Developing, Deploying and Assessing Usage of a Movie Archive System among Students of Film Studies

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Abstract. This paper describes our work in developing a movie browser application for students of Film Studies at our University. The aim of our work is to address the issues that arise when applying conventional user-centered design techniques from the usability engineering field to build a usable application when the system incorporates novel multimedia tools that could be potentially useful to the end-users but have not yet been practiced or deployed. We developed a web-based system that incorporates features as identified from the students and those features from our novel video analysis tools, including scene detection and classification. We deployed the system, monitored usage and gathered quantitative and qualitative data. Our findings show those expected patterns and highlighted issues that need to be further investigated in a novel application development. A mismatch between the users' wishes at the interviews and their actual usage was noted. In general, students found most of the provided features were beneficial for their studies.

Keywords: Video browsing, deployment effort, usage analysis.

1   Introduction

With the growing management tools for digital video and its potential usage value as a learning tool, digital video can offer not only an exciting way for students to study better but in the context of film studies it is particularly important. Multimedia technologies have enabled production, storage and delivery of large quantities of audio-visual information. The amount of video data available nowadays raises the challenge for developing applications that help the user to organize, browse and find relevant information [6].

In the technologically-oriented multimedia field of today, we attempted to fully bring in a user-centred approach to end-user interactions throughout the 3-year development of this project, we identified benefits and challenges in trying to align the technical perspectives of novel multimedia features to a real-world setting. The aim of our work is to address the issues that arise when applying conventional user-centered design techniques from the usability engineering field, to build a usable application when the system incorporates novel multimedia tools that could be potentially useful to the end-users

but have not yet been practiced or deployed. The *MovieBrowser2* system we developed incorporates automatic video analysis techniques, namely shot boundary detection, keyframe extraction and classification of scenes into action, dialogue or montage [3]. Our application domain is film studies where students need to study movie contents and to analyse sequences. We began with the identification of user needs through interviews and brainstorming, followed by sketching and prototyping an online system that incorporates the video analysis tools we offer as functional features. We then deployed this system, monitored its usage and gathered quantitative as well as qualitative data.

In this paper we overview our developed system, discussing the findings from the user and usage analysis of our trial deployment.

2   Related Work

Related deployment efforts of experimental video systems include *Newsblaster* at Columbia University [5], which automatically crawled news websites and summarised them for users. This was first deployed in 2001 and a number of user studies have been conducted; an Austrian interactive TV trial [1] deployed a novel TV application to a local cable TV provider in Salzburg, Austria, and ran for 4 months in 2004-5; *Físchlár-News* [4] incorporated a number of multimedia and recommendation techniques and was deployed within a University campus for 3 years, during which interaction logging and diary methods were used to capture its usage; *SportsAnno* [2], a video browsing system that allows users to make comments, share opinions and ideas on sports events, was deployed during the 6 weeks of World Cup 2006. Deploying experimental systems like these is always difficult because the underlying novel multimedia technologies, which they incorporate, are often beyond user expectations and the challenge is finding the right way to productively blend these novel functions into tools to support users' tasks. Such efforts would show a growing awareness of the importance of user evaluation in realistic environments but studies which incorporate the end-user perspective from the conception stage of the project are rare; most technology trials start purely from a technical point of view and only after deployment do they try to get any form of feedback from real usage and users.

Our work is similar to the other trial studies listed above, but instead of the technology being demonstrated dictating the design and deployment process, we based the development process from usability engineering, focusing on user-centred design and that is the significant differentiator of our work.

3   System Descriptions

MovieBrowser2 was designed to support two undergraduate film studies course modules at Dublin City University (CM272 *National and Ireland Cinema* and CM135 *Analyzing Media Content*). In both modules, students were required to 'read' a variety of movie sequences in detail referring to the process of analysing a movie sequence closely in order to understand different levels of meanings intended by its creators and manifested from the elements like framing, music, plot, camera angle,

lighting and so on. Libraries of 30 movies were made available on *MovieBrowser2*. They include various genres (comedy, drama, romance, action, etc.), and ranged from contemporary Hollywood movies to old Irish movies. Fig. 1 shows examples of *MovieBrowser2* screenshots. Fig. 1(a) shows a screenshot of the front page that displays movie posters and some movie information. Filtering by movie genre and director are provided by a drop down list at the top area. Fig. 1(b) shows a screenshot of the main viewing area with a visual timeline corresponding to events like dialogue, montage and exciting on the top area, shot keyframe view, the playback area and note-taking section under the playback area.
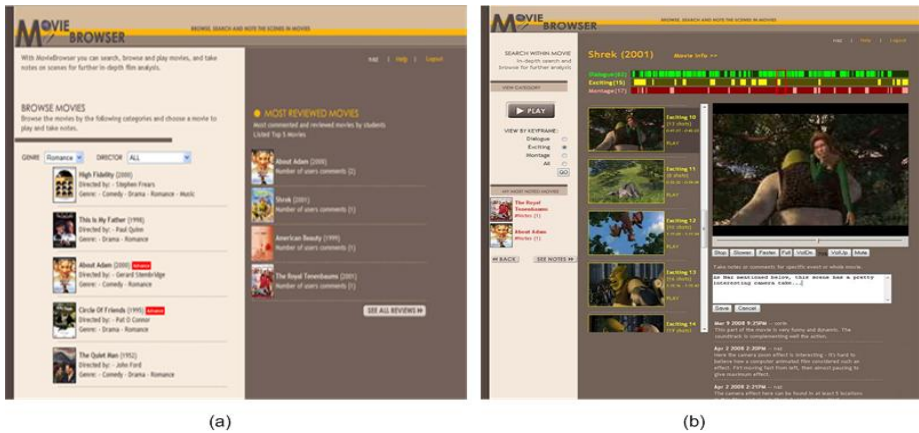

Fig. 1. Interface screenshots: (a) front page, (b) main view area

The note feature is public, similar to the common commenting features of blog sites. Each shot keyframe represents an automatically detected scene, clicking on a keyframe will play video from the scene. The similar colour schemes for event classifications were used in the timeline and the shot keyframe's borderline and text (i.e. yellow colour for exciting events). The scenes also can be filtered using radio buttons. The playback from the keyframe list will play the sequences, while playing the whole movie can be carried out using the 'PLAY' button on top of radio buttons.

4   Usage and User Analysis

4.1   User Access

MovieBrowser2 was deployed throughout the Spring semester (11 weeks) of 2007-8. Out of the total of 268 students in both classes, 107 students (40%) accessed *Movie-Browser2*. From the actual log data collection, we see that on average, almost all 107 students accessed *MovieBrowser2* at least 2 times during the trial period. A vast majority of the students (84%) accessed the system for less than 2-hours. Only 17 users (16%) from the total group accessed between 2-8 hours in total. In thinking about the number of hours our students used the system over the semester, it is worth noting that:

- *MovieBrowser2* was used as a complementary tool in the movie analysis classes where the lecturers encouraged the students to use the tool and there was a short introductory sessions conducted during the classes;
- *MovieBrowser2* featured some movies that are not available from the University library's collection especially for Irish movies;
- *MovieBrowser2* can be accessed only within campus. This means those students who want to work on their essay at home during the weekend or evening are unable to access the system;
- *MovieBrowser2* was developed for a specific technical environment in which it was deployed (computer labs in School of Communications, DCU), consisting of Microsoft Windows XP and Microsoft IE v6+. Thus compatibility with other machines and browsers when some of the students tried to use their own laptops was an issue (as found in post-trial questionnaires).

The total access duration time was around 86 hours during the trial (CM272: 57 hours; CM135: 29 hours). Access duration time for CM272 was almost double than the other module. This may be because the assignment for the former class required students to use Irish movies as examples which were mostly not available in the university library, whereas the assignment for the latter class was not restricted to Irish movies thus much more accessible from conventional sources (library, DVD rental, cable TV, etc.). From the total movie collection, 23 were Irish movies with 7 contemporary Hollywood added to the collections. Our justification in having students from the CM272 and CM135 module was because these two modules were running during our trial semester and had a similar nature of textual analysis assignment. In this work, we are not focusing on comparing each module specifically but mainly to examine students' general access patterns.

All 7 Hollywood movies that were stored in the system library were accessed a total of 73 times (39%) with the movie *Shrek* (2001) mostly accessed by students, 24 times. Irish movies were accessed in total 116 times (61%) with the movie *About Adam* (2000) the most frequently accessed 21 times, followed by *The Butcher Boy* (1997) at 20 times accessed. A few short movies such as *The Visit* (1992) and *Bent Out of Shape* (1995) had no access at all by students.

4.2   Features Access

We divided our movie collection into 'Advanced' and 'Basic' types for navigating movie content and the reason behind this idea was to see the pattern of user interactions when some added technology features are incorporated. The advanced type of browsing consists of some features that could enhance user browsing and navigating of movie content on top of standard playback features. These features are mainly designed to enhance film-reading based on the three events categorizations (i.e. montage, dialogue and exciting). The basic type incorporates only standard playback features (i.e. pause/stop/slider bar and etc).

User interactions are captured and represented as in Fig. 2. The result shows that the percentage of interactions on the features: 'Basic' and 'Advanced' have a similar patterns in playback movie activities. 'Click the whole movie' has the highest interaction that shows activity in watching the whole movie, while 'click play button'
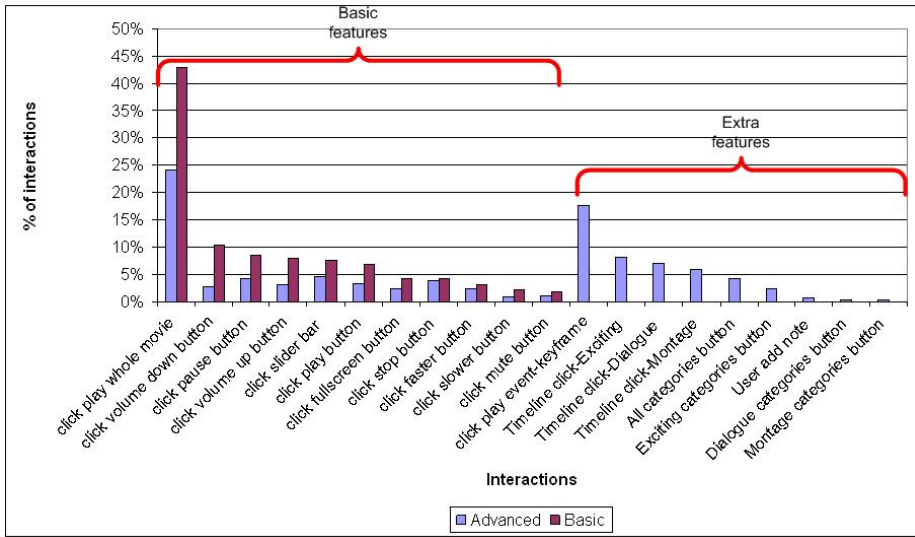
Fig. 2. Types of interactions

denoted the activity of playing a movie after it being paused. User activities such as watching or playing a sequences or the whole movie were identified from user-action entries such as 'click pause button', 'click stop button', 'click play button', 'click slider bar' and so on, labelled in the chart as basic features. These are standard inter-actions that are mainly related to conventional movie playing activities as normally found in a video player (i.e. play, pause, stop, slider bar and volume adjustment). As for the advanced type of browsing, there are some 'extra' interactions on top of the standard playback activities. These extra features are provided in the advanced screen as well as standard movie playback (Fig. 1(b)). The result reveals that the amount of interaction of playback-related features was spread out into that of extra features in the advanced page as Fig. 2 shows. The spread of the interactions shows the tendency of the user to doing more exploration on the page. Users seem to appreciate the add-on features provided in the advanced page with the increased number of interaction percentages and this result is also reflected by the increased hours spent on the ad-vanced type with 45 hours as compared to 33 hours in the standard or basic interac-tion. This result indicates that the advanced features made the students stay longer on the system on the event segmentation that underlies the features. Users managed to jump from one point to another point easily on the movie using visual representations of a timeline or the shot keyframe view. Instead of browsing sequences from the nor-mal playback interaction for example either using the pause button or slider bar, the playback of sequences shifted to playing from the shot keyframe view as depicted in the chart with the highest percentage (18%). The findings in the qualitative comments given by students also reveal a preference for these extra features (see Table 1) as well as some complaints from students about those movies with no advanced features.

It is worth noting that the interactions that have been represented in Fig. 2 are based on different movie watching. This analysis was not meant to compare between basic screen [A] vs. advanced screen [A+α] but mainly in monitoring the usage pattern of some value add-ons features in navigating and browsing of movie content and whether it would influence usage in a particular way.

We also provided other features on how users make movie selections. Features included filtering movie collections based on film-director, film-genre or no filtering at all. In the percentage of log interactions, we noted only 11% of interactions filtered the movie collections based on film-director, 17% filtered based on film-genre with the rest (72%) no filtering at all. We listed all movie posters in the front page of the system by default (see Fig. 1(a)). From our observations, film genre seems an important factor in selecting a movie in the student's actual textual analysis as the topics given by the lecturer are normally based on movie themes.

Dealing with mismatch – A note-taking (or commenting) feature was incorporated as a result of initial requirements analysis but was underused and unappreciated (used by 3 students only), showing an interesting mismatch between what our users said would be beneficial and what they actually used (see Fig. 2). As this is a result that perhaps indicates how conventional usability engineering based on capturing user requirements/wishes is not sufficient in developing a novel interface, we want to analyse this point further. A follow-up email was sent to students asking questions regarding their use of notes. We asked them why they did not use the features during deployment. We got an email reply from 15 users. The reasons for not using notes features was calculated and grouped into several categories as concluded below:

- "I don't want my colleagues to steal my ideas" --- Privacy issue
- "I like to write with pen and paper" --- Preference for conventional practice
- "I wanted to do it at home" --- Access limitation
- Interface design issue (e.g. notes button at the bottom of the screen, thus not emphasised enough)

A mismatch between students' initial wishes for a note or commenting feature and its actual usage during the trial triggered more question for us in how users' wishes collected at the requirement engineering stage should be interpreted in the context of usage rather than treated as an isolated feature in itself.

4.3   Usage over Time

Students started using from the 10th Mar (week-6) of the semester. The system seems to have had quite heavy usage approaching the deadline of the assignment submission, which was on the 9th May 2008 (week-14) for both modules. It is generally believed that this pattern of usage corresponds with our previous observations that even though the topic was given early by the lecturer (i.e. week-6 for CM272), students tend to complete their assignment just before the deadline. The lecturer advises students not to do last minute assignments since reading and analysing movies cannot be done within a short duration, it needs longer time so that the skill of reading will evolve. Huge usage was found around the month of April until early May, 1-week before the deadline of the assignment. This pattern corresponds with our findings in

our user study that the process of reading and understanding movies starts by watching the movie many times before the essay can be written on paper. Another possibility from these usage patterns is that students were engaged with other assignments from other modules. Students have to follow priority deadlines. Some informal conversations with students indicated that this was strong possibility. A few email reminders were also sent to students regarding the deployment trial and we found that once an email was sent, there were some usages recorded.
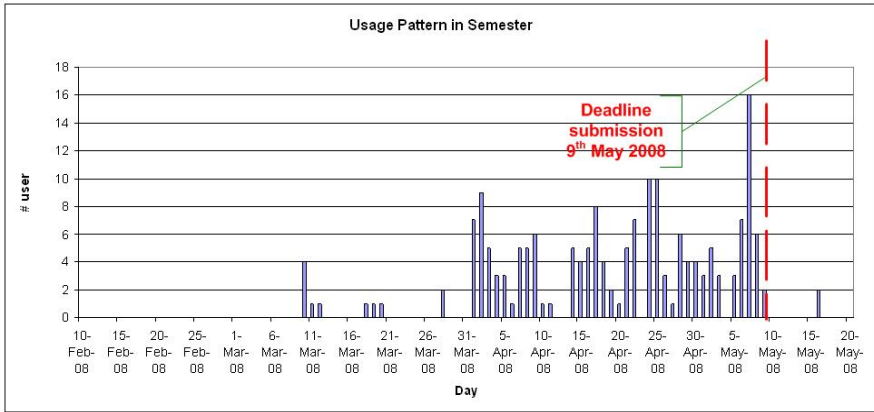

Fig. 3. Student's usage in the semester

4.4   User Opinion

Out of the 107 students who accessed the system, only 60 students (56%) responded to the questionnaires that we administered within week-13 to -14. In identifying what are the features or functions students like or dislike most particularly in the system we developed, we gave students a qualitative question. Table 1 summarises several items mentioned most frequently by users on the system - both likes and dislikes. From the Table, it can be seen that note-taking was among the most frequently mentioned features that they liked, with 21 (30%) out of the total (71 mentioned) and this is followed by event categorization (24%), timeline (18%), shot keyframe view (11%) and playback of the movie (8%). These responses mainly correspond to the advanced features that had been adopted in the system.

The idea of having the facility to take notes while playing a movie scene seems advantageous. We noticed that most important value of the system was simply the fact that it allowed easy access to movies in a non-linear fashion. The timeline and keyframe view which highlight where the action, dialogue and montage scenes overlap in a movie were praised as very useful, indicating that a strong temporal orientation with additional cues on the movie contents is useful as some comments show.

"The timeline as it breaks down the film into the various sections - montage, action, dialogue, etc. --- this makes it easier to carry out a more in depth analysis of the movie" [P11].

"I found the combination of timeline and event categorization very useful since I can select those parts of the movie that contains the events of interest" [P2].
"I liked the way I could go directly to the exciting or montage parts" [P59].

Not only that, we also noticed some other features that our users liked from reading their comments, which we categorise under system design and access. For example, in the system design layout, comments were mainly on the well-designed layout and presentations, which makes it easy to navigate. The rest of the frequently mentioned items were on the convenience of access as an online-based application without having to borrow a DVD from somewhere else.

Table 1. Frequency mentioned of system features. *convenience, **less coverage.

Features	System-likes	System-dislikes
Note-taking	21	1
Event categorization	17	-
Visual timeline	13	1
Shot keyframe view	8	1
Movie playback	6	-
Other:		
System design	4	3
Access	2*	3**
Limited movies	-	10
Streaming problem	-	9
Compatibility	-	3
Total mentioned	71	31

Regarding those aspects that our users didn't like (right column of Table 1), there are very few comments related to system features as there was only one mention found on each for the timeline, notes and shot keyframe view. We noticed system scalability among the issues in feedback on system dislikes. The highest frequently mentioned issue was about the limited number of movies that were stored in the library, which might restrict usage. Other comments we read were such as system compatibility (i.e. MAC user/Internet browsers). The system design (dislikes) was related to the lack of function, like not able to change the password and the advanced type of browsing did not apply for all movies. Ease of access in the 'system-likes' column in Table 1, was meant as a convenience factor by users, but in the 'system-dislikes' column, it was meant as less coverage of access. When comparing the frequency of mentioned, which were, either likes or dislikes, we noticed that no issues arose much on the "system design" and "features provided" aspects. Most of the disliked features were related to the system scalability issue.

We also asked a question to the students about their overall experiences in using *MovieBrowser2* after the semester had completed. Among these 60 students, 43 of them (72%) said they would use it in the future. We calculated the positive and negative expressions of their overall experiences and we estimate that 19 of them (32%) gave positive expressions and only 4 (7%) gave a negative tone of expression while

the rest of 37 (62%) did not express either positive or negative expressions. Examples of positive expressions include emotion (i.e. "I'm very happy/discovered …") and feature usefulness (i.e. "I found it is useful/able to …") and negative such as system limitation (i.e. "Not enough/database is too small…").

Finally, we compiled a 'wish-lists' from all user feedback. Some of these list elements appear due to the difficulties in the implementation and would not be expected during the development design stage. The list entries were categorized below:

1.   Larger and varied type of movie database (i.e. Irish, Hollywood and Europe)
2.   System compatibility (i.e. Internet browsers and MAC users)
3.   Improved access (i.e. off-campus)
4.   Technicality constraints (i.e. high-speed access)

We also believe that these 'wish-list' elements contributed as the main reasons for low usage during the trial. Our users mainly want to access movie resources to be used in their textual essays. Having difficulties in the conventional way of assessing DVDs, means the tool is appreciated much by the students. We did not receive many complaints on the design aspects of the features we provided (i.e. navigation, color-coding, page layout, buttons, graphics, 'look and feel' etc.) and these can be considered as a minor aspect. We believed that for the future, whatever the design for a similar system to this, it could be of potential benefit if these four 'wish-list' elements could be improved.

5   Conclusion

The results presented in the trial deployment experiment highlighted some interesting patterns for students of film studies in browsing and playing movie content. User access and usage were found to be varied and influenced by many factors. In general, students found the features we provided were beneficial for their studies. Some issues or mismatches arose during the trial. A 'wish-lists' was drawn up that might be useful for the future system developer. Our big strength in this study was on the interactions among real users, namely students of the School of Communications, DCU throughout our 3-years of experiments.

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