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JUDUL : EFFECT OF VIDEO ENCODING SCHEME ON BATTERY

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EFFECT OF VIDEO ENCODING SCHEME ON BATTERY CONSUMPTION OF MOBILE DEVICE

NOR AFIFAH BINTI MAT NAWI

This report is submitted in partial fulfilment of the requirements for the Bachelor of Computer Science (Computer Networking)

FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY
UNIVERSITI TEKNIKAL MALAYSIA MELAKA
2013

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DECLARATION

I hereby declare that this project report entitled

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DEDICATION

This dissertation is dedicated to my beloved parents Mat Nawi B. Jusoh and Mas Binti Awang, who always supporting and encouraged me in this study. Also to my supervisor, Dr, Zul Azri Bin Mohd Noh, who introduces me to this topic as well for the support on the way.

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ABSTRACT

Battery like a soul for our mobile phones. It provides energy to the mobile phones. Nevertheless, battery of mobile devices has limited power. We need to charge it back when the power is low. In addition, the diversity of applications that are used will reduce the battery life time. One of the application provided are video player. But, the battery usage is difference when we watch the streaming video through wireless or when we watch it in the storage. One of the reasons is the using of video codec. So, our approach is to measure the battery consumption of mobile devices based on video codec that supported by Samsung Galaxy Tab 2. In the end, user will know the suitable video codec for their mobile devices.

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ABSTRAK

Bateri adalah nyawa bagi telefon bimbit. Ia membekalkan tenaga kepada telefon bimbit untuk terus berfungsi bagi memudahkan kita menggunakannya. Walaubagaimanapun, bateri peranti mudah alih mempunyai kuasa yang terhad. Kita perlu mengecas kembali bateri apabila kuasa adalah rendah. Di samping itu, kepelbagaian aplikasi yang digunakan akan mengurangkan jangka hayat bateri. Salah satu aplikasi yang disediakan adalah pemain video. Walaubagaimanapun, penggunaan bateri adalah berbeza apabila kita menonton video aliran melalui internet atau apabila kita menonton dalam simpanan. Salah satu sebab adalah penggunaan codec video. Jadi, pendekatan kami adalah untuk mengukur penggunaan bateri peranti mudah alih berdasarkan codec video yang disokong oleh Samsung Galaxy Tab 2. Akhirnya, pengguna akan tahu codec video yang sesuai untuk peranti mudah alih mereka.

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LIST OF ABBREVIATION

PSM	Projek Sarjana Muda
Li-Ply	Lithium Polymer
Li-Ion	Lithium Ion
NiCd	Nickel cadmium
NiMH	Nickel Metal Hydride
mAH	mili ampere hours
MP4	Mpeg4
WMV	Window Media Player
mW	Mili Watts
ITU-T	International Telecommunication Union
ISO	International Organisation for Standardisation
IEC	International Electrotechnical Commision
CODEC	encoder/DECoder

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CHAPTER 1

INTRODUCTION

1.1. Project Background

Communication technologies todays grow in tandem with the development of our generation. Along with that, have their own smartphones become almost necessity for everyone. Due to the trend, various applications for the smartphones are provide by the developer. The applications developed are to provide services to the users. But, what happen is, from the usage of variety applications make the battery life-cycle reduced faster.

Battery like a soul for our mobile phones. It provides energy to mobile phones. The developers of phones attempt to develop mobile phones that use minimizes and more efficiently the power of battery so that it can be gives longer service to user. There are four type of rechargeable battery that commonly used in mobile phones. They are Lithium Polymer, Lithium Ion, Nickel Cadmium, and Nickel Metal Hydride.

However, the diversity of applications that are used will reduce the battery life time. One of the application provided are video player. For mobile devices, the different video players encode the video with different type of video codec. Video encoding is the process of converting original video files from one format to another while video decoding is the process of converting the compressed video file into the format to be

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viewable on the devices. The process is because of different devices and browsers support different video formats. This process can also be called as video conversion.

In this project, we will discover how video encoding scheme effect the battery consumption and which video codec suitable for mobile devices to encode the video. Our approach is to measure the battery consumption of mobile devices. The result will be asses by the performance of the mobile battery. In the end of this research, we will recommend the best video codec that compatible for mobile devices to view video with the least used of battery energy. This is because; the type of video codec used to encoding video will effect the battery consumption of mobile devices.

In addition, this research focuses on watching video encoding by media player on mobile devices. We will use android smartphone; Galaxy Tab 2, 7.0 model GT-P3100 with non-removable Li-ion 4000 mAH battery. We will test the encoding video on the all video codec that compatible to this model such as MP4, H.264, H.263, Divx, Xvid, and WmV player.

By the end of this project, the expected results must fulfils or meet the objective requirement as the recommendation of using H.264 video codec to save battery consumption. The H.264 is the advanced video compression standard. (Sullivan, Topiwala, & Luthra, 2004). Other than that, in the end we will also recommend of .avi video format file when encode the video. Then, the reading of battery performance can be read based on percentage.

1.2. Problem Statements

Usually when we watch many videos on browser, the battery life-time will reduced faster. However, the battery usage is different when we watch video via browser or we watch it in storage. The battery usage is different although with the same video and with same duration. Why the same video used different amount of battery power?

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Since there are so many type of video codec that provided for the mobile devices, users normally do not know which video codec that suitable for their device. There are a few types of video codec that mobile phones use to compress video when user views. But, different video codec used for different type of phones. Besides, we also do not know which the best type of video format file needed when we want to save the video in data storage.

Table 1.2.1: Research Problem

RP1	The battery life-time shorten faster when viewing video
RP2	The duration of the video same, but the usage of battery life-time is different.
RP3	Which video codec suitable for mobile devices.

Table 1.2.2: Research Question

RP1	RQ1	How much battery life-time need when watching video?
RP2	RQ2	Why the same video use different amount of battery consumption?
RP3	RQ3	Which the best video codec for mobile devices?

1.3. Objectives

The objectives will achieve if the problems solved. First objectives are to assess the battery consumption when watching the video in storage and stream video from server. The assessment is based on how much the battery reduced after watch the video. Second objectives are to analysis the battery consumption based on type of video codec and format file. There are video codec with the same video format file but the usage of battery still different. So, the last objectives are to know which video codec is better to be implemented. After all the research and testing will be done, users will know and used a suitable video codec when playback the video.

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Table 1.3.1: Objectives

RP1	RQ1	RO1	To assess the battery life-time when watching the encoding video in mobile devices.
RP2	RQ2	RO2	To do research of the battery consumption based on format file of video and type of video codec.
RP3	RQ3	RO3	To know the best video codec suitable for mobile devices.

1.4. Scopes

This research focuses on view video using media player mobile devices. We will use android smartphone; Galaxy Tab 2, 7.0 model GT-P3100 with non-removable Li-ion 4000 mAH battery. We will test the encoding video on the all video codec that compatible to this model such as MP4, H.264, Divx, Xvid, and WmV player. The battery of mobile phones will fully charged when viewing the video. Then, we will charge it back to view another video that compress with other video codec. This mean, every time we test the battery with watching the video, the battery wills fully 100% charged. The video will be stream from server to the mobile devices using wireless network.

1.5. Project Significance

The significance of this project is to determine which video codec suitable for mobile devices. The video that compressed with different video codec will show different result of battery consumption. From this project, we will see which video codec better for mobile devices. So when user watching their video, user can views video longer than usual

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1.6. Expected Output

By the end of this project, the expected results must fulfils or meet the objective requirement as recommendation of using H.264 video codec to save battery consumption. And recommendation of .mp4 video format file. Then, the reading of battery performance can be read based on percentage.

1.7. Conclusion

In the end of this research, we will recommend the mobile devices users of which the best video codec that compatible for their mobile devices to view video with the least used of battery energy. This is because; the type of video codec used to encoding video effect the battery consumption of mobile devices. Video codec is a compressor that compresses the original video into the different format file. This will reduce the capacity or space that original video used. Hence, users will not experience with the low battery power when watching the video.

Next chapter will be discussing more detail about the literature review for this project. It was about the previous research that related to current research. It has been used to gain information about the project

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CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter will focus on the literature review. The literature review is a previous research that written by someone that we used as reference for our research. Literature review is a summary of the previous research or study that related to current research. It is to summarize the others idea without exaggerate it. Literature reviews are from all issues related such as books, journals, articles, reports, web pages and e-books. In this paper, i have books and articles that related with my reserach that i used as references and literature to my research.

2.2 Facts and Findings

This part will describe details about the facts findings from the previous research. It will summarize the previous research that related the this project. This information can be found from online journal, research books, articles and journals.

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2.2.1 Measurement of Overall Power Consumption

From previous research, An Analysis of Power Consumption in a Smartphone (Carroll, 2010), he measure the overall system power of a modern mobile devices, the Openmoko Neo Freerunner mobile phones. He also measure the exact breakdown of power consumptions of the main hardware parts of devices. In his paper, he measured the power required for playing a video file in storage. From the graph of power breakdown for the video playback, it showed that CPU used the most power when playing video. The measurements aggregate that power used excluding backlight is 453.5 mW.

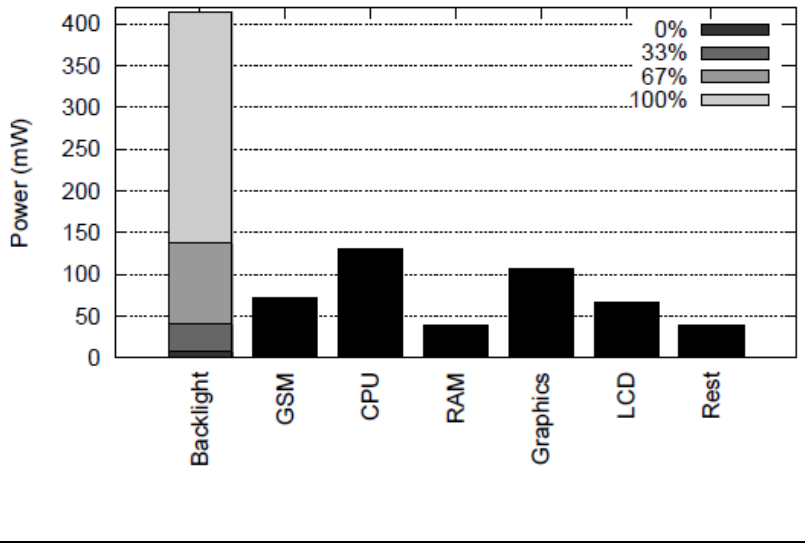

Figure 2.2.1.1: Video playback power breakdown

2.2.2 Battery Basics

From previous research about the battery, accurate online power estimation and automatic battery behaviour based power model generation for smartphones, (Zhang, et al., 2010). They show that the variation between power models for different type of model phones. In that paper, they propose a power model generation technique that uses the knowledge of battery behaviour. The power characterization technique does not require external power measurement equipment. They explained the power

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model generation by using properties of Lithium-ion battery. They stated that the most popular batteries for portable embedded system is Lithium-ion battery. It was due to their high energy-to-weight ratios, long service lifetimes, and low self-discharge currents.

The voltage of battery is change when it discharge so it allow the reduction of energy. In this research, they explain how the changes occur. Lithium ions (Li+) carry current in the battery while discharge. The ions move from negatives to positives electrodes, through the non-aqueous electrolyte and separator diagram. In a while, all the current in battery will loss the energy.

2.2.3 H.264 Video Compression

H.264 is a video codec method and format for video compression. It is the process of converting the video signal into a format that use less capacity when stored or transmitted. H.264 is the standard video compression that had been recommend by two international standard bodies, the ITU-T (International Telecommunication Union) and ISO/IEC (International Organisation for Standardisation / International Electrotechnical Commission). It defines a format for compressed video and method for decode the syntax to produce a displayable video sequence. The H.264 Advanced Video Compression Standard book, (Richardson I. E., 2010),

H.264 is better video compression compared with earlier standard by its improved performance. Compared with others standards, H.264 can deliver a better quality with original video at the same compressed bit rate and a lower compressed bitrate for the same video quality.

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2.3 Keywords

2.3.1 Battery

In mobile phones, there are four basic commonly types of rechargeable battery that we used. They are Lithium Polymer (Li-Poly), Lithium Ion (Li-Ion), Nickel Cadmium (NiCd), and Nickel Metal Hydrid (NiMH). These batteries have their own advantage and disadvantage.

For cell phone batteries Li-Poly is the newest and most advanced technology. This type use Ultra-lightweight energy, that do not effect from memory effect and deliver more battery capacity than NiMH of the same size. (Y, S, M, & T, 2004) It also no need a cell casing makes it thinner and lighter battery. The Li-ion battery is the currently and most popular battery. Although Li-ion battery is expensive, it is a bit lighter than NiMH battery, and also has a longer lifetime. But, it may damaged by extensive overcharging. (Tanjo, Ohsawa, Horie, Fukuzawa, Kawai, & Ogawa, 2009) Then NiCd battery, it is the cheapest phone batteries. Its able to helps to bring down the cost of mobile phones.

However, this rechargeable battery suffers from memory effect, it must be completely charge 100% before recharging or else damage can occur. Then NiMH battery, this type is made from non-toxic material and environmentally friendly. It also delivers a higher capacity related to its size and weight. To maximize its performances, it is advised to completely discharge the battery.

2.3.2 Video Codec

Video coding is the process of compressing and decompressing video signal. Compression consists of two pair of system, a compressor or encoder and a decompressed or decoder. The encoder will converts the original video data into a compressed form, and the decoder will converts the compressed form to the viewable form. The encoder and decoder is often called as a CODEC (enCOder/DECoder). (Richardson I. E., 2002)

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Since my research will be testing on Samsung Galaxy tab, there are a video codec that compatible with that type. There are MP4, H.264, Divx, Xvid, and WmV player. These all video codec will be used so that I can compare the differences between them, which one is the most suitable to be used. Some of them are the old standard and also have the most advanced standard for video compression.

2.3.3 Quality of Experience (QoE)

QoE is needed in this project to value the quality of video that have been compressed. QoE is referring to quality of user experience with the services. Users will directly value the quality of services and give their opinion based on their experience.

In this project, we used 10 persons as users to test and play the video that already compressed with different type of video codec. We used the method of out of five stars, how users prefer to give for each type of video. From the result collected, we know which video users most preferred.

2.4 Analysis of Current Problem

Usually users will experience the reduction of battery power when viewing video. However, the battery usage is different when we watch video via browser or when we watch it in the storage. One of the reasons is the using of video codec. Users must know what type of video codec that suitable for their mobile phones. Each type of phone use different video codec. This video codec will compress the video into compressed form occupying a reduced number of bits. In other word, the video will compress into smaller size. When users view the smaller size of video, the usage of battery will reduced. Besides that, type of format used to save the video file also effect the usage of battery.

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