CHAPTER 2

LTERATURE REVIEW

2.1.1 Introduction

The purpose of the project is to explore the possibility of IR signaling to communicate computers and with peripheral devices on a local LAN and as a viable cost effective solution for WEP and WAP technology prevalent in RF.

The primary objective is to identify the burst pair sequence of the devices .The UART on the main board of the centre processing will identify the electrical signal and convert them into binary format understood by the machine. They operate by switch modulating (on/off) and transmitting them through an infrared light source. This makes the IR light source synchronously incident on the receiver corresponding to the carrier frequency. The carrier represents the information of the signal that it needs to convey and to be processed by the I/O device. Thus it is of significance to synchronize the IR receiver for a given remote into the IR carrier frequency in order to convey the information of the I/O correctly.

2.2.1 Infrared interpretation

The preferred distance between the computer and essential peripherals is 0.6- 1.2 m while those for printers, modems etc can extend up to 3 m. The present prototype maintains the distance of 0.194 to 0.235 m only, is due to the limitation of hard ware. The length of transmission can be increased by installing a photo diode coded PT505 which have a transmission length of 1.0m peak sensitivity of 1050 a wavelength of 600nm . But such hardware is not available in Malaysia.

2.2.2 IR code definition

The transmission cycle is divided into three significant parts.

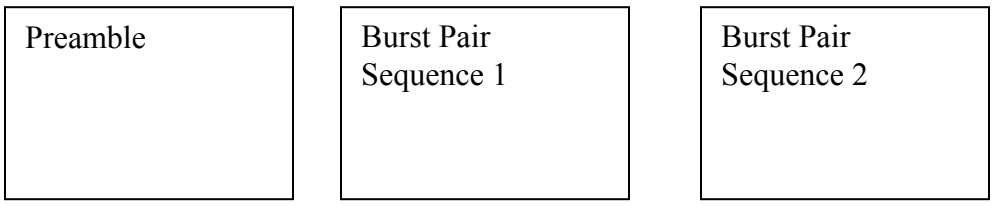

Figure 2.2.1: Infrared Burst Pair

The preamble is a set of 4 hexadecimal numbers of bits each. Each number has a precise meaning as defined below.

1. The first number is always set at 0000 which indicate that the IR pattern is a raw data.
2. The second hex represents the frequency of the IR carrier in terms of the internal clock control of the device.
3. The third number is the number of burst pair in sequence. Each burst pair contain 4 digit hex number representing on/off time of that burst
4. The fourth number is the number of burst pair in burst pair sequence two.
5. There is a lead burst pair; its function is to inform the controller to start receiving. Its timings are totally different from those of the data burst pair. Its second function is to set the AGC level of the device and marks the end of the message of the device that need to be received.

The Infrared photodiode and phototransistor is mainly made by a material named GaAS .It functionality and characteristic is the same as normal LED diodes. In order to obtain stimulated emission, there must be a region of the device there are many excited electron and vacant sates present together. This can be achieved by forward biasing a junction When junction is forward bias with a voltage nearly equal to the energy gap voltage, electrons and holes are injected across the junction in sufficient numbers to create a population inversion in a narrow zone called active region.

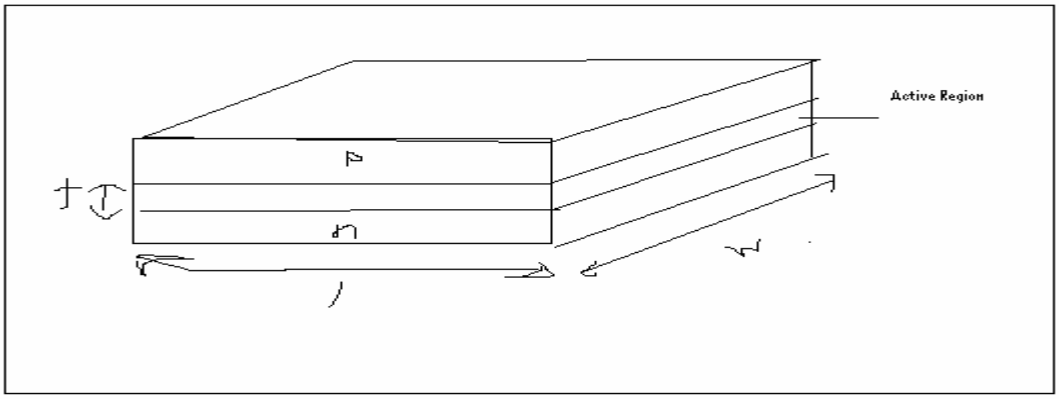

Figure 2.2.2 : Infrared Photodiode Internal Structure

The thickness ‘t’ of the active region can be approximated by the diffusion length ‘L ‘of the electrons injected into the p region assuming that the doping level of the p region is less than the n region, so that the junction current is carried substantiallyby electrons. For heavily doped GaAS at room temperature L is 1-3um.In the case of those materials such as GaAS which have a direct band gap the electrons and holes have a high probability of recombining radioactively. The recombination radiation produced may interact with the valence electrons and be absorbed, or interact with electrons in the conduction band thereby stimulating the production of further photons of the same frequerncy,If the injected carrier concentration become large enough the stimulated emission can exceed absorption so that optical gain can be achieved in the active region. The radiation generated within the active region will spread out to the surroundings. The remaining carriers present in the active region increases its refractive index forming a dielectric wave guild. The emitting action at the threshold current density is detected by an abrupt increase in the radiance of the emitting region; this is accompanied by a dramatic narrowing of the spectral width of emission If the current is to increase substantially above the threshold there will be a spectral width decrease in the spectral width of the emission.

Figure 2.2.3: Infrared Biased base Structure

Threshold density is a population inversion between 2 bands of energy level .Assumingly the active volume where population inversion is maintained nave the thickness of t the power of the signal deepened on the threshold current density of the photodiode.

As the injection current increases above the threshold laser oscillation build up and resulting stimulated emission reduces the population inversion until it is clamped to the threshold value. Part of the power is dissipated inside the cavity. The quantum efficiency is defined as the ratio of the increase in photon output rate resulting from an increase of injection rate.

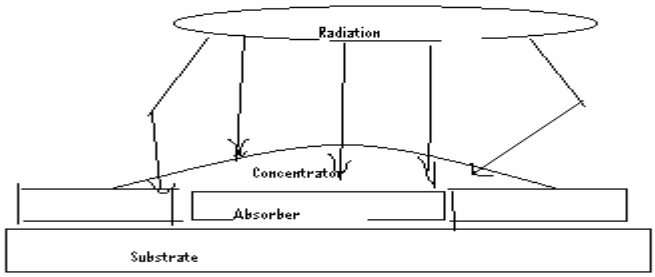

Figure 2.2.4: Infrared photodiode receive process

2.2.3 Infrared photodiode (Detector/receiver)

When the photon impinges on the surface of the detector, this will cause a rise and fall time. These photons will produce photon current slightly above the dark current level which is 1 micro meter. Only the desired photon wavelength is allow to penetrate through the crystal while others light sources with longer wavelength are absorbed near the surfaces

2.31 Mouse & keyboard (infrared interpretation)

Basic function of the keyboard and mouse needs to be understood before we can interpret infrared wireless transmission. There are two signal line voltages D+ and D-. For both high speed link, a differential 1 denotes the D+ line voltage is >200mv over the D- signal voltage. Whereas a differential; 0 denotes when the D+ voltage is less than the D- signal voltage. The state of 1 and 0 are defined when the differential 1 and differential 0 are driven onto the signal during the idle period between the packet transmissions.

When the transmission starts the D+ and the D- will change polarity during the synchronization and data portion of the packet transmission .The differential value between D+ and D- depends on the information transmitted and NRZ inverted protocol. The synchronizing pulses are also recovered from the differential pattern.

Before any signal could be transmitted, the receiver need to determine that the carrier frequency is 40 KHz and the number of burst pair sequencers used and the number of burst pair that is available, finally the number of burst pair that is repeatable. This is of significance importance as this pulse that would represent the instruction being sent and the result is highly dependant on it.

2.4.1 The Mouse

The basic universal construction of the mouse is centered on the Genius make IC k0307002bB. The IC contains numerical data and operand use to execute the basic instruction and Opcode in order to make the device operational.

Before producing the prototype, several attempts have been made to test the parameter and the signal produce by the mouse in order to find the suitable transmission method to match with the transmission sequence of the burst pair emitted by the infrared photodiode.

In order to test the device, few parameters has to be set to figure out how fast the UART controller of the mother board deals with the signal during the whole transmission and receiving processes. Dimensional differences when the mouse movement dictates the transfer viability and the decipher processes of the information and instruction when the information is being transmitted.

When interpret the mouse into IR transmission, the device only needs a single periodic transfer. Since it only involves a single transmission purpose, the command line is send under a text machine mode. Analogue transmission from the initial stage is possible and then when the transmission is done the centre processing unit will convert automatically to binary by the UART controller inside the motherboard of the IC.

2.5 The prototype block diagram for this project:

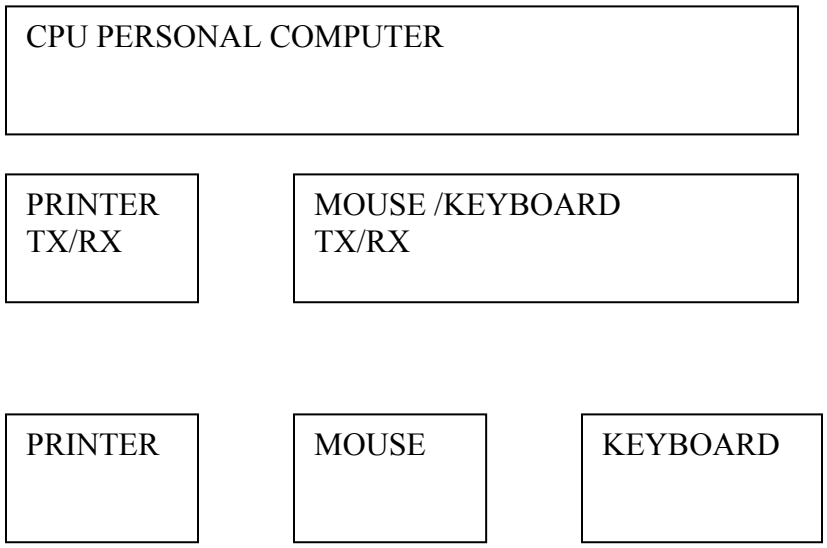

Figure 2.5 : Infrared computer peripheral block diagram me

2.6 Flow chart for the IR transmitter prototype

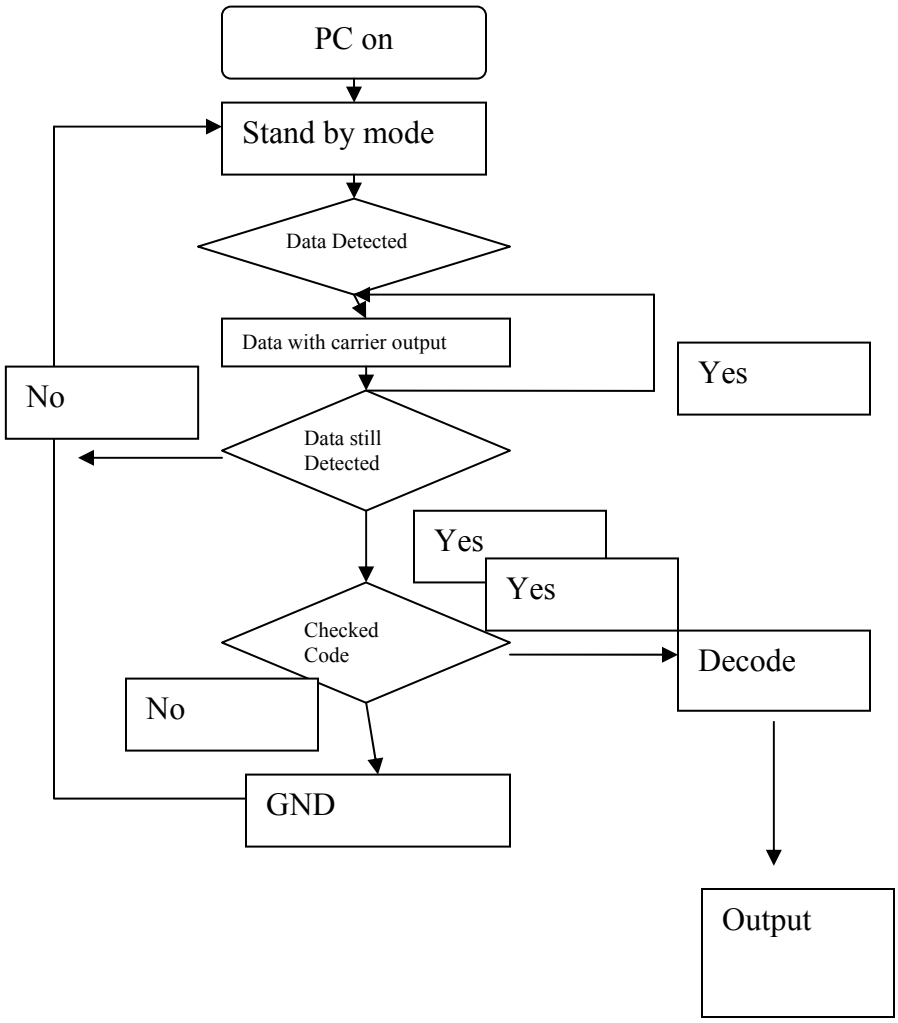

Figure 2.6.1 :Project flow Diagram me

2.6.1 IRDA Standards

Infrared Data Association (IRDA); the function is to establish standards devices so that they can be interoperatable by manufacturer around the globe.

IRDA Data defines the standard for the wireless two way infrared data transmission between two devices and consist a set of mandatory protocols. PHY (physical) ,IrLAP (Link access) and IrLMP (link management) .

IRDA Control is the infrared standard that allows wireless pheriperal and other pointing devices to interact with many types of host devices. IRDA control has its own set of mandatory protocol, PHY (Physical), MAC (Media access Control), LLC (Logical Link Control).

There are 2 types of infrared transmission, firstly is the direct infrared transmission which point to point one to one communication. This transmission requires line of sight and is a secure form of data transmission and reception. Second is the reflection based on diffuse infrared transmission, which allow many to many connections, and can be unidirectional or bidirectional. The latter type of method is favored.

There are two kinds of infrared module in the market. Firstly is the FIR fast infrared transmit mode IrDA 1.1 which is capable to transmit data up to 4Mbits/sec.Second is the Serial Infrared transmission (SIR) mode which is capable to transmit data at 115.2Kbits/sec

2.7.1 Basic function of the Printer

The data transfer rate for the printer is in the range 1.3-1.5 Mbps. The maximum transfer rate of the photodiode in the Malaysia market is much below 115Mbps. The standard transfer rate is practically impossible to achieve.

The control language is commonly referred to as PCL, which is develop by manufacturer as a protocol for printer and has been recognize as the industry standards

The PCL level is divided into level 1.1 through 5e and 5c.These level using command base language to control the sequence that are process and interpreted in the order they are received .The PCL data stream are generated by a printer driver, in some cases the PCL output can also be generated by using custom application.

Division of Class

Class 1.1

- Draw tools To support drawing lines arcs ellipses, chords ,rectangles ,polygon ,Bezier paths ,Raster images, Scan lines etc
- Colour handling, support 1/4/8-bits patterns, RGB /grey color space .Support custom halftone patterns (maximmm256 patterns).
- Compression : Support RLE
- Units of measurement: Inch millimeter, tenth of millimeter.
- Paper handling :Support custom or predefined sets of paper types ,including common letter, legal ,A4.etc
- Font setting

Class 2.0

- Compression added JPEG
- Paper handling
- Fonts (text to be written vertically)

Class 3.0

- Protocol support PCL pass through allows PCL 5 to be used by PCL 6 streams. However some PCL 6 states are not preserved when using the feature