

Application Group

A11-037

作品名稱

**前瞻3D攝影即時防手震系統
Advanced 3D Video Capture and Stabilization System**

隊伍名稱

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- 蔡教授分別於1990年、1994年與1998年於臺灣大學電機系所取得學士、碩士與博士學位。
- 2000年進入中央大學電機系擔任助理教授，2004年升任副教授，2008年至今為中央大學電機工程系教授。
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ABSTRACT

Recently, various stereoscopic 3D visual equipments have been launched on market. How to film a home-made 3D video is becoming an important issue. Many photographic equipment manufacturers design kinds of 3D stereo cameras. With these cameras, home-made 3D videos can be easily captured and obtained. However, when recording videos by handheld cameras, the recording method may cause some unwanted vibration in videos. The vibration in video may cause audiences having uncomfortable viewing experience. Audience may want to view videos where no vibration exists. Therefore, the unwanted vibration in videos needs to be removed or reduced. Moreover, if the video is filmed by a handheld 3D stereo camera, the vibration in video will introduce more problems than traditional 2D video does. A stereo camera has two lenses on a single device. The vibration in video may diminish the 3D relationship between left-view video and right-view video. Thus, audience could not view the stereoscopic effect and feel more uncomfortable due to videos without 3D relationships. Therefore, this need motivates us to develop a 3D stereo video stabilization system.

With the consideration of the flexibility in the 3D stereo video stabilization algorithm, we applied a hardware platform with a pure software solution. As shown in Fig 1, the system has three parts. They are input device, embedded platform and display device. In the input device part, user can use binocular camera, cellphone or PDA with embedded two lens camera as the image input device. The most important part of the system is the embedded platform. We design the system including input/output interface control and algorithm execution. The I/O interface controls the transfer of video which user sends into the embedded platform, and the transfer of processed video which the embedded platform sends to display device. For real-time processing, Xilinx Virtex5 ML510 platform is adopted. The IBM PowerPC 440 processor on the platform is the central process unit in the system. The system can automatically output images to display device. 3D videos are displayed on LCD monitor or CRT monitor. The experimental results present that the proposed 3D stereo video stabilization approach can accurately estimate the global motion and real-timely produce well stabilized 3D videos for two views from two cameras. The demonstration shows our superior performance on 3D video stabilization.

作品摘要

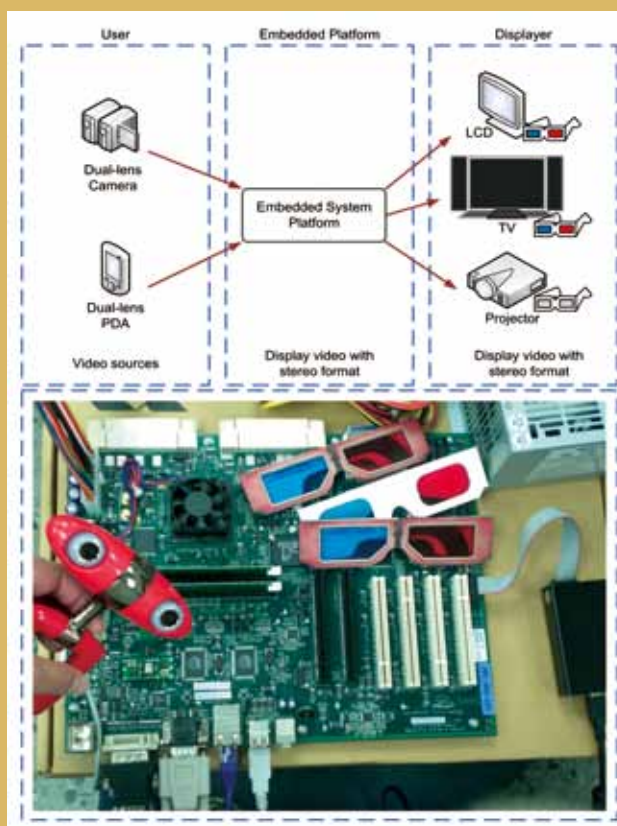
隨著市場上多種不同的家用3D立體影像影音設備陸續推出，在立體影像來源有限的情況下，如何自製拍攝出3D立體影像也逐漸成為一大熱門話題，各大攝影設備製造廠商也逐漸推出各種3D立體影像的消費性電子產品，將自製3D影片的技术門檻大幅降低，也讓自製3D立體影片越來越風行與普及。

的運算核心，最後產生穩定影片，系統會自動將影像輸出至顯示端，以LCD或CRT顯示3D影像，供使用者觀看。

但對使用者而言，在錄製影片的過程中，最難克服的問題就是當以手持攝影機的方式錄製影片時，隨著拍攝時間越長而有越大的可能產生不可避免的手震現象，進而造成錄製的畫面產生相同震動，導致觀賞拍攝影片時會因畫面的不穩定感到不舒適感，所以需要防手震功能將此現象減緩，此外，當這樣的情況發生在3D立體影片錄製時，會因為多鏡頭的同時震動，使得手震現象對影片的影響更為突顯，於是，我們開發一個前瞻3D攝影即時防手震系統。

對於一個3D立體視訊防手震系統，除了考量一般二維影像的手震現象，更要考量畫面中的內容需符合3D立體視訊顯像基本之要求，並避免因為手震的情況降低影片中的3D立體效果，才能更完整的完成3D立體視訊防手震效果。

如圖一所示，整個系統大致上可分為使用者端、嵌入式平台、顯示端三部分。在使用者端，使用者可使用雙眼式攝影機、內嵌雙鏡頭之手機或PDA等攝影商品做為影像輸入裝置。整個系統的核心著重在嵌入式平台，我們所開發的功能包含輸入介面的控制與演算法的執行，介面控制包含了與使用者端之間的影像轉換與將處理完的結果送至顯示端，為了即時處理，我們採用 Xilinx PowerPC 440 Processor為此系統



圖一 系統方塊圖

A 3D stereo video stabilization system has to not only smooth the vibration in video, but also maintain the relationships between two cameras. Two main design challenges exist in 3D video stabilization. One is how to compute and smooth the global motion. The unrelated local motion may cause false detection in global motion estimation. The unrelated motion objects also affect the global motion estimation. The other is how to reduce the computation of maintaining the relationships between two cameras.

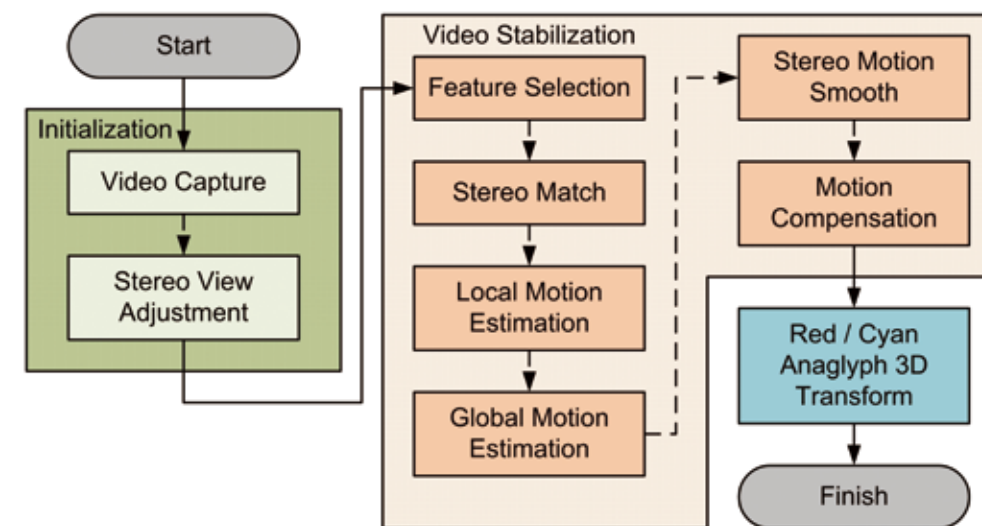


Fig.2 The proposed advanced 3D video capture and stabilization system algorithm