CHAPTER 5

IMPLEMENTATION

5.1 Introduction

The purpose of this chapter is to present the results of implementing the Raspberry Pi as an HTPC.

5.2 Testing Method

There are six files to use for testing the Raspberry Pi.

File Type	File Format	File Name	Additional Notes
Audio	Mp3	Blind Guardian - Mirror Mirror	-
Audio	FLAC	Last Exile – I've got friends	-
Video	Mp4	Top Gear Season 20 Episode 6 HDTV BBC HD	H.264 AVC 720p, Audio AAC.
Video	Mkv	Senjou no Valkyria 3 OVA 1	Hi10p H.264 AVC 720p, Audio AAC, Subtitle Format ASS.
Video	Mp4	G.I. Joe Retaliation	H.264 AVC 1080p, Audio AAC.
Video	Mkv	Eiyuu Densetsu Sora No Kiseki OVA 1	Hi10p H.264 AVC 1080p, Audio FLAC, Subtitle Format ASS.

The first two files are simple music files where the Raspberry Pi is expected to perform without much problem. The 4 movie files are used due to most high definition video files are encoded in h.264.

There will be two different distro to be compared. Objectives to be observed for:

- Boot time
- Idle CPU usage
- Overclocking

  The Raspberry Pi supported overclocking therefore it is neccessary to observe which distro supported this feature. An overclocked processor will allow for smoother video with less artifacts on screen.
- Stability

  Stability is examined to find out which distro is prone to crashing or auto restart.
- Compatibility

  Compatibility to be observed are the wireless device and CEC remote.

5.3 Preparation

Before beginning the project, there are several steps that is required to setup the Raspberry Pi. Below are listed the equipment and method to set the Raspberry Pi into an HTPC.

Gathering the equipment:

1. Raspberry Pi.

   For this project, the Raspberry Pi Model B is used because of the greater memory of 512 MB.

2. Raspberry Pi Casing.

   The casing is needed to protect the Raspberry Pi from the elements.

Figure 5.1 Raspberry Pi and Casing

3. USB Power Adapter

   The Raspberry Pi required a USB power adapter with an output of 5V and

700mA. In this project, a Cadpase brand adapter (5V, 1000mA) is used.

Figure 5.2 USB Adapter

4. HDMI Cable

A High-Definition Multimedia Interface (HDMI) Cable made by Belkin with a length of 1.8m is used to connect it to the television.

Figure 5.3 HDMI Cable

5. Television

Sony Bravia television is used as the display for the Raspberry Pi. It already comes equipped with a Consumer Electronics Control (CEC) capable remote

which will be used to control the Raspberry Pi HTPC through the HDMI connection.

Figure 5.4 Sony BRAVIA TV

Figure 5.5 BRAVIA Remote

6. SD Card

An SD Card is used as the main storage for the Raspberry Pi. For optimal operations, a SanDisk 8GB Class 10 card is used to store the operating

system and media center application.

Figure 5.6 SD Card

7. USB Flash Drive

A USB flash drive is used to provide storage for the media files.

Figure 5.7 USB Flash Drive

8. Wireless Dongle

A wireless dongle is required to provide wifi access for the Raspberry Pi.

Figure 5.8 Wireless Dongle

9. Powered USB Hub.

A powered USB Hub is used to increase additional USB port for the Raspberry Pi.

Figure 5.9 USB Hub

10. Wireless Mouse

A wireless mouse will be used as an additional control and emergencies.

Figure 5.10 Wireless Mouse

Preparing the SD Card:

1. Download distro raw image.
2. Install SD Card Formatter from the SD Card Association to properly format the SD Card.
3. Find a disk imaging software. In this project, win32DiskImager is used.
4. Format SD Card using the formatter.
5. Use the win32DiskImager to write chosen distro image to the SD Card.
6. SD card is prepared to be used for the Raspberry Pi.

Starting the Raspberry Pi

1. Insert SD Card into Raspberry Pi.
2. Connect HDMI cable into television and Raspberry Pi.
3. Connect wireless dongle, and mouse into the USB hub.

4. Connect USB hub to the Raspberry Pi.
5. Plug USB Flash Disk to the Raspberry Pi
6. Connect Raspberry Pi to the USB power adapter to activate.

Installation of the operating system for the Raspberry Pi is relatively simple. Once the Raspberry Pi is turned on, the distro on the SD card will automatically asks for installation. Follow the instructions on screen and wait for the installation to be finished.

5.4 Result

Below is the result of the Raspberry Pi running the two distro.

File Name	**Raspbmc**	**OpenELEC**
Blind Guardian – Mirror Mirror	Running perfectly	Running perfectly
Last Exile – I've got friends	Running perfectly	Running perfectly
Top Gear Season 20 Episode 6 HDTV BBC HD	Running perfectly	Running perfectly
Senjou no Valkyria 3 OVA 1	Video run smoothly however there are artifacts everywhere. Audio is perfect, no stuttering.	Video run smoothly however there are artifacts everywhere. Audio is perfect, no stuttering.
G.I. Joe Retaliation	Video run without trouble. Slight artifacts appear when jumping scenes.	Video run without trouble. Slight artifacts appear when jumping scenes.

	Audio is perfect.	Audio is perfect.
Eiyuu Densetsu Sora No Kiseki OVA 1	Video run smoothly however there are heavy amount of artifacts. Audio is perfect, no stuttering.	Video run smoothly however there are heavy amount of artifacts. Audio is perfect, no stuttering.

From the above table, both distro achieved the same results. This is because both runs the same XBMC platform and use the same codecs. The Raspberry Pi encountered problems running Hi10p profiles media but this is expected since average modern computers also have problems playing it. The fact that it is able to run Hi10p media smoothly without the video and audio stuttering is a testament on the excellence of the XBMC codec software.

Figure 5.11 Music file, Mp3, Mirror Mirror

Figure 5.12 Music file, FLAC, I've Got Friends

Figure 15 Video file, h.264 720p, Top Gear

Figure 5.14 Video file, Hi10p h.264 720p, Senjou no Valkyria

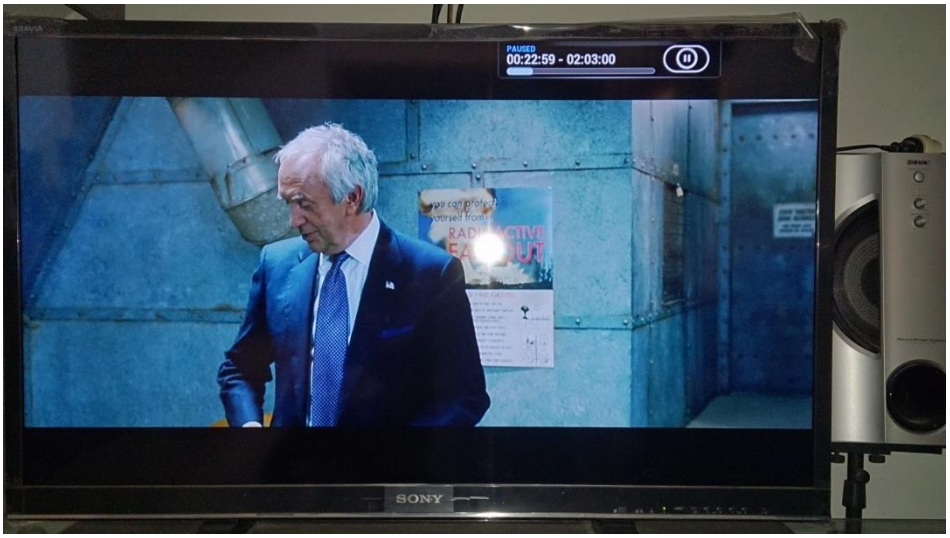

Figure 5.15 Video file, h.264 1080p, G.I. Joe

Figure 5.16 Video file, Hi10p h.264 1080p, Eiyuu Densetsu

5.5 Comparison

Below is the comparison between the two distro:

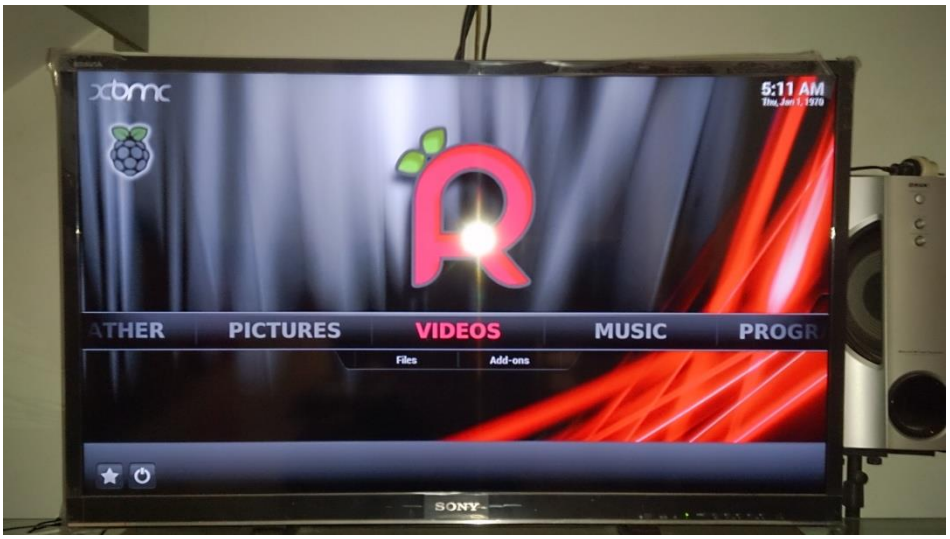

Figure 5.17 Raspbmc

Figure 5.18 OpenELEC

	Raspbmc	**OpenELEC**
Boot Time	47 seconds	50 seconds
CEC Remote	Working	Working
Overclocking	Available	Not available
Wireless Connection	Working	Not working
Android XBMC Remote App	Working	Not working

Between the two distro, Raspbmc has a slightly better boot time than OpenELEC. The CEC remote were automatically detected by both distro allowing immediate use of the device to control the Raspberry Pi. If the remote happens to stop functioning, restarting the television fixes the problem. Raspbmc comes with an overclocking feature that allows the Raspberry Pi to temporarily boost the CPU and GPU power. This is not recommended however since it will cause it to heat up drastically and might damage the Raspberry Pi.

The reason OpenELEC is unable to connect wirelessly is because the driver is unavailable in the distro while Raspbmc comes pre-loaded with it. If the wireless connection is unavailable the OpenELEC is unable to be controlled by the Android XBMC Remote App.

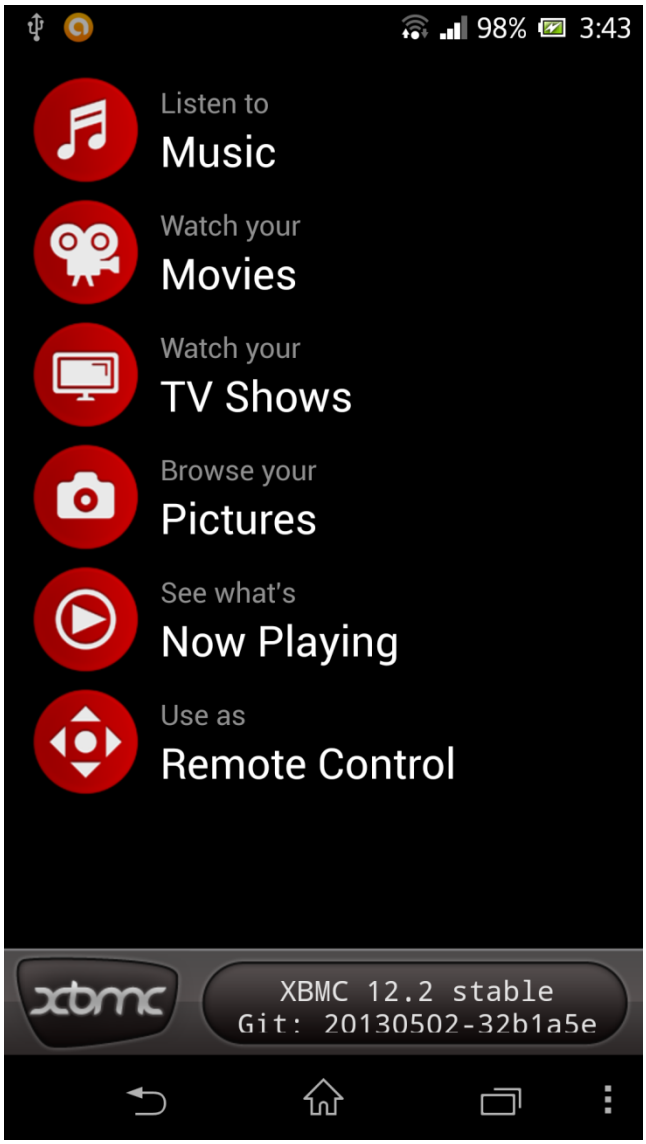

Figure 5.19 XBMC Remote

Figure 5.20 XBMC Remote Menu

Below is pictures of both distro at idle:

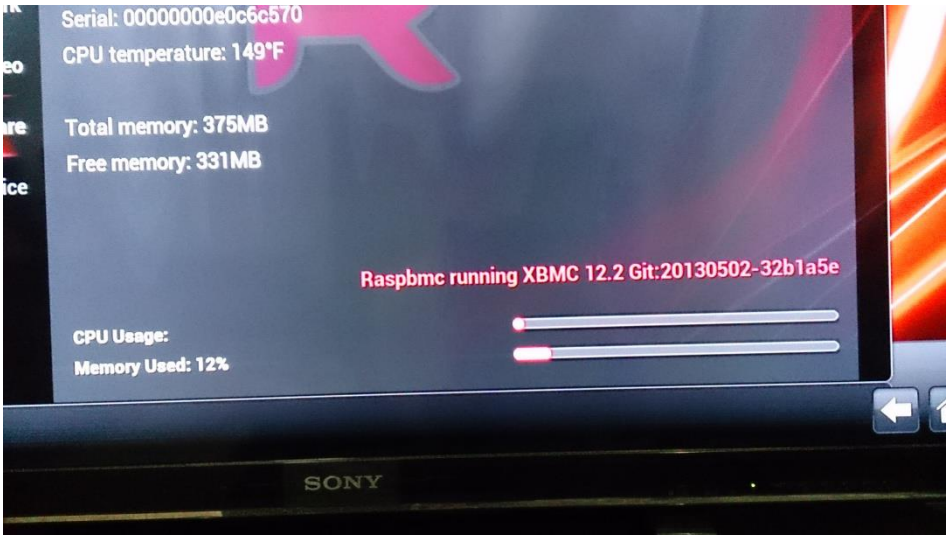

Figure 5.21 Raspbmc Idle

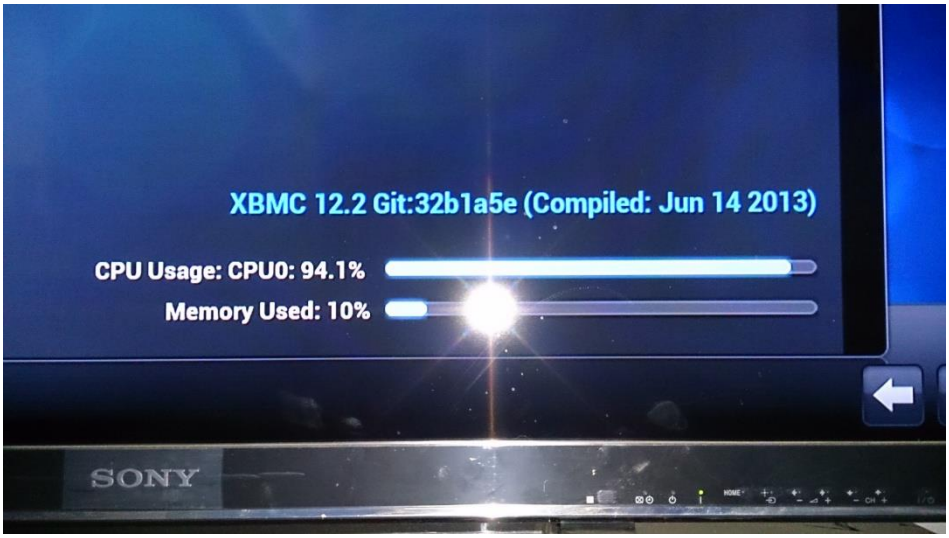

Figure 5.22 OpenELEC Idle

At idle, Raspbmc has little CPU usage while OpenELEC has very heavy CPU usage. Despite this however OpenELEC has a better response while browsing the menu in comparison to the slight stuttering in Raspbmc. Both distros have nearly the same amount of memory used while idle.

After several investigations, the reason OpenELEC has a high CPU usage during idle is due to the Media Center Application. The XBMC renderer will render

each frame even during periods of inactivity, a legacy from the days as an XBOX application. In Raspbmc this is not the case, since it is optimised not to render when idle.

During testing, Raspbmc appear to be a little unstable compared to OpenELEC. Raspbmc crashed twice during a 6 hour run while OpenELEC does not. The crashes however does not happen when a media is played but in the menu screen while browsing.