Palestine Polytechnic University

College of Engineering & Technology
Electrical & Computer Engineering Department

Graduation Project

Mobile Electronic Program Guide Calendar "MEPGC"

Project Team
Hiba Jraiwy
Maram Al Hirbawi
Shireen Sonoqrot

Project Supervisor
Dr. Radwan Tahboub

Hebron – Palestine

June /2009

جامعة بوليتكنك فلسطين
Palestine Polytechnic University
(PPU)
The Library المكتبة
Acc. 23696 الرقم التسلسل
Class. الصنف

الخليـل-فلسطـين
كلية الهندسة والتكنولوجيا
دائرة الهندسة الكهربائية

اسم المشروع

Mobile Electronic Program Guide Calendar

(MEPGC)

اسماء الطلبة

شيرين سنقرط مرام الحرباوي هبة اجريوي

بناء على نظام كلية الهندسة والتكنولوجيا واشراف ومتابعة المشرف المباشر على المشروع وموافقة اعضاء اللجنة الممتحنة تم تقديم هذا المشروع الى دائرة الهندسة الكهربائية وذلك للوفاء بمتطلبات درجة الباكـالوريوس في هندسـة تخصص انظمة الحاسـوب.

توقيع المشرف

.....

توقيع اللجنة الممتحنة

....

توقيع رئيس الدائرة

.....

Abstract

More television channels are now available to viewers than ever before, and each channel has several programs, so users have a problem to remember which of these channels show appropriate programs and the time of each one.

There are many techniques used in order to help viewers to remember the programs information, some channels display the scheduling of there programs for every day this technique is called "TV Guide".

This project devcloped the idea, by making interaction between satellite receiver and mobile phone via Bluetooth technology, since the extracted information for desired program will be sent to mobile and then the calendar entry will be built within mobile phone according to the information of a desired program.

Table of Contents

List of tables Page

List of figures Page

Abbreviations:

ADC	Analogue-to-digital converter
API	Application programming interface
CDC	Connected Device Configuration
CLDC	Connected Limited Device Configuration
CRT	Cathode Ray Tube
CVM	C Virtual Machine
DAC	Digital-to-analogue converter
DBS	Digital broadcasting satellite
EPG	Electronic program guide
FC	File Connection
FEC	Forward Error Correction
J2ME	Java 2 Micro Edition
JRE	Java Runtime Environment
JVM	Java Virtual Machine
KVM	Kilo Virtual Machine
LNB	low noise block
MIDP	Mobile Information Device Profile
MPEG	Motion Picture Editors Guild
PAN	personal area network
PDA	Personal Digital Assistants
PIM	Personal Information Management
RF	Radio frequency
RMI	Remote Method Invocation
UUID	Universally Unique Identifier

CHAPTER ONE 1

Introduction

1.1 General idea about the projects and its importance

1.2 Project objective

1.3 Literature review

1.4 Time plane

1.5 Project risk management

1.6 Cost Estimation

1.7 System requirements

1.8 Report content

1.1 General idea about the project and its importance

Nowadays more television channels are now available to viewers than ever before, and each channel has several programs, so users have a problem to remember which of these channels show appropriate programs and the time for these.

Several different broadcast channel's guides are available to help users to organize all these channels information, the program guide or an Electronic Program Guide (EPG), is an on screen guide schedule broadcast television, with a function that permit the user to select and discover the channel's content like viewing time, program title and subject of that program, simply by using an input device such as remote control [10].

In this project the idea will be improved by making an interaction between receiver and a building calendar entry within a mobile using Bluetooth technology.

So the information about a specific channel and broadcasting time for specific programs in that channel will be saved in a text file and then the text file will be read and the string within it will be sent to mobile phone via Bluetooth technology to build calendar entry.

In order to achieve the project goal, several components within a receiver should be studied such as LNB which connects the end arm of the dish to the satellite receiver via coaxial cable, it receive the signals from dish and converts them to a lower frequency then sends them to the receiver in order to demodulate the signals and show these in TV.

To save the EPG information as text file image processing should be used in order to extract the text information about the desired program from EPG image and store it in txt file.

The concern is done about EPG information which usually displayed as video text on TV screen; the purpose is to transfer this information into mobile phone after save it in txt file.

Figure 1.1 illustrates this idea.

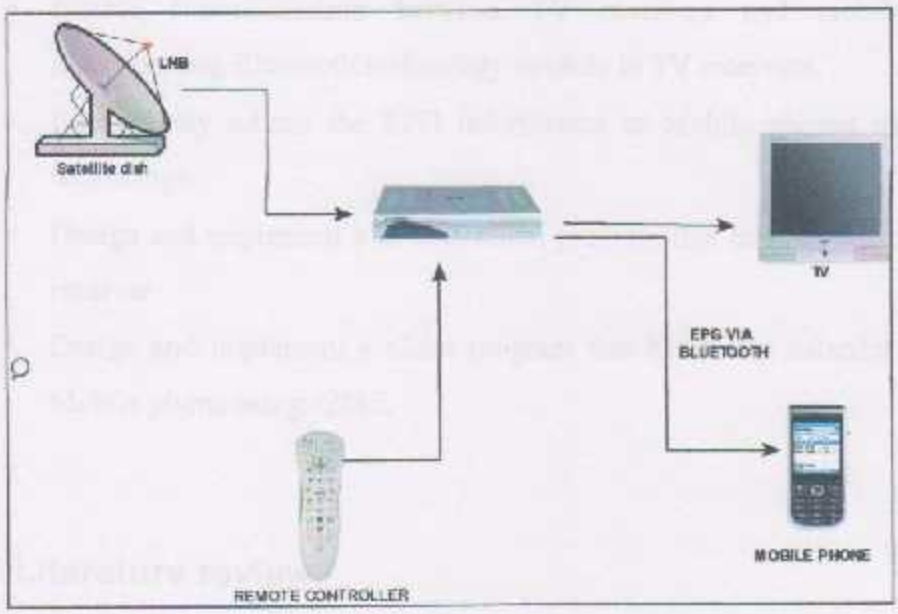

Figure 1.1: Projects' block diagram

1.2 Project objectives

This project aims to achieve some objectives such as:

- Extract and manipulate the EPG information in a TV receiver through adding a new image processing module to existing systems.
- Enable communication between TV receivers and mobile phones by incorporating Bluetooth technology module in TV receivers.
- Interactively submit the EPG information to Mobile phones using Bluetooth technology.
- Design and implement a mobile client program that communicates with the TV receiver
- Design and implement a client program that builds the calendar entries in the Mobile phone using J2ME.

1.3 Literature review

Different topics about program guide are covered, some of these related to the way in which program guide will be displayed, and other concern the implementation of an electronic program guide.

Here are some of these studies that in some way are related to our project:

The first appearance of this program guide was in 1953 were the first television program listing magazine which called "TV Guide" was published, this magazine offered a program listings for the entire week[11].

In the 1980s the subject became more important and more needed, since 1985 an electronic guide was launched, it was an independent cable network that covered the entire schedule for the week [12].

The later versions of EPG saved a portion of a screen for program guide; it displayed a program guide in the bottom of the screen.

In 1988 a company called Prevue Network which was the original creator of the Electronic Program Guide was established, EPG was renamed to Prevue Guide, Prevue Network asked the small cable companies to replace their old version of an Electronic Program Guide cable with the updated Prevue Channel version [13].

In 1997 Prevue Network and United Video Satellite Group launched an online service for local TV listing which was called Prevue Online; it did provide more history and more useful information about the Prevue Channel [13].

In 1999 United Video Satellite Group which is the parent for Prevue Network bought by TV Guide, so TV Guide and Prevue Network merge to be TV Guide Channel [13].

TV Channel Guide has its own 24 on-screen program guide, it's useful for users who don't have access to the internet or a magazine subscription to access the TV listing content.

1.4 Time plane

Table 1.1: Time plane

Week / Task	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Idea decision																
Gathering information																
Data analysis																
Design Options																
Documentation																

Week / Task	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Software Implementation																
Testing																
Documentation																

1.5 Project risk management

There are some possible risks that may occur in our project within hardware part or software part. Here is some of those risks and how to manage them.

Technology risks:

Some risks may occur because of software and hardware used in the system.

Hardware risks:

- TV/Receiver malfunctions.
- Device failure.
- The receiver does not respond.

Software risks:

- The software is not computable with the mobile version.
- Problems that may occur with using the software development environment.

People risks:

- Member of team get ill.
- Member of the team becomes unavailable for any reason.

Organizational risks:

- Facing project resources problem.

Tools risks:

- Losing of any supported software or hardware that used to develop the system.

Requirements risks:

-Risks may occur by change or add requirements in the system that will make major changes in the system design.

Risk Avoidance:

The following strategies will be taken to avoid risks mentioned above:

- We must take care when we deal with the hardware components and using them according to their specifications.
- Take care of team member's health during the project development.
- Good estimation and usage of the projects budget and resources.
- Good estimation of system requirements.

Risk management:

Risk management will be as follows:

- Including an extra amount of the hardware components, so when any problem occurs we can find an alternative one.
- Software development environment risks will be handled by the backup of software.
- People risks are handled by using work load balancing on member especially when a member can't perform some of his tasks, then it will be done by other member

1.6 Cost Estimation

Table 1.2: Cost Estimation

Number	Object	Cost ($)
1	Receiver Card	125
2	Dish and Cables	25
3	Matlab, Vb, J2ME,JAVA	Free

1.7 System Requirements

This section lists the main requirement that must be met in project, in order to set the main services that will be provided.

1.7.1 Functional Requirements:

- Display EPG screen.
- Select appropriate EPG.
- Store EPG screen as image.
- Send EPG information to mobile phone.

1.7.2 Nonfunctional Requirements:

1- Reliability:

The system will be accurate, reliable, fault tolerant.

2- Performance:

The system will provide the user with a fast reaction regarding the whole system speed.

1.8 Report Contents

The documentation for the project is divided into three chapters, each chapter concerns to dedicated point of the system. The following explain the content of each chapter.

Chapter 1: Introduction:

The first chapter provides a general idea about the project, lists the project objectives, some literature review are provided, the time schedule, finally the project risks are listed and there managements plan.

Chapter 2: Theoretical Background:

The second chapter is a theoretical background related to the main idea of the project and component, its hardware and software components.

Chapter 3: Project Conceptual Design:

This chapter describes project objectives in some detail, the overall system design options as well as its components are provided and the general block diagram is described.

Chapter 4: Software Implementation:

This chapter the software implementation for both receiver satellite and mobile phone, and it's contain flowchart and sequence diagram.

Chapter 5: Experimental Analysis and Results:

This chapter presents the performed tests to verify the whole process of making interaction between satellite receiver and mobile phone via Bluetooth; also it contains experimental results for the project.

Chapter 6: Conclusions and Future Works:

This chapter includes some recommendations to enhance this system, also it contain the conclusion for the project.

Acknowledgment

Our deepest gratitude and appreciation goes for our supervisor Dr.Rdwn Tahboub for his valuable contribution to accomplish this work. The project's idea was suggested by him, and without his supervision these papers wouldn't have been produced…

To our families who granted us best condition to carry out this work…

To Eng Wadah Sultan for his continues supports and helps…

To our friends and colleagues with whom we spent the best times of our life…

To all who are interested in such technologies …

Dedication

To our parents

To our friends

CHAPTER TWO 2

Theoretical Background

2.1 Overview

This chapter lists the general requirements which will be used in this project, and gives brief descriptions about them; more specific requirements and theoretical background will be mentioned.

Description of new technology which used for the interaction between the requirements will be mentioned too.

2.2 Satellite receiver

2.2.1 Digital satellite receiver function

The first input signal to the receiver is a RF which is the output signal from LNB, this signal supplied to ADC, the output from ADC is supplied to a QPSK demodulation circuit, and the data received decoded form.

The data stream sent from satellite includes video data in the format specified by the motion picture expert group stander MPEG, MPEG audio data and EPG data.

Data that is identified by its header to be video data is transferred to MPEG video decoder, data that is identified by its header to be audio data is transferred to MPEG audio decoder .Similarly data having a header that identifies the data to be EPG data is transferred to a predetermined area in the data buffer designated to store the EPG [2].

The MPEG video decoder decodes the video signal; the decoded digital video signal is supplied to video encoder and converted to a composite video signal and RGB.

The MPEG audio decoder decodes the digital audio signal, the decoded digital audio signal is converted into an analog audio signal by DAC, and the audio signal output through scart.

An RF modulator mixes a composite signal output from video encoder with an analog audio signal output from DAC, the RF modulator converts the mixed signal into an RF signal and outputs the RF signal there form.

CPU control processor unit performs certain functions of the system. Receives and processes the user input [2].

Figure 2.1 is a simple block diagram for satellite receiver.

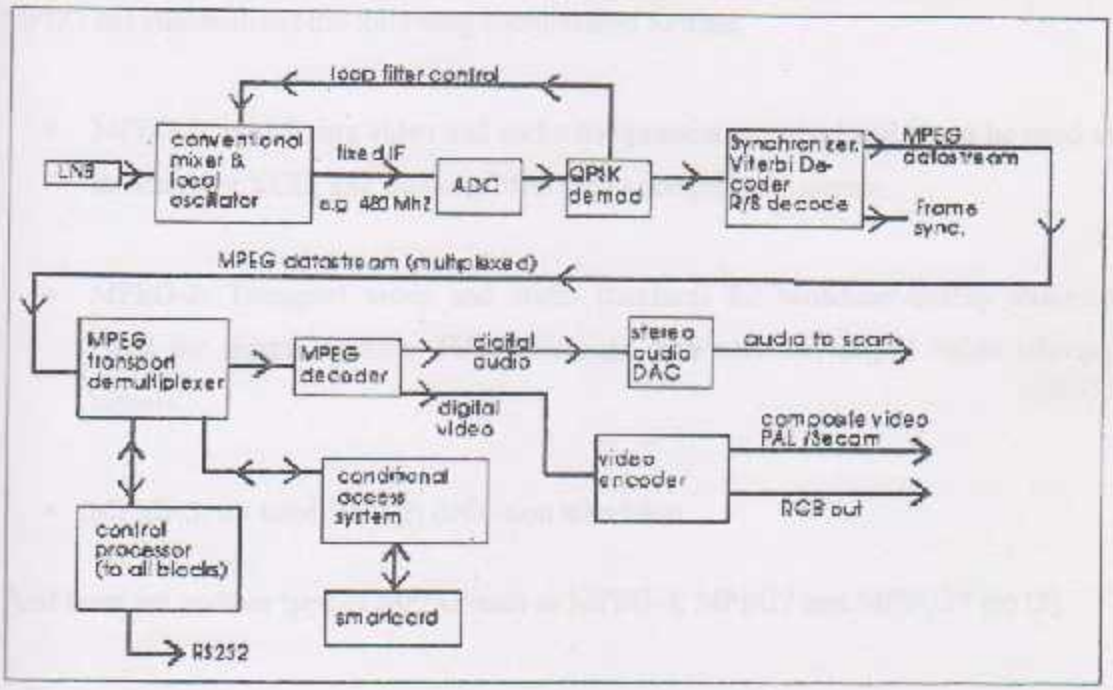

Figure 2.1: Satellite receiver block diagram [2]

2.2.2 Component of satellite receiver

2.2.2.1 MPEG

MPEG: is an audio/video compression technique that represents staff motion picture film and television editors, it's used for different application, which is based in similar principal; it's described as interaction acronyms for Moving Picture Experts Group which was set up by international standard organization to work on compression[5].

The major advantage for the MPEG is that MPEG file are much smaller for small quantity, because that its use very complex compression technique.

MPEG has standardized the following compression formats:

- MPEG-1: Initializing video and audio compression standard and it can be used as a standard for VCD, and includes MP3 audio compression format.
- MPEG-2: Transport video and audio standards for broadcast-quality television. Used for digital satellite TV services as dish network, digital cable television signals.
- MPEG-3: it's used for high definition television

And there are another type of MPEG such as MPEG-4, MPEG7 and MPEG27 etc [3].

The output of single MPEG audio and video coder is called Elementary Stream its an endless near real time signal, these stream can be broken into more than one block, the block should contain the header information to define the start of the packet and it should contain timestamps because packetzing disrupts the time axis[5].

The main advantages of compression mechanism, is that to reduce the quantity of data used in display video images.

The production standard for digital video gencrate over 200 megabyte per second of data ,this require an expensive capacity for storage and transmission ,if the eased storage and bandwidth are available , wider digital video could be used.

Having less data and cheaper capacity for storage is made using compression which express audio and video by using less data.

Reduce the bandwidth needed when operating in real time, in addition it's allowing a faster transmission between media [4].

2.2.2.2 Video encoder

The video encoder typically contains 4 or more DACs which run at video rates & quality. This infers 8 bit video DACs (not cheap). 3 are needed for RGB; another is needed for composite video out (PAL or SECAM). Some use 10 bit DAC's & the difference may be visible by viewing sharp transitions like black to white -hint.

2.2.2.3 LNB

LNB is replaced for Low Noise Block- downconverter, its connect the dish to satellite receiver, LNB receive the signals with very high frequency, amplify and convert them to similar signals carried at a much lower frequency which is called intermediate frequency, and sends them out to the cable connector which connect to the satellite receiver via coaxial cable [7].

In the LNB there are several steps to convert the signal to the lower form:

First the signal pass through a band pass filter which only used for passing this signal, then the signal goes from it to the Low Noise Amplifier in order to amplify it then sends to the mixer.

At the mixer, using a powerful local oscillator signal, all signals that come through the band pass filter and which come from the amplifier are scrambled up to generate a wide range of distorted output signals.

The mixer output is the difference product between the wanted input signal and the local oscillator frequencies, these signal is pass through another band pass filter for selecting and then feeds them to the L band amplifier and then to the cable, this mean that the output frequency = input frequency - local oscillator frequency, if the output frequency= local oscillator frequency- input frequency, in this case result should inverted.

The signal that using in a satellite have high frequency so it need a special kind of cable or waveguide would be required, any significant length of cable leaves very little signal left on the receiving end[6].

The figure 2.2, shows the block diagram for the Low noise block downconverter

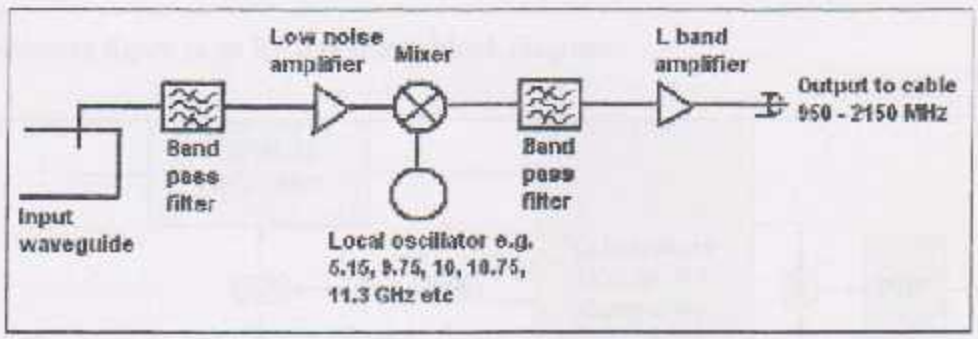

Figure2.2: LNB diagram [6]

2.2.2.4 RF modulator

The picture will be displayed in television but it should be in suitable form that the television is accepted, so the data must modulate to the format that television can accepted.

Radio Frequency modulator: is a device which receive baseband input signal and create Radio Frequency modulated signals as output, internal RF modulator can be found in VCRs and old video games, if the television is in an old version that only has a cable/antenna connection, so it should have RF modulator to connect a DVD player or DVD recorder to the television [8].

TV modulators must take audio and video signal from a composite video or internal source, and so it will produce a PAL or NTSC broadcast signal which can be fed into a television aerial/coaxial connector which is standard on all TV sets [9].

The main disadvantage of RF modulators is that it produces a poor picture; the image quality maybe lost during the modulation from the source device, and the demodulation in the television.

The following figure is an RF modulator block diagram:

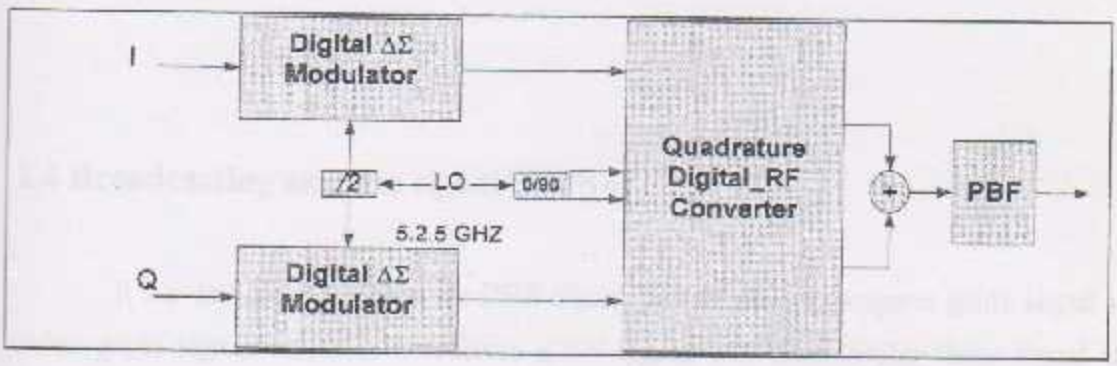

Figure 2.3: RF modulator

2.3 Electronic program guide

An EPG, it is an on-screen information to scheduled broadcast television program , allowing a user to select, and discover content by time, title, channel ,using an input device such as remote control , this information may be delivered by a dedicated channel or assembled by the receiving equipment from information that sent by each program channel[10].

Viewer can see more information about the current and future program and about programs, by navigating through an EPG on a receiving device, connecting EPG to Personal Video Recorder able a user to see their record broadcast programs to a hard disk for later viewing.

For displaying a descriptions of the program like its title and other information such as program start times, channel name and so on, graphical user interface are used to display it in a suitable form, EPG information is typically displayed on a grid with the option for selecting more information for each program [9].

2.4 Broadcasting satellite signal receiver

It's a device which receives DBS signal, which include program guide signal and video guide signal, and also it receives a TV signal, and then display these signal in a desired form to produce a TV picture [1].

Receiving mode for a broadcasting satellite signal receiver:

- DBS signal receiving mode.
- Program guide signal receiving mode.
- TV signal receiving mode.

2.4.1 Digital broadcasting satellite signal receiver component

Broadcasting Satellite signal receiver includes the following component:

- Controller which generate two signal, one of them is for selecting program guide signal which is a part of the DBS signal , and the other is for selecting one of the programs which the program guide signal contain.

- Decoder, the input of this component is program guide signal, the decoder responsible for decoding this signal corresponding to the first signal.

- Storing unit, the input of it is a decoded program guide signal, which is the output of the decoder, the storing unit separate and store the signal as position data, channel data and video data.

- Signal compressing unit which compress the video data in response to the second signal o display it in a suitable form.

- Display unit which display the mixed signal. If the receiver doesn't have the mixer so it displays a decoded program guide signal or compressed video data [1].

2.4.2 Broadcasting satellite signal receiver concept

The following figure is the block diagram which illustrates construction of conventional broadcasting satellite signal receiver.

This block diagram shows that a user can't display the decoded program guide signal and the video data at the same time.

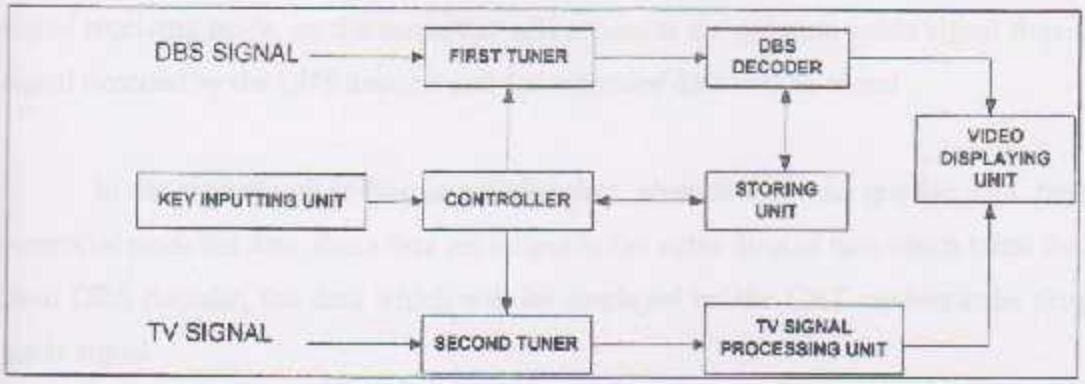

Figure 2.4: Broadcasting satellite signal receiver

The receiver include a key input unit such as remote controller, when the user depress on the remote control the signal of his depressing is input for the controller.

If the user depresses on the button which is responsible for the DBS signal receiving mode, this mode will be set by the controller, then the first tuner receive the DBS signal, so this signal will be the input for the DBS decoder which decode this signal.

In other case if the TV signal receiving mode is set by the controller in response for depressing of the user, a second tuner receives a TV signal and sends it to the TV processing unit which convert it into the suitable form for displaying , the storing unit store the program guide signal which is a part of DBS signal and store it as position data, channel data and graphic data.

In response to the DBS signal decoded by DBS decoder, or TV signal processed by TV processing unit, video display unit derives a cathode ray tube (CRT) to display one on these signals on the CRT.

If the user depress the button on the remote control and select the program guide signal receiving mode, so the controller will separates the program guide signal from DBS signal decoded by the DBS decoder and the separated data will be stored .

In the storing unit it was as position data, channel data and graphic data, then the controller reads the data, these data are output to the video display unit which takes the data from DBS decoder, the data which will be displayed on the CRT represent the program guide signal.

If the user depress on the key inputting unit and select any program corresponding to that channel and time from the program guide signal which displayed on the screen, this process is called confirming the content of the selected program.

The program which is selected by the user maybe broadcasting at the same time in which it is selected, or it may be broadcasting in future time, in the first case the controller make the first tuner to tune to the desired channel and display the program, in another case if it will be broadcasting in future time, the controller read the video data which is included in the DBS signal and store it in the storing unit, the video data will display on the CRT [1].

2.4.3 DBS with mixer

In order to provide a broadcast satellite signal receiver, capable of easily confirming the content of the program from program guide signal which is a part of a digital broadcasting satellite signal, there is an invention which add a new component to the device to provide this capability, the following block shows that the new component is the mixer which mix a decoded program guide signal as a main screen signal with the compressed video data as a sub-screen signal.

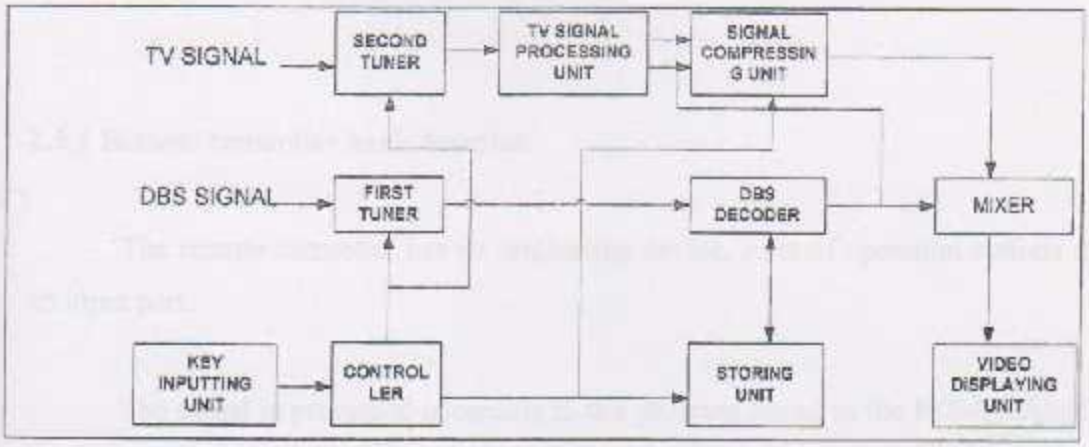

Figure 2.5: DBS with mixer

2.4.3.1 DBS with mixer concept

The controller recognize the signal for selecting digital broadcasting satellite signal receiving mode, signal for selecting a TV signal receiving mode or signal for selecting program guide mode, these signals are generated in response to depressing a certain key of the remote control, all component in this block diagram is work the same as the previous one.

The only one difference between them is the mixer, which responsible for mixing the signal selectively compressed by the signal compressing unit which are TV signal or DBS video signal with the program guide signal included in the DBS signal decoded by the DBS decoder, then video displaying unit displays the mixed signal on CRT[1].

2.5 Remote controller

2.5.1 Remote controller basic function

The remote controller has an originating device, a set of operation buttons through an input port.

The signal is processed according to the program stored in the ROM. RAM is used as a working space to produce a transmitting code [2].

The transmitting code is sent to the infrared originating device through an output port and converted into an infrared signal; the infrared signal is transmitted to the receiver.

The operation button include a direction key for designating a pointer direction such as north , south , east and west , an "EPG " key, a "MENU" key ,an "EXIT" key .the set of operation buttons enable the user to select programs and channels[2] .

Figure 2.6 shows a simple block diagram for remote controller.

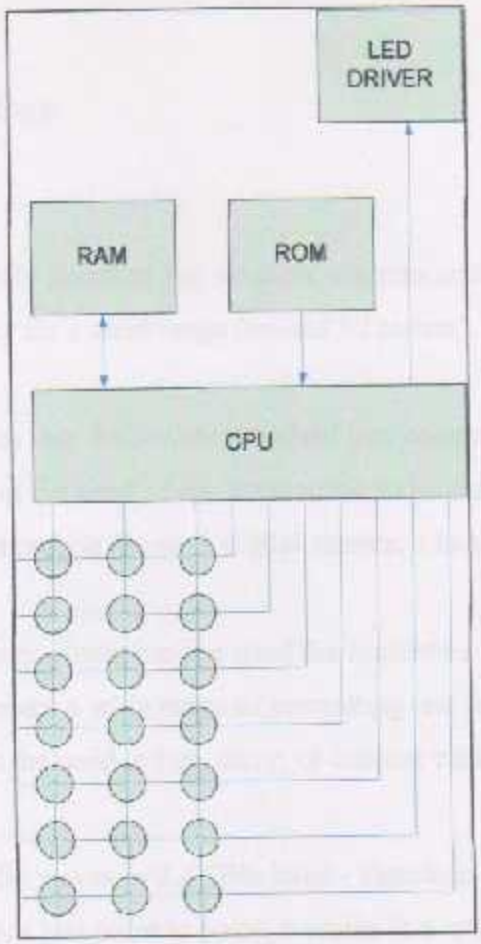

Figure2.6: Remote control block diagram

2.6 Bluetooth technology

Bluetooth is actually standard for wireless communications between devices in a PAN using radio frequency for a short range (around 10 meters).

So any two devices that follow the standard can communicate and exchange data between each other without the need of any connection to be made between them. A group of Bluetooth devices like a mobile phone, a digital camera, a hand held device etc.

Bluetooth technology eliminates the need for numerous and inconvenient cable, so It will enable users to connect a wide range of computing and telecommunications devices easily and simply, without the need to buy, carry, or connect cables.

Bluetooth uses radio waves in 2.4 GHz band - therefore, no line of sight is required and supports multipoint, not just point to point, it works in a small confined area - 10 to 15 meters a part [14].

A Bluetooth implementation contains both hardware and software components (and software in ROM, also known as firmware), as illustrated in Figure 2.7

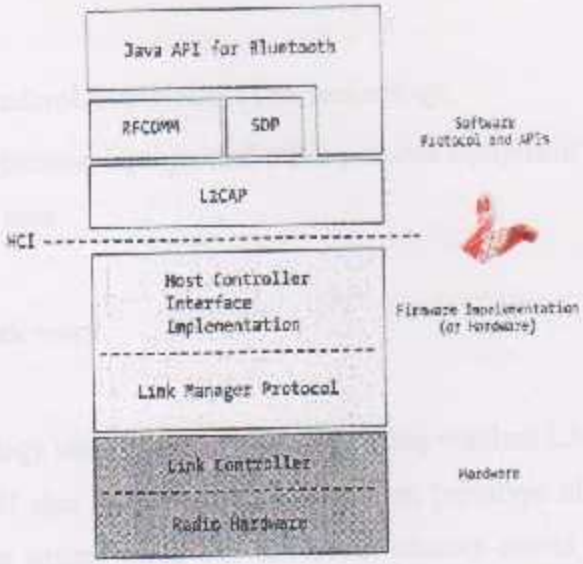

Figure 2.7 Bluetooth implementation

A network consisting of devices connected via Bluetooth is often called a Personal Area Network (or PAN for short). The software portion of a Bluetooth "stack" enables data to be interchanged between locally connected devices in a variety of ways. The different interactions possible between devices in a PAN can be roughly classified as follows:

- Discovery: Find out what devices are connected, how they may be useful, and when a device is no longer available (for example, you may have traveled out of range).
- *Client activities*: Use services that other devices provide. For example, use a printer nearby to print your e-mail.
- Server activities: Provide services and/or information that otherdevices may use. For example, a Bluetooth-enabled storage server may accept data from mobile Bluetooth devices.
- Peer activities: Act as both client and server within an activity. For example, a business card exchange application may enable two phones to exchange business card information using Bluetooth.

Bluetooth feature:

- High-speed,
- Low-power microwave wireless link technology,
- Connecting phones, laptops, and other portable equipment together with little or no work by the user.

2.6.1 How Bluetooth work

The technology uses modifications of existing wireless LAN techniques but is most notable for its small size and low cost. The current prototype circuits are contained on a circuit board 0.9cm square when one Bluetooth product comes within range of another, (this can be set to between 10cm and 100m) they automatically exchange address and capability details. They can then establish a 1 megabit/s link (up to 2 Mbps in the second generation of the technology) with security and error correction, to use as required.

The protocols will handle both voice and data, with very flexible network topography.

The Bluetooth modules can be either built into electronic devices, for instance in a PC they can be built in as a PC card or externally attached via the USB port.

The Bluetooth device consuming 30 micro Am to the active transmitting range of 8-30 milliamps (or less than 1/10th of a watt). The radio chip consumes only 0.3mA in standby mode, which is less than 3 % of the power used by a standard mobile phone. The chips also have excellent power-saving features [14].

Bluetooth radio modules avoid interference from other signals by hopping to a new frequency after transmitting or receiving a packet. Compared with other systems operating in the same frequency band, the Bluetooth radio typically hops faster and uses shorter

packets. This makes the Bluetooth radio more robust than other systems. . Use of FEC limits the impact of random noise on long-distance links.

The Bluetooth protocol is a combination of circuit and packet switching. Slots can be reserved for synchronous packets. Each packet is transmitted in a different hop frequency. A packet nominally covers a single slot, but can be extended to cover up to five slots. Bluetooth can support an asynchronous data channel, up to three simultaneous synchronous voice channels, or a channel, which simultaneously supports asynchronous data and synchronous voice.

The Bluetooth system supports both point-to-point and point-to-multi-point connections. When a device is connected to another device it is a point to point connection. If a device is connected to more than one device starts with two connected devices, such as a portable PC and cellular phone, and may grow to eight connected devices. All Bluetooth devices are peer units and have identical implementations. However, when establishing one unit will act as a master and the other(s) as slave(s) [14].

2.7 J2ME

2.7.1 J2ME Overview

J2ME is a family of APIs that specify application platforms which are typically implemented by embedded or handheld devices.

The handheld devices include PDAs and high-end mobile phones. These platforms are typically limited in memory capacity and I/O capabilities, although they do have the ability to transfer data over low bandwidth, intermittent wireless connections [15].

2.7.2 General J2ME architecture

J2ME uses configurations and profiles to customize the Java JRE. As a complete JRE, J2ME is comprised of a configuration, which determines the JVM used, and a profile, which defines the application by adding domain-specific classes.

2.7.2.1 J2ME Configurations

The configuration defines the basic run-time environment as a set of core classes and a specific JVM that run on specific types of devices. There are two configurations exist for J2ME:-

Connected Limited Device Configuration

Used specifically with the KVM for 16-bit or 32-bit devices with limited amounts of memory. This is the configuration (and the virtual machine) used for developing small J2ME applications. Its size limitations make CLDC more interesting and challenging than CDC [17].

Target devices for J2ME applications developed using CLDC generally have the following characteristics:

- 160 to 512 kilobytes of total memory available for the Java platform.
- Limited power, often battery powered.
- Network connectivity, often with a wireless, inconsistent connection and with limited bandwidth.

- **Connected Device Configuration**

Is used with the CVM and is used for 32-bit architectures requiring more than 2 MB of memory. An example of such a device is a Net TV box.

The target devices for CDC generally have the following characteristics:

- Powered by a 32-bit processor.
- Two megabytes or more of total memory available for the Java platform.
- Devices that require the full functionality of the Java 2 "Blue Book" virtual machine.
- Network connectivity, often with a wireless, inconsistent connection and with limited bandwidth [17].

CLDC versus CDC

The following graphic depicts the relationship between CDC and CLDC. It also illustrates their relationship to the full J2SE API. CDC is a subset of J2SE plus some extra classes. We also saw that CLDC is a subset of CDC [16].

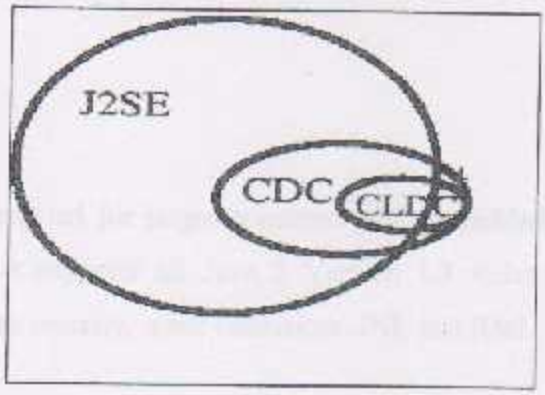

Figure2.8: Relationship between CDC and CLDC [17]

Virtual Machines

The CLDC and CDC configurations each define their own set of supported features from the Java virtual machine. Consequently, each requires its own Java virtual machine. The CLDC virtual machine is far smaller than the virtual machine required by the CDC, since it supports fewer features. The virtual machine for the CLDC is called the KVM, and the virtual machine for the CDC is called the CVM [18].

- The KVM

The KVM is a complete Java runtime environment for small devices. It's a true Java virtual machine as defined by the Java Virtual Machine Specification, except for some specific deviations that are necessary for proper functioning on small devices. It is specifically designed from the ground up for small, resource-constrained devices with a few hundred kilobytes' total memory [19].

- **The CVM**

The CVM is designed for larger consumer and embedded devices, such as those found with the CDC. It supports all Java 2 Version 1.3 virtual machine features and libraries for items such as security, weak references, JNI, and RMI.

2.7.2.2 J2ME profiles

The profile defines the type of devices supported by your application. Specifically, it adds domain-specific classes to the J2ME configuration to define certain uses for devices. Profiles are built on top of configurations.

Two profiles have been defined for J2ME and are built on CLDC: KJava and MIDP. These profiles are geared toward smaller devices. A skeleton profile on which you create your own profile, the Foundation Profile, is available for CDC [17].

The MIDP

The MIDP is designed to be used with the CLDC, and provides a set of APIs for use by mobile devices, such as cellular phones and two-way pagers. The MIDP contains classes for user interface, persistence storage, and networking. It also includes a standardized runtime environment that allows new applications to be "downloaded" to end user devices. Small applications that run under the MIDP are called MIDlets, the figure below explains the life cycle for MIDlet [16]. Figure 2, 9 is a state graph which shows the lifecycle of the midlet

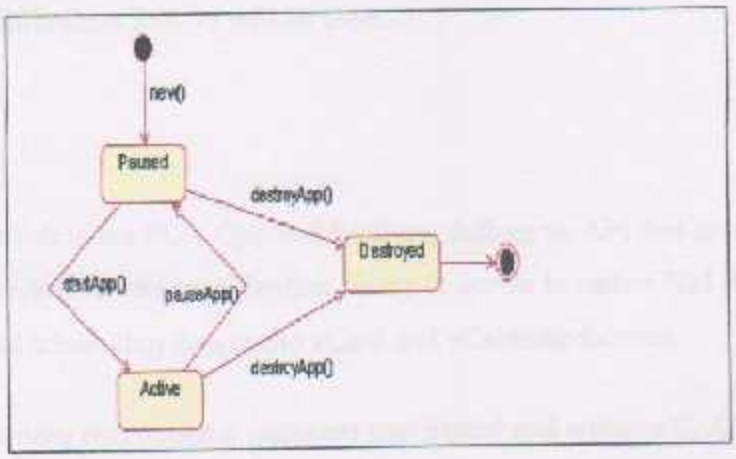

Figure 2.9: The lifecycles of midlet

2.8 PIM

Personal information management refers to the ability to manage in electronic form the kinds of personal data that broad classes of users want handy.

PIM data is often stored on the device in a native format, intended for access by applications the vendor provides.

Accessing to the device that based on PIM is difficult, because that the CLDC and MIDP themselves don't define APIs for easy access to native databases, or to data in the vCard which is business card format and vCalendar which is scheduling-exchange format, to simplify this difficulties JSR 75 will be used.

2.8.1 JSR 75

JRS 75 which is the PDA Optional Package; defines an API that gives J2ME devices, which implement the specification ability to access to native PIM data on devices, and to contact and scheduling data in the vCard and vCalendar formats.

JSR 75 defines two optional packages that extend and enhance CLDC to give J2ME developers access to important features commonly found on PDAs; these two packages are optional and independent of each other:

2.8.1.1 FC APIs:

This package gives J2ME devices standardized access to file systems residing on mobile devices, primarily to allow access to removable storage media such as external memory cards.

2.8.1.2 PIM APIs:

Optional package that gives J2ME devices access to personal data stored in device-native formats, it resides in a new J2ME package javax.microedition.pim that consists of eight interfaces and six classes.

Many devices, especially phones, have the ability to maintain lists of phone numbers and names, some devices also store addresses, e-mails, events, to-do lists, and other personal information.

This PIM data is stored in PIM databases, most devices will have built-in applications that manage the PIM data, and a device vendor may now expose access to its PIM databases through the PIM Optional Package, specified in JSR 75, figure 2. shows the hierarchy of major classes and interfaces in the PIM API.

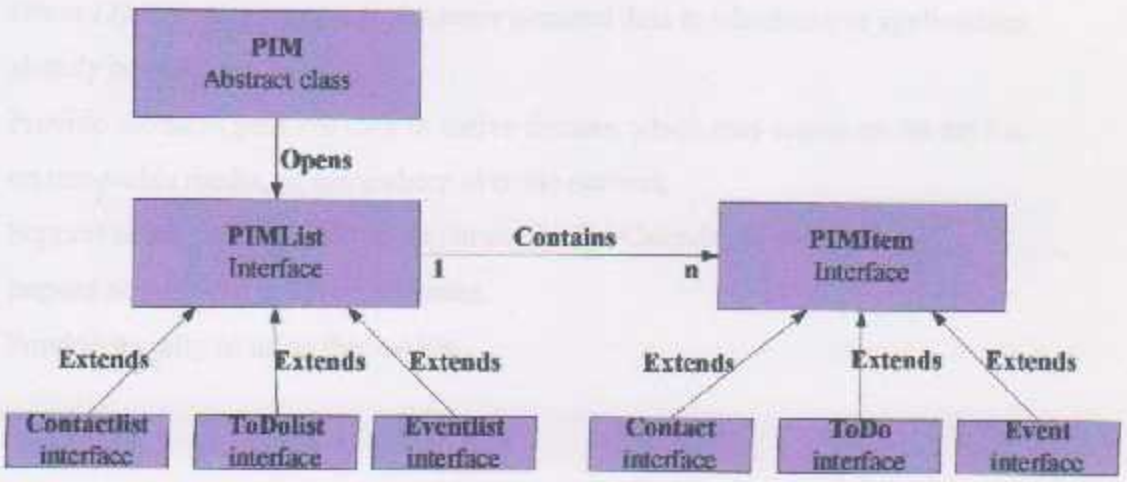

Figure 2.10: PIM API Architecture

As shown in Figure 4.11, PIM is a singleton object that is used to open lists of records; lists are accessed through the PIMList interface, each list contains items, and each item represents a single record in the PIM database.

Items are accessed through the PIMItem interface. Contact, Event, and ToDo all inherit from PIMItem, while ContactList, EventList, and ToDoList all inherit from PIMList.

Objectives of PIM APIs

Here are the lists for PIM API optional package objectives:

- It can be used to access the address book residing in the mobile device. Since nearly all mobile devices these days supports address book where contact can be stored, so to access that address book, PIM APIs provides a supporting for that.
- Gives J2ME devices access to the same personal data to which native applications already have access
- Provide access to personal data in native formats, which may reside on the device, on removable media, or somewhere over the network.
- Support access calendar and to-do list entries in vCalendar format.
- Impose no required fields or attributes.
- Provide security in using these APIs.

2.8.2 PIM List

The PIM optional package API defines three types of PIM data, known as PIM lists, not all devices support all three types, but a device must support at least one of these:

2.8.2.1 Contact list

Those contain names, addresses, phone numbers, and other info about business and personal contacts, a mobile device contains all the contacts in a contact list.

It is responsible for determining which of the fields from a Contact are retained when a Contact is persisted into the List.

2.8.2.2 Event list

Those store appointments, reminders, and other date-specific items.

2.8.2.3 To-do list

It is an interface extending from PIMList, represents a To-Do list containing To-Do items and is responsible for determining which of the fields from a To-Do are retained when a To-Do is persisted into the List

2.9 Summary

This chapter covered different topics that are related to receivers' works, Bluetooth technology and mobiles' works.

The most important receivers' component, working of remote controller and DBS (digital broadcasting signal) satellite are explained here

CHAPTER THREE 3

Project Conceptual Design

3.1 Overview

This section discusses the general block diagram as well as many other techniques for designing this project.

3.1.1 General block diagram

Figure 3.1 is the general block diagram for a project, as illustrated below, the LNB connects the dish to the receiver satellite which takes the signal with a very high frequency from the dish then converts it to a lower frequency, then the signal will be separated to video signal, audio signal and EPG signal, then these signals are send to the TV.

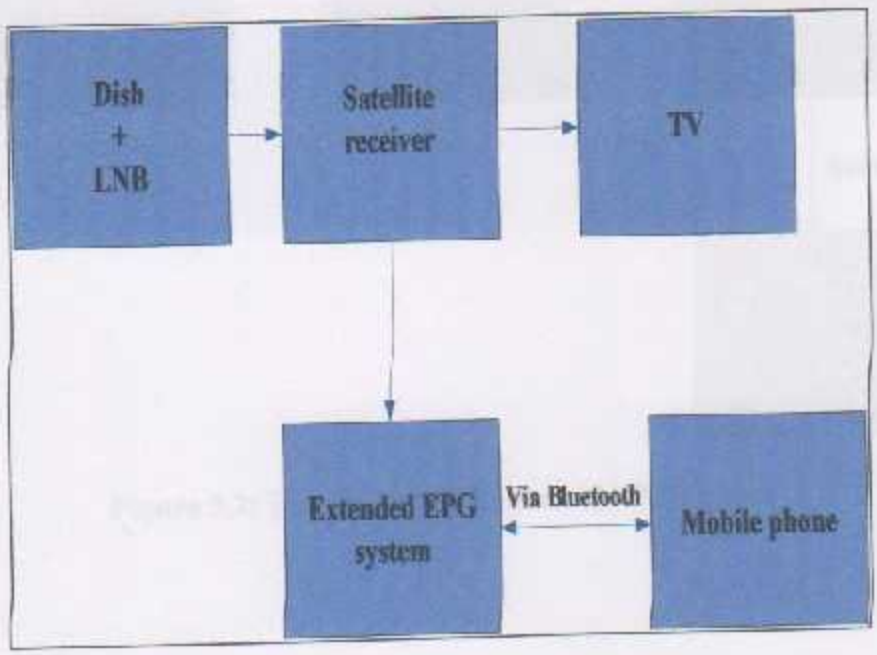

Figure 3.1: General block diagram

In this project the concerned is done about the EPG screen, which will be treated as an image and the text information about the desired program will be extracted from this image and stored as a text within txt file.

3.1.2 Extended EPG system block diagram

The extended block should is responsible to create text file which will be read and the string data within it will be sent to the mobile, figure 3.2 is a semi block diagram which shows the component of the extended EPG system, and illustrates how to get text from image using matlab and store this text in a text file.

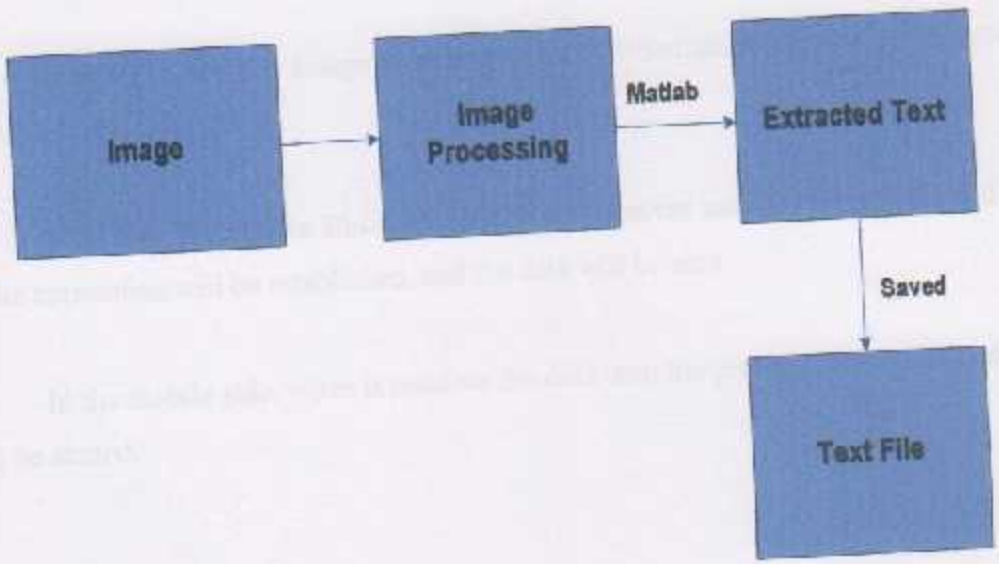

Figure 3.2: Extended EPG system block diagram

3.1.3 The system concept

When the user depress on the EPG button, which is a button in the remote control, the scheduling of the program with their names and time will be displayed on the TV screen, the user can select the appropriate program to send it to his mobile.

When user selects the program, EPG screen will be captured and stored as an image, which contains the information for the program, such as date, start time, end time, channel number and program name.

Matlab process this image to extract the text information for desired program and store it as txt file.

After that the mobile Bluetooth search for receiver satellite Bluetooth, and find it so the connection will be established, and the data will be sent.

In the mobile side, when it receives the data then the process to build calendar entry will be started.

3.2 Design options

As shall see in the following figures, the building of the broadcasting satellite signal receiver doesn't changed, the components aren't deleted or reconstructed, only some additional hardware or software components will be added, in order to achieve the objective of this project.

3.2.1 First option

One of the design options is to program the controller of the receiver itself. Only Bluetooth will be added to it in order to make the interaction with Bluetooth mobile phone possible and matlab to process the image, Figure 3.3& Figure 3.4 illustrate this option.

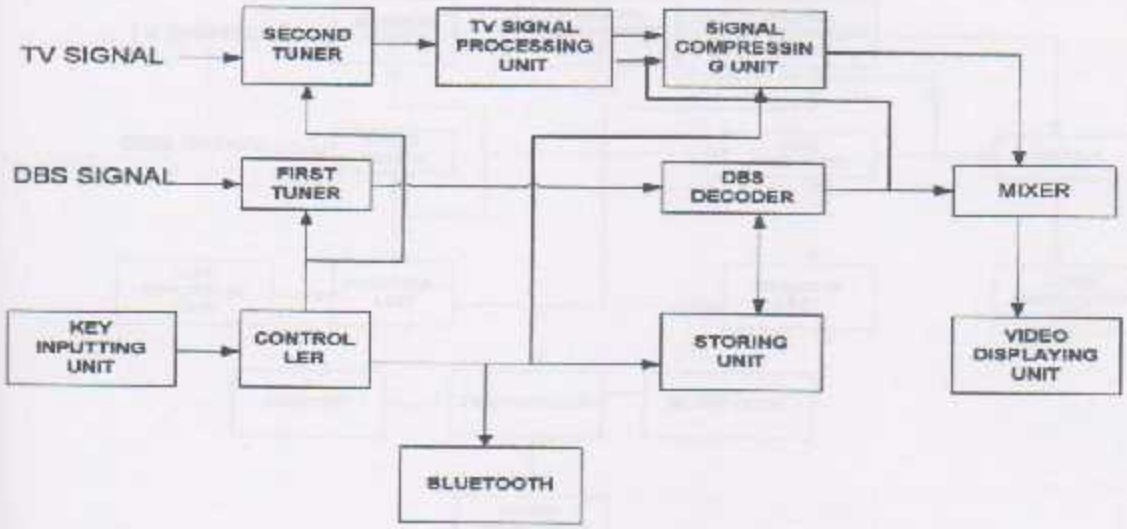

Figure 3.3: Option 1 block diagram

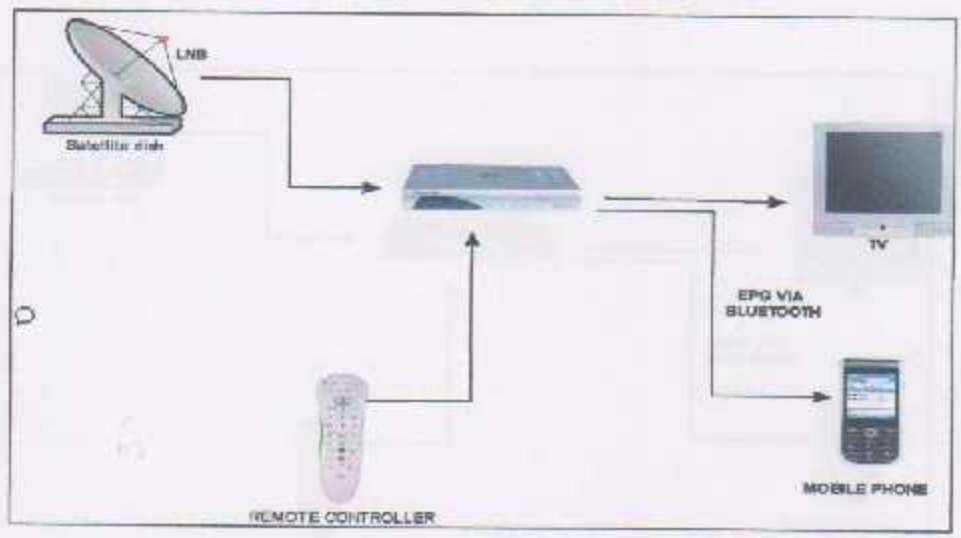

Figure 3.4: Option 1 details block diagram

3.2.2 Second option

In this option a new controller, Bluetooth technology and image processing module will be added to the original block diagram. Figures 3.5 and 3.6 show the block diagram for this option:

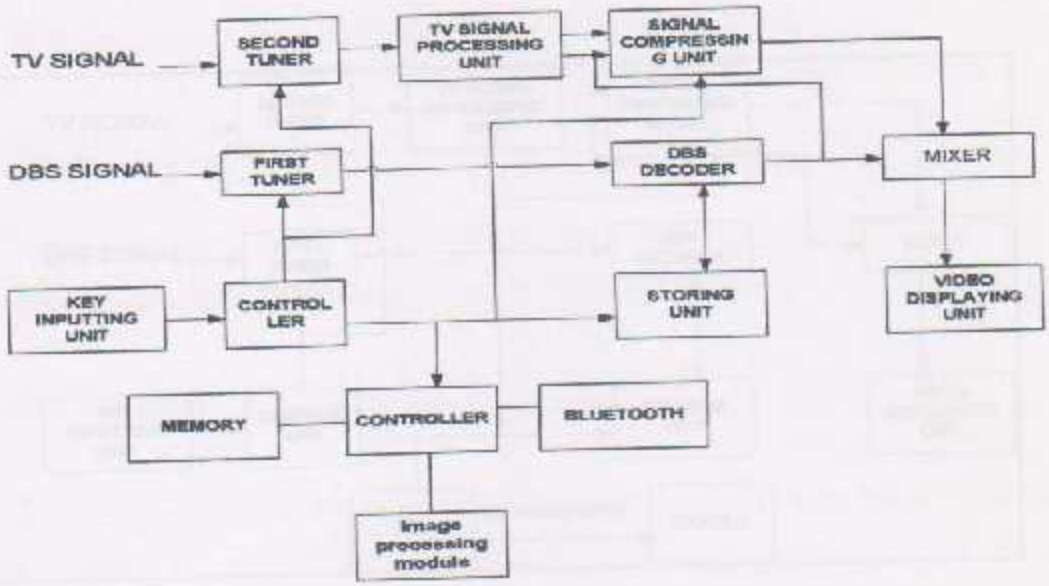

Figure 3.5: Option2 block diagram

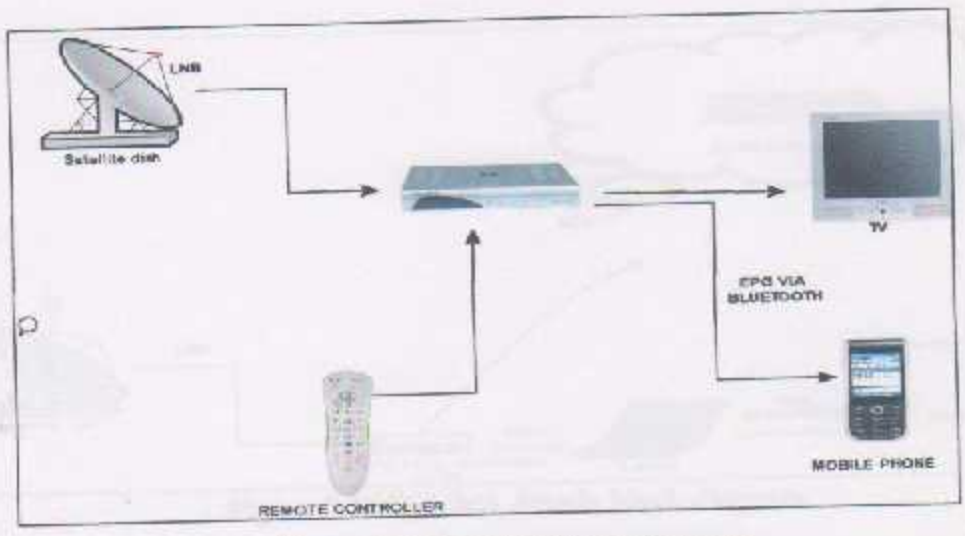

Figure 3.6: Option2 block diagram

3.2.3Third option

In this option a receiver card will be used, and it will be connect to PC. This method is the most suitable one since PC will be assumed as a receiver which has the entire component including image processing module and Bluetooth technology that has the ability to communicate with mobile. Figures 3.7 and 3.8 show the block diagrams for these options:

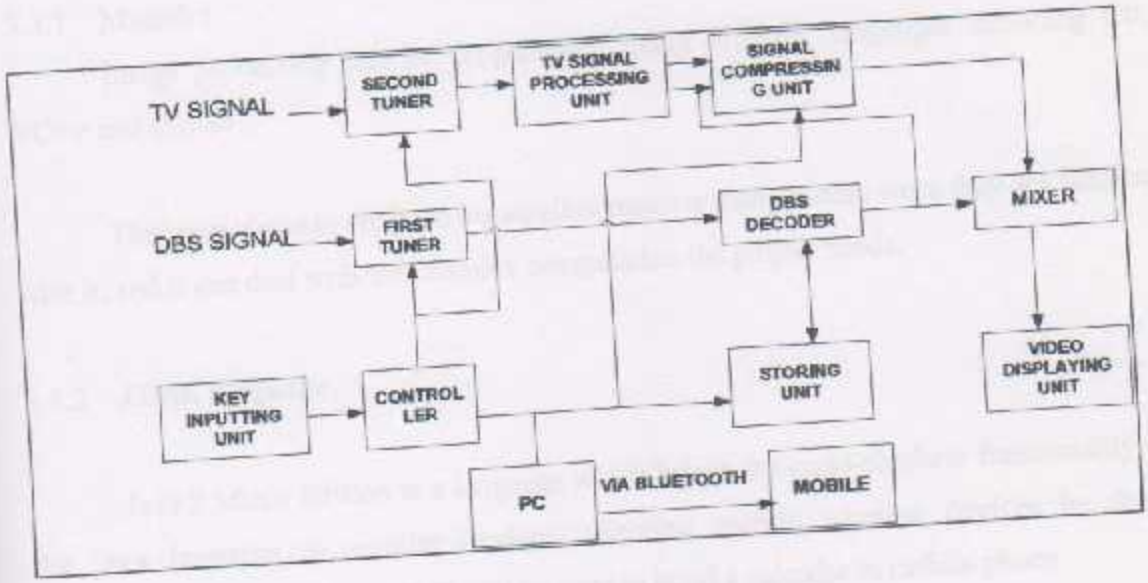

Figure 3.7:Optoin3 block diagram

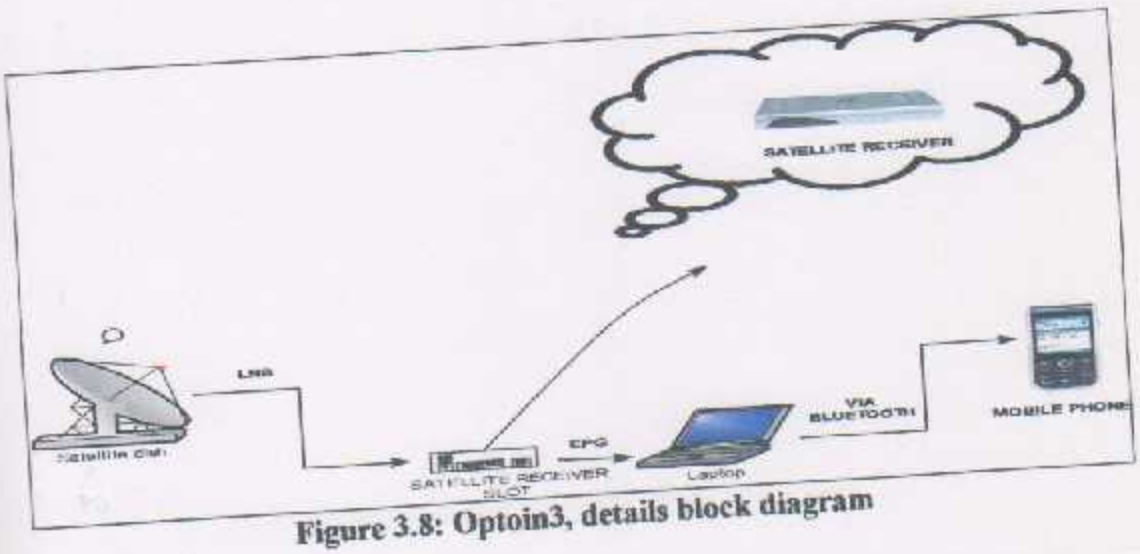

Figure 3.8: Optoin3, details block diagram

3.3 Project software

The software will be made using the following language:

3.3.1 Matlab :

Image processing can be programmed using different languages including C#, VC++ and matlab.

The team chose to program the satellite receiver using matlab since they are familiar with it, and it can deal with the complex computation the project needs.

3.3.2 J2ME language:

Java 2 Micro Edition is a language which brings the cross-platform functionality of the java language to smaller devices, allowing mobile wireless devices to share applications. In this project J2ME will be used to build a calendar in mobile phone

3.4 Summary

In this project there are many design options as described and illustrated above, and the third option that uses receiver card which its type is "technisat skystar 2 TV" that will connect to PC is what will be considered for the purpose of sending the program data.

جامعة بوليتكنك فلسطين
Palestine Polytechnic University
(PPU)
The Library المكتبة
Acc. 23696 الرقم المسلسل
Class. رقم التصنيف

CHAPTER FOUR 4

Software Implementation

4.1 Introduction

This chapter includes the software implementation for mobile phones using J2ME language and receiver satellite using image processing.

4.2 Obtaining EPG Text

EPG text will be obtained and stored in a text file using image processing, since EPG screen will be captured using print screen key and stored as an image.

The EPG information is displayed on the screen in static form; the type and size of strings and location of these are stable, to extract the text form image several steps must be done, the processes for each step will be explained bellow with flowchart for each one.

Step1:

This step include storing all characters which include all letters, numbers and some of special characters as images in work file within matlab program, then find the value of rows and columns for each one of these image.

Then create an array which has a row equal to the maximum number of image's rows, and its columns equal to the number of the characters.

After that calculate the pixels for each row of each image, then store the results in an array one column for each image; figure 4.1 is a flowchart that shows the process of this step.

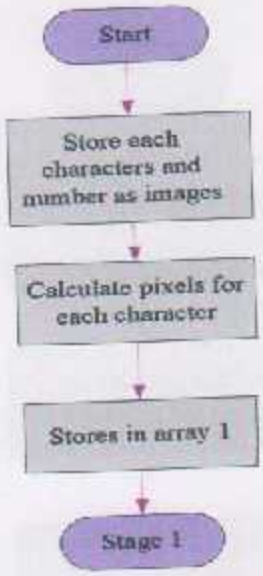

Figure 4.1: Storing Character in Arrays

Step 2:

When EPG information is displayed, and the users choose the appropriate program, then the EPG screen will be saved as image using print screen key, then the image will be stored in specific location with specific name.

Using image processing the descriptions of the desired program will be determined and extracted and then stored as image, these description include time, date, name for the program and the number of channel which display the program.

Then these images will be read, and the segmentation will be done on the text within the image to store each character itself in a separated images.

Then for each one of these images the pixels will be calculated and stored in an array which its rows equals to number of rows in the first array ,and the number of columns equal to the number of strings that are contained in a text image.
Theses processes are shown below in figure 4.2.

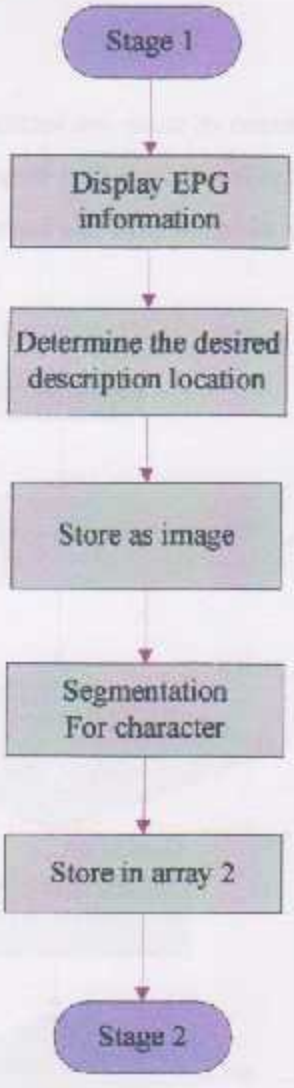

Figure 4.2: Extract Desired EPG Information

Step 3:

This step is the most important one since its concern to output the text, the rows of the second array will be compared with each row from the first array, according to the result, the strings will be returned and then stored in a text file, figure 4.3 shows the processes of this step.

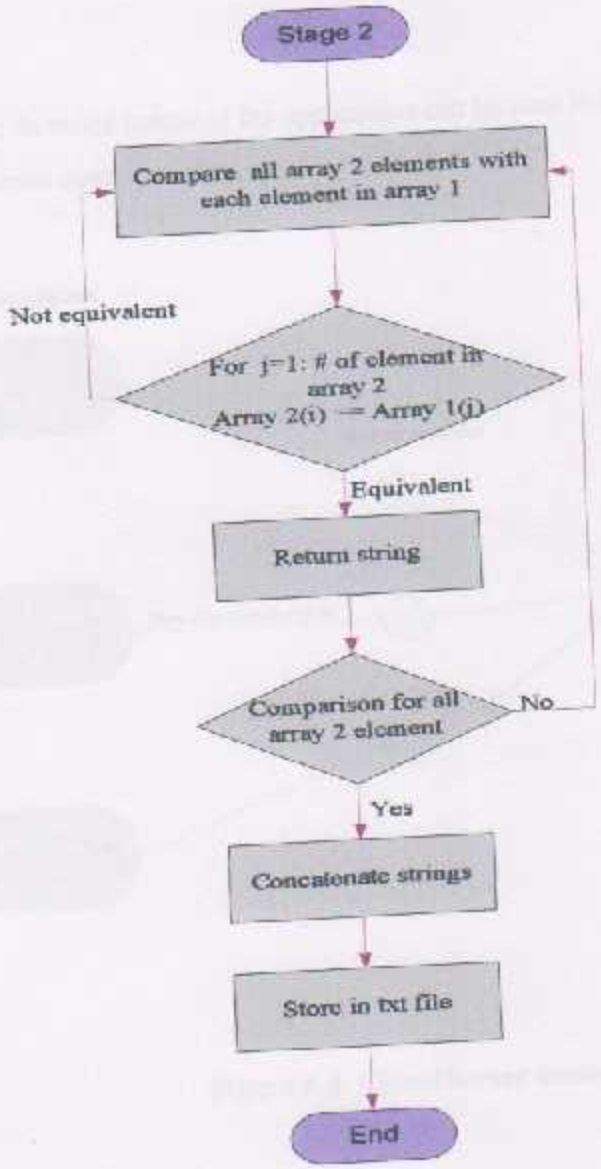

Figure 4.3: Store Information in Text File

4.3 Client / Server Communication

Each connection is serviced by new thread between client and server; since server use a dedicated thread for each one of these servers.

Server is identified by a Bluetooth UUID and a service name, the stream connection between a client and handler is created using Bluetooth's RFCOMM protocol.

The threaded nature of the application can be seen in Figure 4.4 , which shows how the clients connect to the server.

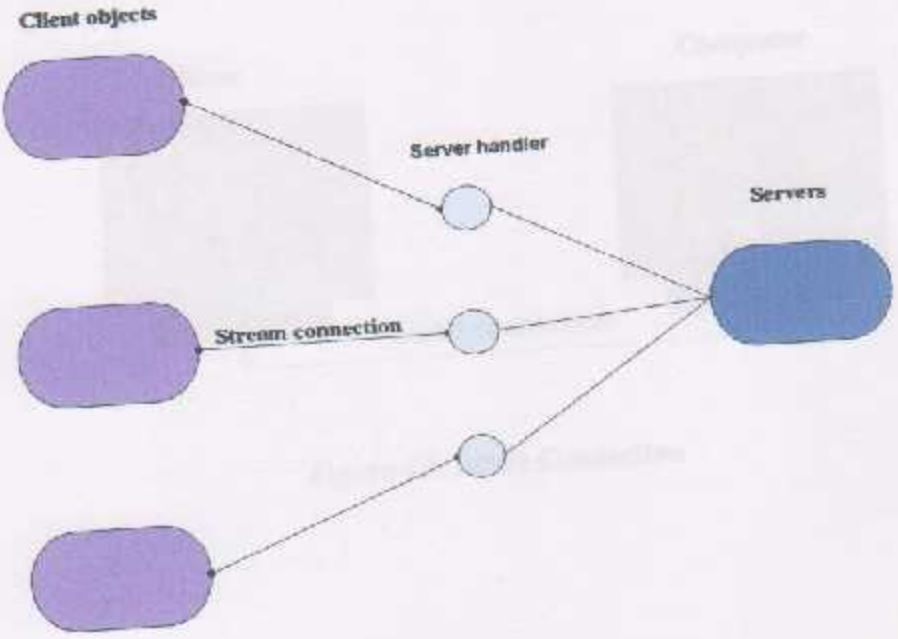

Figure 4.4: Client/Server connection

4.3.1 Connection Type:

With Bluetooth connections there are two basic use cases:

1- Static connection.

2- Dynamic connection.

4.3.1.1 Static Connection

A common use for Bluetooth communication is when the user wants to synchronize data or send files between a personal computer and a mobile phone, figure 4.5 sows this kind of connection.

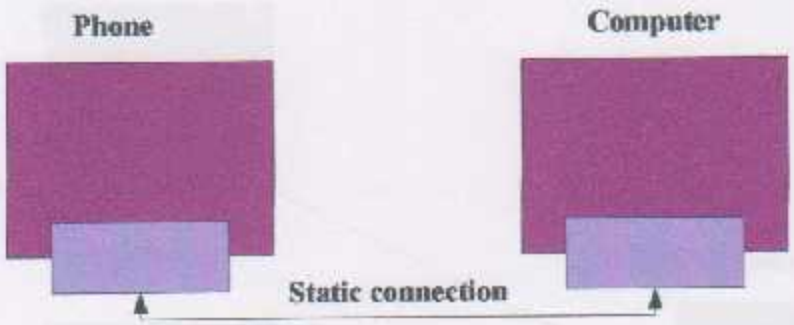

Figure 4.5: Static Connection

4.3.1.2 Dynamic Connection

This type of Bluetooth connections involves finding devices according to the services they publish. It may not be important of which device connection is established, but it is important to have the correct service in use.

In this case, the computer and mobile phone do not know information about each other. The first task is to enable the computer and mobile phone to find each other, then the second task is to pair the computer and mobile device.

After pairing is done, the connection can be opened and data transferred, figure 4.6 shows the dynamic connection case.

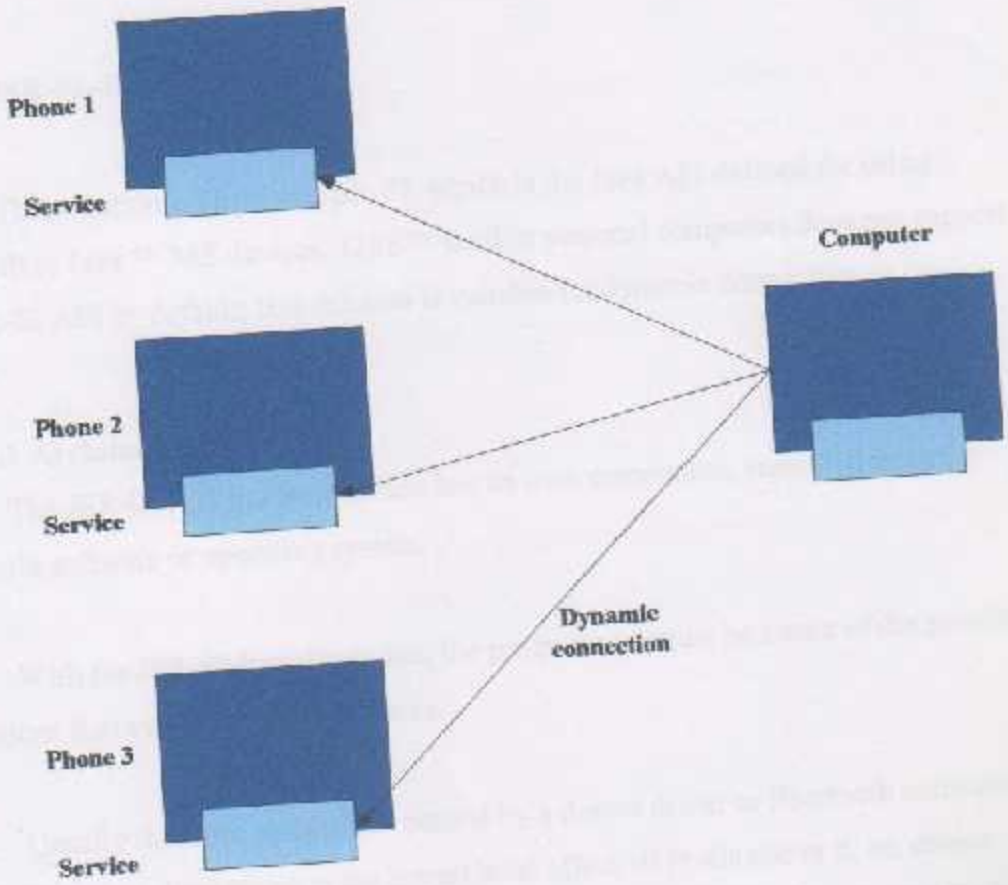

Figure 4.6 Dynamic Connection

4.3.2 Based Solution Connection

There are a solution for each one of these connection types, COM-based solution which used for static connection and JSR-82–based solutions that used for dynamic connection.

4.3.2.1 COM-Based Solution

The COM-based solution is based on virtual COM ports created by both communicating devices. From the programmer's point of view, using a virtual COM port is similar to using a normal COM port, this solution is best for the static connections use case.

4.3.2.2 JSR-82–Based Solutions

This solution is based on JSR-82, which is the Java API defined for using Bluetooth in Java ™ ME devices. J2SE™ used in personal computers does not support the JSR-82 API by default; this solution is suitable for dynamic connection.

4.3.2.2.1 Architecture of JSR-82

The JSR-82 API implementation has its own component, separated from the Bluetooth software or operating system.

With the JSR-82-based solution, the programmer must be aware of the possible limitations that every component causes.

Usually there are restrictions caused by a device driver or Bluetooth software implementations, limitations at the lowest level affect all levels above it, so, device driver limitations are visible in Bluetooth software and JSR-82 levels. Figure 4.7 shows the overall architecture.

Figure 4.7: JSR-82 Architecture

4.3.2.2.2 The Needed Equipment and Software

Implementing the JSR-82-based solution, first need a Bluetooth device compatible with the Bluetooth stack and software at the computer and the device ends such as Windows XP Service Pack 2 Bluetooth stack and Widcomm Bluetooth stack

A second needed software component is JSR-82 implementation; there are two free JSR-82 API implementations for the Windows XP Service Pack 2 Bluetooth stack:

- Blue Cove.
- Blue Sock.

Here JSR-82–based solutions are used since the connection between the devices is dynamic connection, to allow different mobile phone to be communicated with the receiver satellite at different time.

4.3.3 Client \Server Activities

In this project receiver satellite acts the server and mobile phone is a client, so to connect the client with server several step must be done from each side , the following flowcharts display the these steps for each one.

4.3.3.1 Client

First mobile phone will start it processes to discover devices Bluetooth to be communicated with it, after founding it, then next step which is services search will be started, then client chooses the desired server which is the desired receiver satellite.

After that the server should be examined to see if it has a desired service, then a server will send data and client will accept this data, else the process will be terminated.

After client accepts data, the client connection will be closed; figure 4.8 illustrates the client activities.

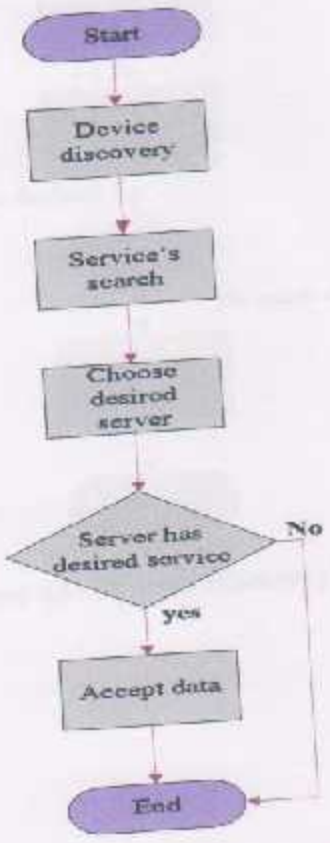

Figure 4.8: Client Activities

4.3.3.1.1 Device discovery

As shown in figure 4.9 which is a flowchart that illustrates the stages involved in devices discovery, first the discovery agent will be initialized, then the mobile will begin its search process for the receiver satellite Bluetooth to be connected with it.

If the device was found, then mobile will continue its search process to discover if there are other devices to be communicated with it, since the maximum number of devices that allowed to be connected with mobile is seven. If mobile doesn't find other devices or the number of devices that are found reach to the maximum number, then devices search process will be terminated.

Figure 4.9: Device's Discovery Flowchart

4.3.3.1.2 Services Search

After the desired device was discovered then the processes to fined and discover the services in this device will be started.

The first step is to search for the services in the receiver satellite, if the service founded and it's the desired one the services search process will be terminated, and if there is no services in the devices then as the first case the process will be terminated, but if there are other services the device continue to search for these services and examine it, figure 4.10 illustrate the services search process steps.

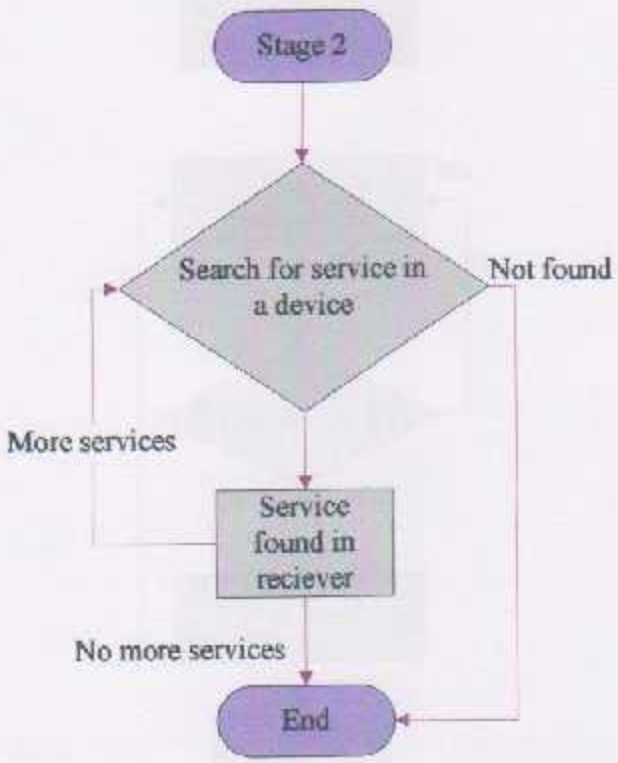

Figure 4.10: Services Search Flowchart

4.3.3.2 Server

For server side, after the services is initialized, server will wait for the connection to be established, so if it established then the string data will be sent, else if it not established then server will return to wait for new connection , figure 4.11 shows the server activities.

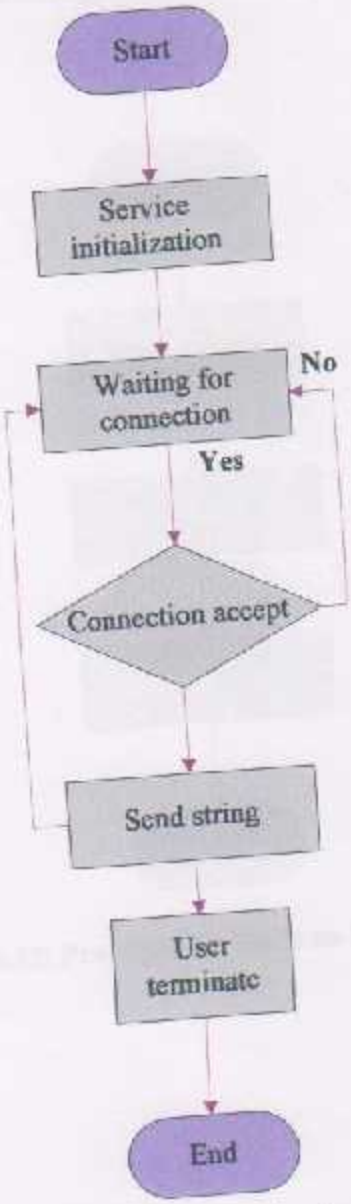

Figure 4.11: Server Activities

4.4 Building Calendar Entry

After the connection between the devices are established and the services are found, then the string in text file will be read using java, then string data will be sent to a mobile phone through established connection.

When mobile receive data, it starts its steps to process it, first this data will be converted to date as shown later, and this date will be used in order to build a calendar using PIM, figure 4.12 shows then step.

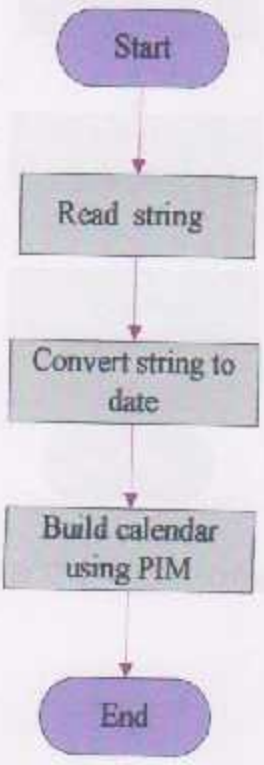

Figure 4.12: Processes To Build an Entry Calendar

4.4.1 Convert String to Date

The strings which are read will be split into day, month and year, then this string will be converted into integer, integer data will be converted into date, then a calendar will be built using this date data, figure 4.13 shows the steps of this stage.

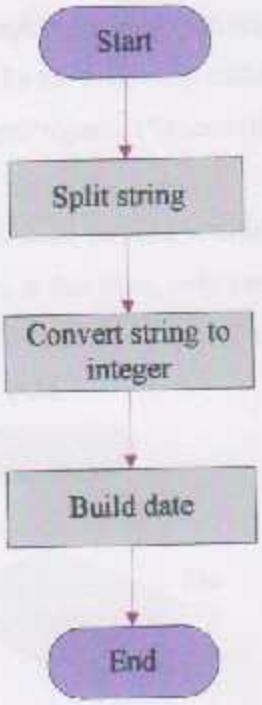

Figure 4.13: Converting String to Date

4.4.2 Building Calendar Entry

The first step is to examine if the PIM Optional Package is available on a device before attempting to use it, if its available then continue other steps else terminate the processes.

Checking for the system property is done by calling microedition.pim.version, since all PIM Optional Package implementations are required to support it; the code which is used for this purpose is like the following code:
String current Version = System.getProperty ("microedition.pim.version ").

Also the returned version should be used in order to make sure that the code which is used is a computable one, at this time, only version "1.0" is available, else the call will return null if the optional package is not available, and figure 4.14 illustrates how to build an entry calendar by PIM.

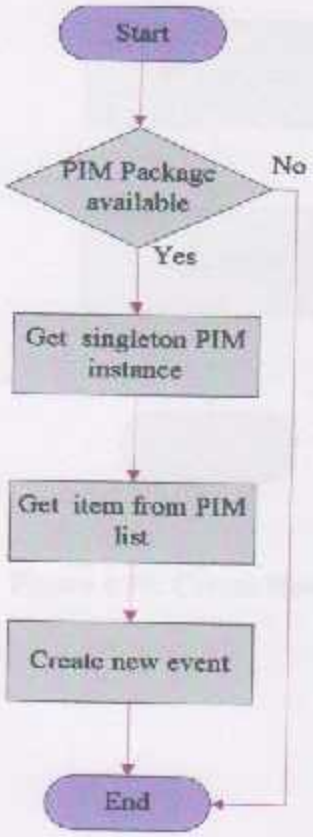

Figure 4.14: Use PIM to Build an Entry Calenda.3 Create New Event:

In order to cerate a new event, first createEvent () method from Eventlist should be called to return a new event for the list with no value set for any of the fields, in order to set a value for this event, <data type> () methods for the event should be used, then save the new field values to persistent storage by calling commit () method, figure 4.15 is a flowchart that shows the processes to create new event.

Figure 4.15: Create New Event

4.5 Sequence Diagram

Figure shows how the system component will be interacted with each other, in response to the user request.

First when the user display EPG information and choose the appropriate program, the EPG screen will be captured and stored as image format, then using matlab the image will be processed to extract the description for the desired information and store this strings in a text file.

Since the user choose the program the process for establishing the connection between receiver satellite and mobile phone will be started.

After the connection are established then the text file will be read, and strings that it contained are send to the mobile via this connection.

Then the mobile receive string data and start to process it, in order to build an entry calendar using J2ME language.

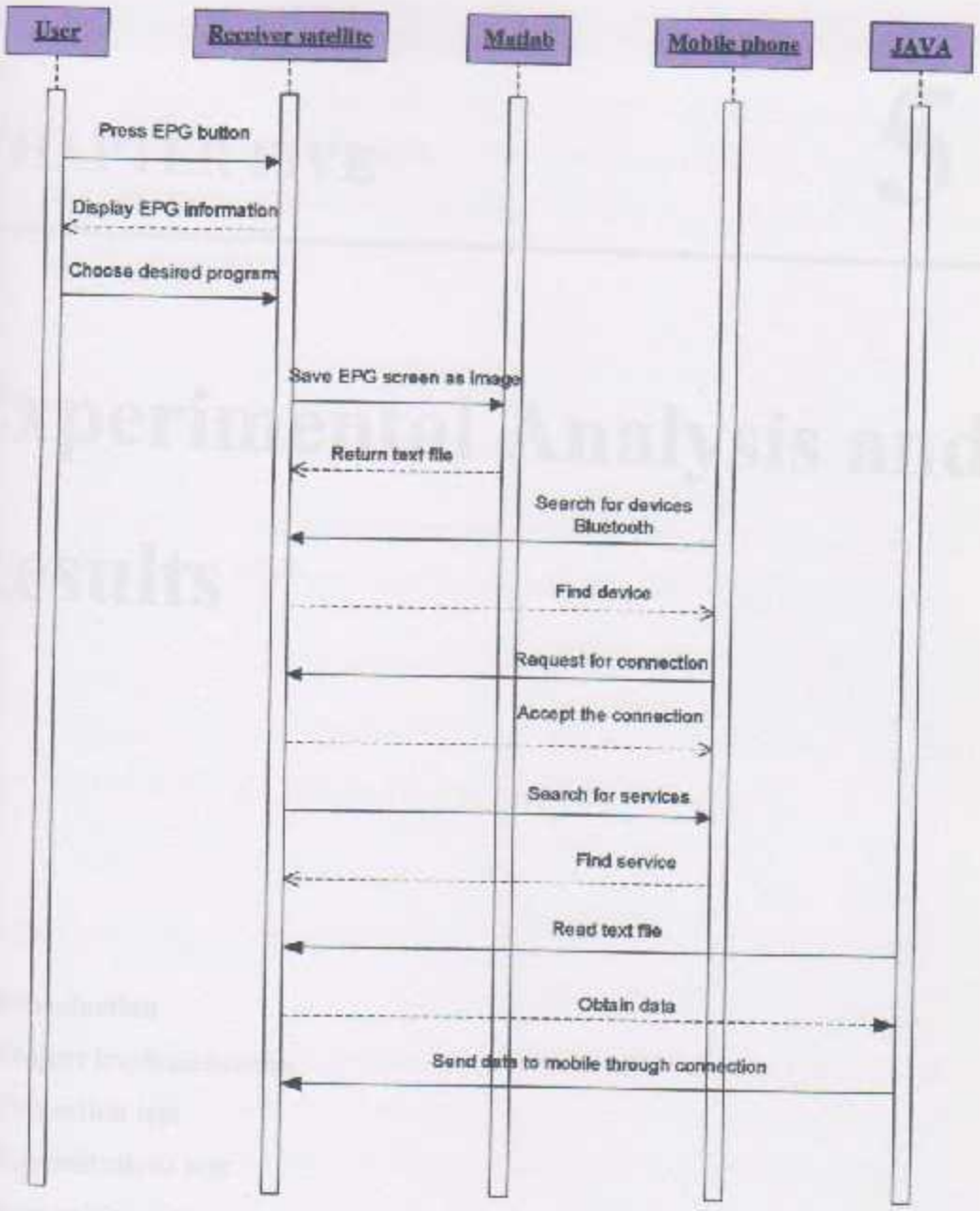

Figure 4.16: Sequence Diagram

CHAPTER FIVE 5

Experimental Analysis and Results

5.1 Introduction

5.2 Project implementation

5.3 Extraction test

5.4 Segmentations test

5.5 Recognition test

5.6 Test for establishing connection via Bluetooth

5.7 Constructing mobile phone application

5.1 Introduction

This chapter presents the performed tests to verify the whole process of making interaction between satellite receiver and mobile phone via Bluetooth. The tests were first performed separately for each phase, then the whole system is tested, the results of these tests are presented in this chapter.

5.2 Project implementation

This project was implemented by using different languages such as matlab to extract the information of the favorite program, java language to build agent on pc and mobile phone.

VB language to make keyboard be interfaced with satellite receiver, and J2ME to construct mobile phone application (an entry calendar).

5.3 Extraction Test

The proposed method for the extraction phase is to detect the x axis and y axis of desired places that contain the information of the favorite program such as date ,start time ,end time , channel number that displaying it, and the name of the program.

The images were taken as it shown in figure 5.1, 100 images were captured with different information that contains all numbers and characters. The test was applied on all these.

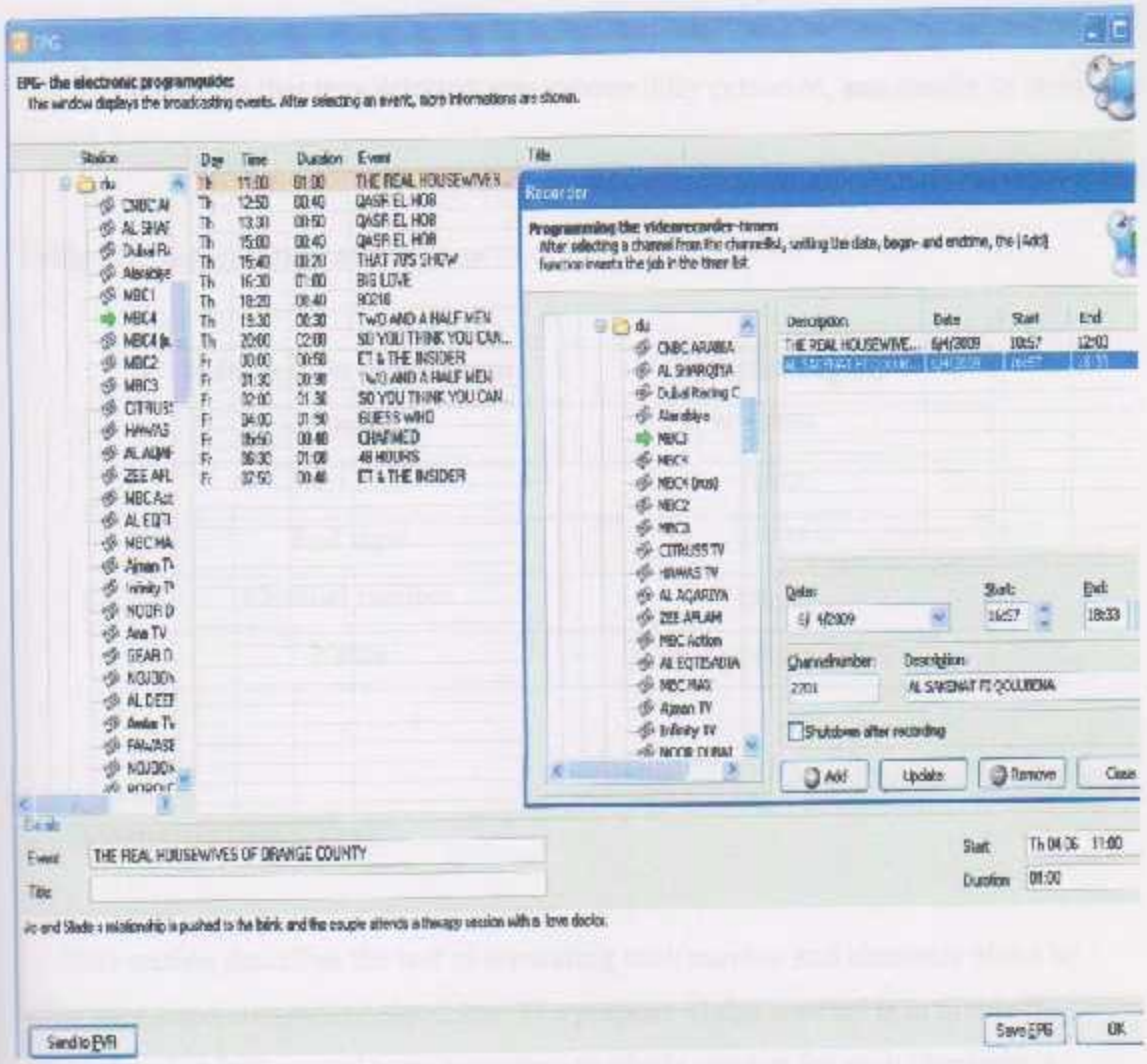

Figure 5.1: EPG Page

The region that was detected was successfully extracted, and results as shown in table 5.1

Table 5.1: Information of Program

Information of program	Detected region
Date	6/ 4/2009
Start time	16:57
End time	18:33
Channel number	2201
Name	AL SAKENAT FI OOLUBENA

5.4 Segmentations Test

This section describes the test of separating each number and character alone by using connected component algorithm. The purpose of this method is to divide the detected region into several parts according to pixels number for each character; a successful separating must fulfill all of the following criteria:

- The detected region must be divided into several parts.
- The order of these parts must be appear in the same way as they appear in the detected region.

The test was performed on the images that received from successful extraction phase; the process was performed on all images.

5.4.1 Results

The proposed method based on number of components is very excellent way in dividing the detected regions into several parts, in all images the algorithm succeeded in separating all of regions into parts; this means that the success rate for this method is 100% as table 5.2 shows.

Table 5.2: Segmentation Test

Method	Successful	Rate of success
Connected component algorithm	100/100	100%

5.5 Recognition Test

The final step is to recognizing each numbers and characters that extracted from segmentation phase from detected region that includes it.

The method that used in this phase is to identify all numbers and characters as matrix of ones and zeros according to the number of pixels in order to recognizing each of it. This phase will be highly successful if all the characters identified correctly. The matrix that identifying some numbers and characters as shown in figure 5.2

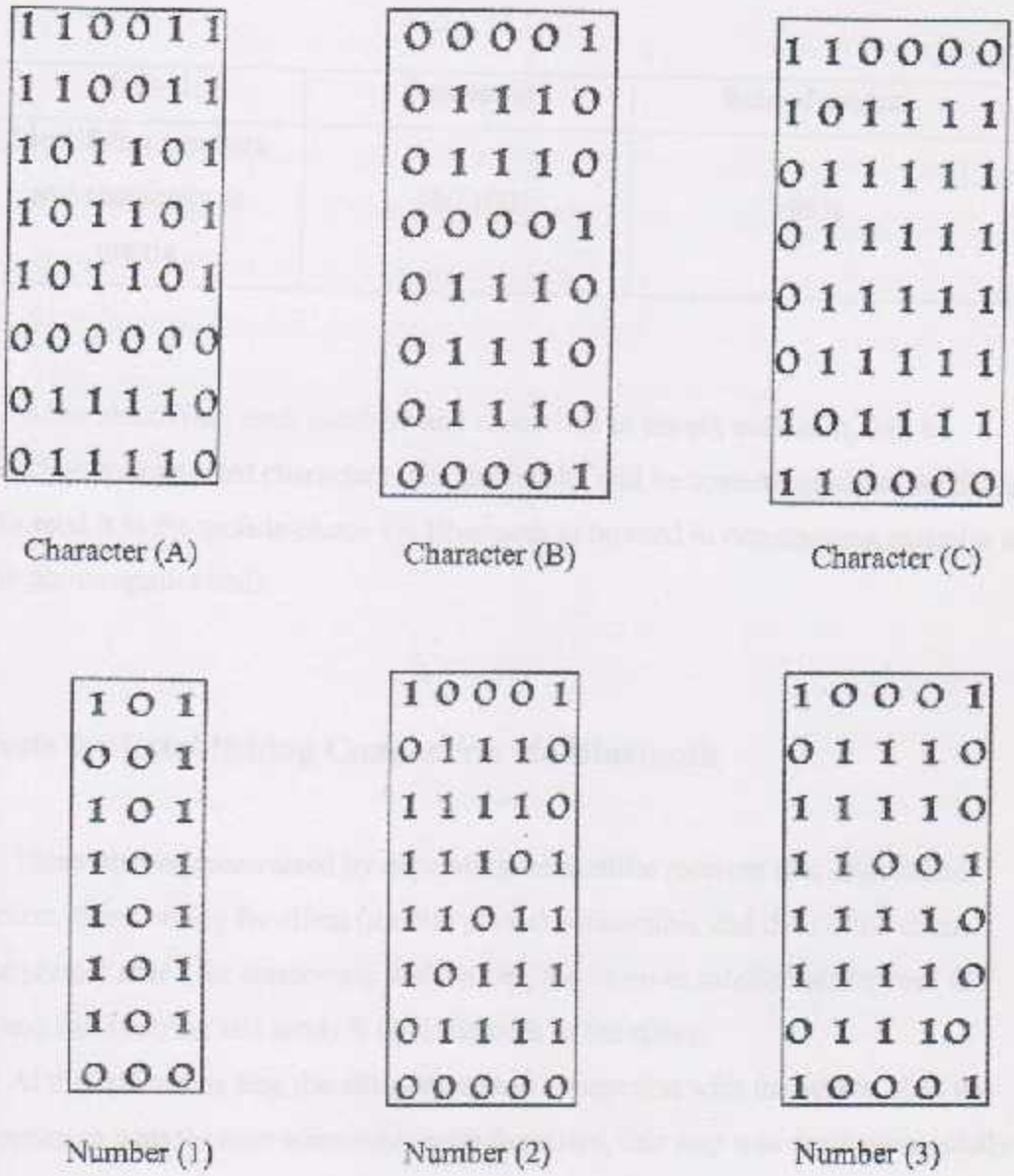

Figure 5.2: Matrixes of Numbers and Character

5.5.1 Recognition Results

The proposed method in this phase based on identifying each the numbers and characters that received from segmentation phase is good way to recognize it, all numbers and character recognized successfully with a success rate of 95% as shown in table 5.3.

Table 5.3 Recognition Test

Method	Successful	Rate of success
Identifying numbers and characters as matrix	100\100	95%

After identifying each numbers and characters as matrix each of it, will be compared with segmented characters then the results will be concatenated as text file in order to send it to the mobile phone via Bluetooth to be used in constructing calendar as (mobile phone application).

5.6 Tests for Establishing Connection via Bluetooth

This step was constructed by depending on satellite receiver that established connection, then waiting for client (mobile phone) connection, and then if the client (mobile phone) asked for connection with server, the receiver satellite server read the stored text file as string and sends it via Bluetooth to the client.

At the end of this step the client terminate connection with the server. And the server return to wait for new connection with the client, this step was done successfully

5.7 Constructing Mobile Phone Application

In this step the mobile phone application (entry calendar) was constructed according to the following process:

5.7.1 Converted String to Date:

Converted string to date is the first step of constructing mobile phone calendar. This step was applied and tested successfully. The criterion that was judged for its success is done achieving the following:

- The string contained the information of the desired program as shown in figure 5.3 (date, start time, end time, channel number and name of the program).
- Split each of them alone as shown in figure 5.4.
- Split the date into day, month, and year as shown in figure 5.5.
- Split the start time into hour, minute, and second as shown in figure 5.6.
- Building the date in the event summary

6.4.2009 16:57 2201 AL SAKENATE FI QOLUBENA

Figure 5.3: Information of Desired Program

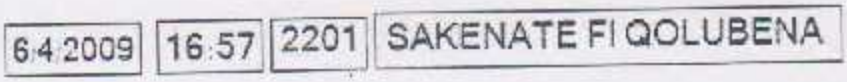

Figure 5.4: Separated Information

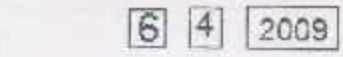

Figure 5.5: Separated Date

Figure 5.6 separated time

5.7.2 Constructing Mobile Phone Calendar:

Building the mobile phone calendar depends on accessing to the mobile phone database using PIM package, if the mobile phone accept the access to its database, it creates a new event.

New event contained the following one

- event start which it is the date of the program
- Event alarm which used to remind the user 10 minute early from the program start.
- Event summarized which store the name of the program and the channel number.

The mobile phone calendar was constructed as the step followed above and it was tested as shown in figure 5.7

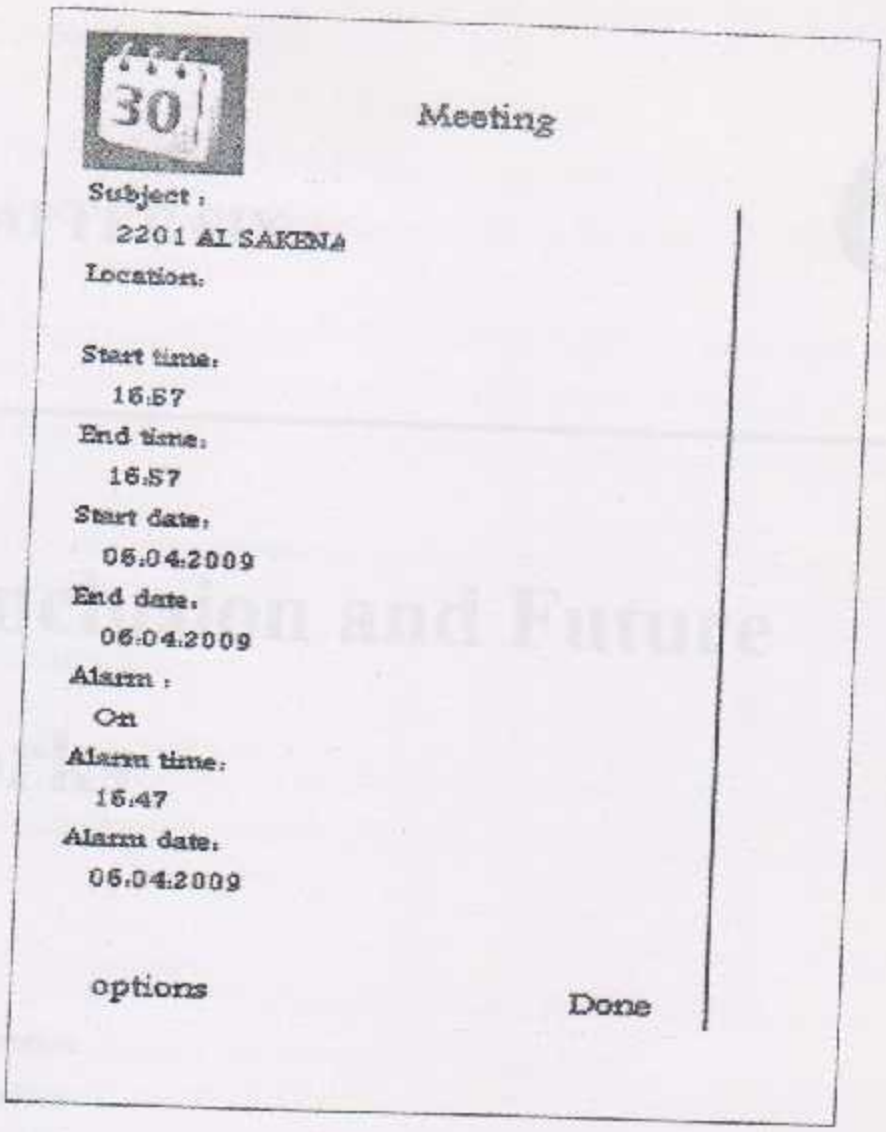

Figure 5.7: Mobile Phone Calendar

CHAPTER SIX 6

Conclusion and Future Works

6.1 Introduction

The project that has been done was an important step for developing the interaction between satellite receiver and mobile via Bluetooth.

Also the project was a good step in developing the idea of saving the EPG information of the favorite program in the mobile phone as calendar .Many problems appeared through testing the system, but fortunately all problems were solved.

In this section some recommendations are suggested to enhance this system.

6.2 Conclusions

This project was focused on the interaction between satellite receiver and mobile phone via Bluetooth. The system was designed, developed and tested; and the following remarks were being outlined.

1. The information of the desired program was extracted from the EPG page by using image processing, this step was accomplished successfully.

2. Interfacing mobile phone with satellite receiver via Bluetooth was accomplished and tested, and the given results were highly successful.

3. Sending information of the desired program to the mobile phone via Bluetooth was done successfully and tested.

4. The calendar in the mobile phone was constructed successfully. And finally the whole system was completely tested and gives high results. As shown in table 6.1

Table 6.1: Main Results

Step	Success rate
Extracting information of desired program	98%
Interaction via Bluetooth	100%
Sending information via Bluetooth	100%
Constructing the calendar	100%

6.3 Problems

During developing the system several problems has occurred, most of them easy to handle it. This chapter recorded some challenges problems and how they were solved.

6.3.1 Software Problems:

Having an open source satellite receiver was the major problem it was solved by using satellite receiver card and using image processing to extract the information of the desired program , it was difficult problem since it was a new idea.

Constructing the mobile phone application was another problem, since no one of the project team had an experience in using J2ME programming language. many books were read and many programs were reviewed in order to learn how to make the application in a way that serves the project, and that took a lot of time, effort, and attempts to do, since not only learning J2ME language what was required, but also to learn how to make the program deal with the database of the mobile phone to build a calendar.

Interfacing the mobile phone with satellite receiver via Bluetooth is another issue. The interfacing was accomplished by using PC in implementation.

6.4 Future Works:

After our work on this project and after facing many problems during the implementation, we are as the project team seeing the following points may be good improvement for this project.

1. Making the system work in real implementation (Interact TV satellite receiver with mobile phone via Bluetooth, Use remote controller to select the desired program instead of keyboard).

2. Use an open source satellite receiver in order to extract information of desired program instead of image processing method.

3. Extracting the information of desired program for channels that not have EPG information by using image processing.

4. Send HTML page of EPG to the mobile phone that allow the user to scan all the information of the programs (embedded web server).

[1] Do, Y, S. (1999)."Program Guide Signal Receiver And Method Thereof" , Samsung Electronics Co.
[2]
[3] http://en.wikipedia.org/wiki/Moving_Picture_Experts_Group
[4] http://en.wikipedia.org/wiki/Video_compression
[5] http://www.mpeg.org/MPEG/mpeg-pointers-and-resources
[6]http://www.satsig.net/lnb/explanation-description-lnb.htm
[7] http://www.satcure.co.uk/tech/lnb.htm
[8] http://homethcater.about.com/od/hometheaterdoityourself/ig/Home-Theater-Connection-Photo-/RF-Modulator.htm
[9] http://en.wikipedia.org/wiki/RF_modulator
[10] http://en.wikipedia.org/wiki/Electronic_program_guide
[11]http://en.wikipedia.org/wiki/Listings_magazine
[12] http://en.wikipedia.org/wiki/Cable_television
[13] http://en.wikipedia.org/wiki/TV_Guide_Network
[14] http://www.bluetooth.com/Bluetooth/Technology/Works
[15] http://java.sun.com/javame/index.jsp
[16] http://en.wikipedia.org/wiki/Java_Platform,_Micro_Edition
[17] http://www.ifi.uzh.ch/~riedl/lectures/Java2001-j2me.pdf
[18] http://en.wikipedia.org/wiki/Virtual_machine
[19] http://en.wikipedia.org/wiki/Kernel-based_Virtual_Machine