diploma of Technical Engineer of HTI, NICOSIA, CYPRUS
JUNE 2002

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1.2 Introduction

Light

Light reviles the world to us. Body and soul crave it. Light sets our biological clocks. It triggers in our brains the sensation of color. Light feeds us, supplying the energy for plants to grow. It inspires us with special effects like rainbows and sunsets.
Light gives us life-enhancing tools, from incandescent bulbs to laser and fiber optics. Scientists don't fully understand what light is or what it can do. They just know that it will illuminate our future.

The power of Light

Light has been here from the beginning. There will be light, feebly, at the end. In all it's forms-visible and invisible-it saturated the universe. It is indestructible. Modern physics has been able to slice up all the stuff from nature into even smaller constituents, but light won't reduce. Light is light-pure but not simple. From ancient times scientists have tried to describe it. A wave? A particle? Modern scientists say both.
Light is indispensable part of our life but we hardly pay any attention to it. Light is almost like air. It's given.
Light gives us some moments of certain appreciation when a particular manifestation of light appears – a rain bow, a sunset, a pulse of heat lightning in a dark sky, the shimmering surface of the sea at twilight, the little red dot from the professor's pointer. Stained glass in a church, a flickering of a candle, flooding the room with romance. The flashlight looking for the circuit- breakers after a power outage.
Usually we do not see light , but we are merely allowed to see with it! The beauty of a red rose is only appreciated by seeing it and not by describing it. It is the brain's interpretation of a specific wave length of light which is roughly around 700 nanometers.
Photon is what you call light when it is behaving like a sub-atomic particle. Photons are replacing the electrons-which we know as the negatively charged particles that orbit the nuclei of an atom- as the favorite tool of scientists to transmit information.
Light is now used for various purposes from the very sophisticated laser surgery up to telephone technology.
Light could even become the prominent power source for long distance space travel. Scientists at NASA have a new plan for a spacecraft which will use an ultra thin sail to catch the "wind" of light beamed from an earth-based Laser. In theory, this craft will accelerate to speeds of a fraction to the speed of light but with no fuel.
The question of what is light still arises in mind.
Light, according to the physicist of the National Ignition Facility NIF in San Francisco, can be used as a power source because we can compress its energy in a very small point. This is because photons carry no charge and so they can be near each other without compelling one another, unlike electrons.

1.2.1 Traveling Back in History

Aristotle's once said that "Light is the activity of what is transparent". This transparency an essential property of various substances; when activated by sun or fire it produced light and color.
In the fifth century B.C philosopher and poet Empedocles had the brilliant intuition that light is a streaming substance emitted by the sun and that we are not conscious of its existence because it moves too fast. Many Greeks, including Plato and Euclid, believed that the eyes produced some kind of visual ray in that way we could see!
They based this theory on the fact that we cannot see a very fast moving object because the ray does not have time to reach it in order to see it. Aristotle argued that this was not true since we cannot see in the dark.

Thousands of years ago , the Arab scientist Alhazen argued that the pain we feel when looking straight at the sun is evidence that the light is entering our eyes and not the other way around.
Light soon after passed through the laboratory of Isaac Newton and never looked the same again. In the1600s Newton demonstrated that the white light can be analyzed into the entire color spectrum by using a prism. Then, by using another prism it recovered it back into white light. Newton believed that light was a particle –'multitudes of unimaginable small and swift Corpuscles of various sizes, springing from shining bodies at great distances one after the other.
Science years after joined forces with James Clerk Maxwell who in the 1860s after he made experiments with electricity and electromagnetic waves he realized that they can travel through space at – the speed of light! Is this a coincidence, he thought, or is light really an 'electromagnetic wave'.
This debate over particle-wave theory had finally found a truce governed by the quantum mechanics: Light is produced by changes in the energy level of electrons. Light moves through space like a wave but when it encounters matter it behaves like a particle. Max Planck's theory of the quanta which implied that light pounds against matter in discrete chunks, like bullets of a machine gun has put scientists into the era of uncertainty. Einstein entered the game saying that light's speed is constant regardless of the observer's own velocity. This is hard to intercept since we must accept that the speed of light from the headlights of a car in move has the same speed as the light from a stationary flashlight. This implies that there is no time domain and there is no absolute location in space. Einstein's relativity reveals that as an object approaches the speed of light, time slows down, and when it reaches the speed of light, time stops.

These are fascinating events that took place in the past. Now we are going to introduce some basic concepts and the various ways of communication.

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