

SCENE CHANGE DETECTION METHOD  
FOR MPEG VIDEO

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A dissertation submitted in fulfillment of the  
requirements for the award of the degree of  
Master of Engineering (Electrical – Electronic & Telecommunication)

Faculty of Electrical Engineering  
Universiti Teknologi Malaysia

APRIL, 2005

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

To my beloved mother and father

## ACKNOWLEDGEMENT

I would like to thank these people:

1. PM Muhammad Mun`im as my supervisor for all the guidance and assistance.
2. Dr. Ahmad Zuri and Dr. Mohamad Kamal as course coordinator.
3. My classmates, especially Mr. Muslim and wife, Mrs. Hidayati.
4. My bosses, which very understanding.

and to all family, friends and professors who support me in completing this research.

Thank you!

## ABSTRACT

Indexing and editing large quantities of video material is becoming an increasing problem today, especially when video acquire technology made video archiving easy. Manually indexing video content is currently the most accurate method but it is a very time consuming process. An efficient video indexing technique is to temporally segment a sequence into shots. A shot is defined as a sequence of frames captured from a single camera operation. A small subset of frames can be used to retrieve information from the video and enable content-based video browsing. To minimize the cost of time for video indexing and editing, automated shot cut (scene change) detection is used. This paper will introduce two types of scene change detection method based on frame by frame comparison. Both methods apply for MPEG-1 video stream. First approach will use the nature of edge continuity within video. Second approach uses grayscale level of extracted frames from MPEG video stream. Both techniques use image processing tools for frames analysis and comparison. Scene change decision is made with the reference of several image processing operation and the threshold value. The performance of detection will be evaluated on detection precision and false alarm. At the end, both methods will produce the result of frame number where scene change is detected. These values will be use for video indexing process.

## ABSTRAK

Proses mengindeks dan mengedit video dalam jumlah yang besar kini menjadi satu masalah, terutamanya apabila perkembangan teknologi mendapatkan video menjadikan proses pencapaian video semakin mudah. Mengindeks video secara manual adalah cara paling yang tepat pada masa ini tetapi ia mengambil masa yang lama. Teknik mengindeks video yang efisien ialah dengan membahagikannya kepada jujutan (sequence) shot. Shot boleh ditafsirkan sebagai jujutan 'frame' yang diambil dari satu operasi kamera. Sub-set kecil daripada 'frame' boleh digunakan untuk mengambil maklumat daripada video dan membolehkan penyemakan video dibuat melalui kandungannya. Bagi meminimakan kos masa untuk proses mengindeks dan mengedit, pengesanan pemotongan shot (penukaran babak) secara automatik digunakan. Kertas kerja kajian ini akan memperkenalkan dua jenis kaedah pengesanan penukaran babak berasaskan perbazaan antara 'frame'. Kedua-dua kaedah digunakan untuk video jenis MPEG-1. Kaedah pertama akan menggunakan kesinambungan sisi (edge continuity) di dalam video. Kaedah kedua menggunakan kaedah membandingkan darjah kekelabuan (grayscale level) untuk 'frame' yang diambil dari video MPEG. Kedua-dua teknik ini menggunakan bantuan pemproses imej untuk menganalisis dan membandingkan 'frame-frame' tersebut. Keputusan penukaran babak dibuat berpandukan kepada beberapa operasi memproses imej dan nilai tambatan (threshold). Prestasi pengesanan akan dinilai berdasarkan ketepatan mengesan dan pengesanan palsu. Akhirnya, kedua-dua kaedah akan mengenalpasti 'frame' di mana penukaran babak dikesan. Nilai-nilai (nombor-nombor 'frame') ini seterusnya akan digunakan dalam proses mengindeks video.

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## CHAPTER 1

### INTRODUCTION

#### 1.1 Objective

The objective of the research is to study, propose and analyze the methods or algorithm of scene change detection in MPEG video. The methods will be compared to determine which element of the methods could be further developed. Image processing software is used to assist to test the proposed methods.

#### 1.2 Overview

Rapid evolvments in computer technologies result on the amount of visual information being generated, stored, accessed, transmitted and analyzed. Conventionally, video is defined as a sequence of numerous consecutive frames, each of which corresponds to a time interval.

Scene detection can be considered as video representation due to fact that a scene corresponds to a continuous action of a single camera operation [1]. Thus, scene change detection algorithms is first applied to video indexing and retrieval systems to extract characteristics frames and shots on which video queries can be applied.

Scene detection algorithms have attracted a numerous research interest, especially in the framework of the MPEG-4 and MPEG-7 standards and several

algorithms have been reported in the literature dealing with the detection of scene changes both in the compressed [2] or uncompressed domain. This paper proposes two different methods for scene detection, all directly applied to MPEG-1 coded video sequences and only abrupt scene changes are examined.

### **1.3 Problem Statement**

Video editing is seldom using MPEG format but instead in QuickTime, AVI or DV format. However, the availability of PC-based TV recording enables the PC user to record very long MPEG recording with substantial redundant scenes, such as commercials. A cut and extract editor with simple scene change detection will enable a user to delete or extract specified sequences.

For MPEG video, there are several element that can be use to detect a scene change. Few to name: brightness, object edge, luminance, RGB value and more. Such information in each frame can be analyze either in compressed or uncompressed domain and the analysis will leads to the decision whether if scene change occurs on that particular frame. Automated scene change can be precise since each frame is analyzed and no frame is skipped.

As many researchers introduced their method and algorithm of scene change detection, nobody claimed their method is the best. Hence research in this field is still wide open and new method is still acknowledgeable.

### **1.4 Research Scope**

While there are many type of MPEG format at present (MPEG-1, MPEG-2 and MPEG-4), this research is subjected to MPEG-1 format. However, the basic method used for processing MPEG file format is technically similar to other format. MPEG-1 is chosen because most of the video file available in this format.

The files used for testing for this research are existing MPEG video file. Hence, no encoding of MPEG file required but the fundamental of MPEG file encoding is needed to understand the structure and the elements of MPEG video. The proposed methods (algorithms) are tested using image processing software to carry out the test. Therefore, the program developed for this research is the represent the proposed methods and are meant for the particular software and might not be compatible with other software.

## **1.5 Research Methodology**

The project consists of two semesters. First semester the focus was on literature review on MPEG's basics and MPEG video compression. This is essential to build up the understanding. The study of various techniques for scene change detection also has been carried out especially from published paperwork and IEEE journals.

The next semester, most of research is done on realizing the proposed method. Below is the methodology for this research:

- Comparison of the various techniques and the advantages or disadvantages. From this, the selection of technique; which to be enhanced; will be further studied.
- Define the parameters which will enhance the performance of detection. Then, to conduct research on enhancement method based on the defined parameters.
- To prepare a testing module and carry out a test for the proposed enhanced technique.
- Performance analysis and evaluation from testing and compare to the existing technique.
- Project documentation.

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