iMovieScan – A Film Digitizing Tool

1 Background

In the current times, there is an increasing demand for digital content in the entertainment industry. Most new movies, TV shows, music and related programs are now distributed in digital format. However, a rich collection of old content remains in the original celluloid film format. A lot of this content is in the form of documentaries and biographies.

Several specialized devices have been made to convert these old films into digital formats, but there remains a need for more cost-effective, flexible and faster methods to handle this conversion process. This paper describes a solution that uses a judicious mix of software and an existing microfilm scanning system.

2 The Movie Scanning Process

iMovieScan is a revolutionary product that uses existing microfilm scanners and intelligent software to simplify the movie film digitizing process. It combines the power of customized software with the rich repository of open source tools to deliver a cost-effective solution that just works.

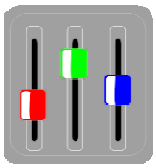
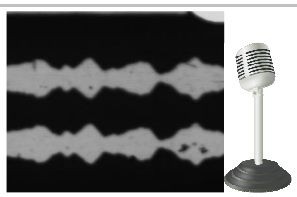
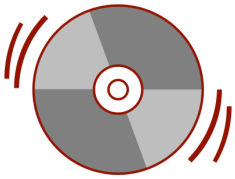
The complete cycle of digitizing a movie film is handled in two phases: the scan phase and the post-process phase.

The scan phase is run on the scanning hardware and is designed to complete in the minimum time so as to maximize the utilization of the scanner.

The post-process phase runs on separate computers and can be run in parallel on multiple computers handling different sections of the scanned film. Currently the post-processing is done on a computer running Linux.

The scanning of movie film is done using a SunRise microfilm scanner that caters to microfilm document scanning. It uses a linear CCD camera coupled with a module to pull a roll of film through a lamp and lens assembly under the camera to acquire images.

The following table shows the major steps involved in the digitization process.

1	 CONFIGURE	Configure iMovieScan – select film size, set focus and lamp level, mark film frame and audio track areas.
2	 SCAN	Start scanning. The scan process also separates the picture frames and optical audio track data based on the settings in step 1. Picture frames can be scaled to a different size before saving to disk.
3	 POST-PROCESS	Run image enhancement steps to improve movie quality (optional).
4	 POST-PROCESS	Generate audio data from images of audio tracks.
5	 POST-PROCESS	Combine picture frames and multiplex generated audio to generate final video clip in the desired format, ready to be burned to CD/DVD. The post-process steps use ffmpeg, mencoder, sox and imagemagick open source tools.

Enhancements of the scanned images during the post-process can include operations like:

- noise reduction
- cropping
- scaling
- inversion
- rotation

3 Film and Video Formats

Film with stereo audio tracks

iMovieScan can handle the following types of films.

Film size	Audio format
• 8 mm • 9.5 mm • 16 mm • 35 mm	Optical tracks of: • Mono • Stereo • Unilateral • Dual unilateral

The output can be generated in a number of popular formats. Some of the most common output formats include:

Containers	Video formats	Audio formats
• 3GP	• H.263	• AAC
• AVI	• H.264	• AC3
• ASF	• MJPEG	• FLAC
• FLV	• MPEG-1	• MP3
• MOV	• MPEG-2	• Vorbis
• MP4	• MPEG-4	
• Ogg	• Theora	

All output is generated in gray-scale. The system is thus ideally suited for converting older black and white motion picture films.

4 Performance

The throughput of the system is dependent on the initial scanning speed as well as the amount of post-processing to be done. However, since the process separates the scanning and the post-processing stages onto different computers, both stages can operate simultaneously though on different film sections or rolls.

Scan speeds vary depending on the kind of film and the scan resolution. A 35mm film is scanned at a rate of roughly 5 frames per second, including the picture and audio portions. Post-processing takes an additional 45 minutes for a 1-hour film.

The powerful blend of a general purpose film scanner and flexible software positions our solution as a unique and highly scalable system that can cleanly handle even very old films. The combination of user guidance and software intelligence ensures that films distorted due to stretching, warping or splicing are also processed well enough to generate clean digital movie clips free from jitter and noise.

About Integra

Integra is an ISO 9001:2000 certified, twenty seven year old software products and services company, based in Bangalore, India.

Its main stream activities are creation of IP, technology consulting, open source training, financial inclusion solutions, system integration, and value added products distribution.

Integra Micro Systems (P) Ltd

#4, Bellary Road, 12th KM, Jakkur, Bangalore, INDIA – 560 064

Tel: +9180 28565 801 – 805, Fax: +9180 28565 800, Toll Free: 1800 425 1340

Email: info@integramicro.com

www.integramicro.com