UNIVERSITI TEKNOLOGI MARA

BLOCK MATCHING ALGORITHMS FOR MOTION ESTIMATION USING MODIFIED CROSS-DIAMOND-HEXAGONAL SEARCH

ABD RAZAK MAHMUD

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ABSTRACT

Block-matching motion estimation is the most important part in today's video coding techniques and standard, such as ISO/IEC MPEG-1, 2, 4, ITU-T H.261, H.263, and the emerging H.264. Each of the video frames is divided into macroblocks. The computational of the current pixel in current frame is compared to the previous decoded frame as a reference. The simplicity and effectiveness of the computational is the main criteria of different ME techniques. The fast search for ME techniques have their own shapes or patterns to work with in order to produce the best matching algorithm. The shape is actually representing the number of candidate need to be evaluated and fewer numbers of candidates will reduce the complexity of computational yet trying to keep a good block matching. A modified of Cross-Diamond-Hexagonal search (MCDHS) based on the Cross-Diamond-Hexagonal search (CDHS) is proposed to match or increase the performance of the Peak-signal-to-noise ratio (PSNR) and reduce the computational complexity of previous motion estimation techniques such as Three Step search (TSS), Simple and Efficient Three Step search (SESTSS), New Three Step search (NTSS), Four Step search (4SS), Diamond search (DS), Adaptive Rood Pattern Search (ARPS) and Cross-Diamond-Hexagonal search (CDHS). This algorithm basically employs two cross-shaped search patterns consecutively in the very beginning steps and switch using diamond-shaped patterns. To further reduce the checking points, two pairs of hexagonal search patterns are proposed in conjunction with candidates found located at diamond corners. The results show that MCDHS performance is equal to CDHS and better than other fast search for ME techniques in average number of search points except ARPS.

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INTRODUCTION

1.1 Video Coding Standard

Digital video is a high bit rate data that requires a lot of bandwidth in storage or transmission. Researchers have struggle to produce techniques that can minimize the used of bandwidth in dealing with digital video. Although there is improvements in storage, transmission, and processor technology have been achieved in recent years, the primary issue is to reduce the amount of data that needs to be stored, transmitted, and processed, in order to make the use of digital video a possibility. Advances in compression technology that has made the arrival of video to the desktop and hundreds of channels to the home become a reality.

In the 1980s, video coding and transmission have become important application area. To ease the development of video coding technology, it must be bound up with a series of international standards for image and video coding. The aim of an image or video coding standard is to support a particular class of applications and to encourage interoperability between equipment and systems from different manufacturers. International Standards Organization (ISO) and the International Telecommunications Union (ITU) have developed a series of standards that have shaped the development of the visual communications industry. The standards that have been issued by ITU are:

- H.261 (1990): Video telephony over constant bit-rate channels, primarily aimed at ISDN channels of p x 64 kbps.