MovieLens Unplugged: Experiences with an Occasionally Connected Recommender System

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ABSTRACT

Recommender systems have changed the way people shop online. Recommender systems on wireless mobile devices may have the same impact on the way people shop in stores. We present our experience with implementing a recommender system on a PDA that is occasionally connected to the network. This interface helps users of the MovieLens movie recommendation service select movies to rent, buy, or see while away from their computer. The results of a nine month field study show that although there are several challenges to overcome, mobile recommender systems have the potential to provide value to their users today.

Categories and Subject Descriptors

H.3.3 [**Information Search and Retrieval**]: Information Filtering

General Terms

Recommender Systems, Collaborative Filtering, Mobile Device, User Interface

1. INTRODUCTION

Shoppers today face a bewildering array of choices, whether they are shopping online, or at a store. To help shoppers cope with all of these choices, online merchants have deployed *recommender systems* that guide people toward products they are more likely to find interesting [7, 11]. Many of these online recommender systems work by suggesting new products that complement the products people have purchased in the past. Others suggest products that complement those in their shopping cart at checkout time. If you have ever bought a book at Amazon.com, or rented a movie from Netflix, you have probably used a recommender system. The problem is that online recommender systems do not help you when you are browsing the aisles of your favorite bricks and mortar store.

Imagine that you have just come to the end of the new release aisle at your local video store. Nothing along the way caught your attention and the rows and rows of older videos look too daunting to even start wandering through. What do you do? Do you leave the store empty handed? No, instead you pull out your PDA and start up its browser. Through the PDA's browser you access the MovieLens Unplugged (MLU) service that recommends videos you might be interested in. One of the highest recommended videos is just what you had in mind so you find it and rent it for the night.

The key to making a mobile recommender system really useful for people is in the interface. While there has been an enormous amount of research on creating better recommender algorithms [6, 2, 10], relatively little has been done on recommender interfaces [13]. In this paper we look at the challenges for recommender systems on occasionally connected devices as a subclass of wireless devices in general.

2. RELATED WORK

Over the past eight years, recommender systems have been deployed across many domains. The GroupLens recommender system helped users wade through articles in Usenet news [7]. Ringo allowed users to get music recommendations online and connect with other music fans [12]. Fab, and other systems like it have helped users find web pages, news articles, and other documents online [1, 4, 8].

Our work builds on and extends our movie recommendation research service (`movielens.umn.edu`), that provides movie, DVD, and VHS video recommendations, along with a search capability. In addition, we rely on the AvantGo service (`www.avantgo.com`) to provide offline access to our interface.

In studying wireless access usability, we found that the most widely known, if controversial, study of wireless device usage is the 2000 Nielsen and Ramsay report [9]. In this field study of 20 cell phone users in the UK, the authors concluded that WAP (Wireless Access Protocol) was not ready for prime-time. In fact, only 15% of the users they surveyed said that they would be likely to make a purchase of a web enabled cell phone within a year. Looking out three years, 45% of their users thought they would have a web enabled cell phone. Another, more recent, account of wireless device usage is the study by Grinter and Eldridge

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in which they examine the use of instant text messaging on cell phones by teenagers [5]. They find that teenagers use text messaging for many social purposes, and find it to be quick, easy, and cheap. Based on these studies, we anticipate a slow adoption curve for truly wireless devices, however MovieLens users showed a willingness to adopt MLU on their PDA. Our research is to study interfaces that will make the devices as usable as possible as they become more widespread.

Buchanan et. al. [3] look at general usability problems on wireless browsers and other small screen devices. They propose four guidelines for WAP usability: direct, simple access; keep navigation to a minimum; reduce vertical scrolling; and reduce keystrokes. Swearingen and Sinha compare several online recommender systems for music and provide five key ideas for recommender system designers to strive for as they build systems [13]. The key ideas are: inspire trust in the system, make the system logic transparent, provide details about the recommended object including pictures and community ratings, and allow users to refine their recommendations by including or excluding items at the genre level. We build upon and extend the recommendations from both groups in the design of MLU.

3. MOVIELENS UNPLUGGED DESIGN

Throughout the design process for MLU we had two detailed scenarios in mind. From these two scenarios we developed an interface comprised of the features that would allow our users to successfully complete both scenarios. A description of the scenarios follows.

Video. The first scenario is that of selecting a video to rent or buy. In this scenario the user is at the video rental store or at a video retail outlet trying to select a movie. Because both retail and rental stores devote so much shelf space to newly released videos, we provide a feature that presents recommendations of recently released videos to our users. Because many users keep a personal wishlist of movies that they want to see on video, we provide them with the ability to view their wishlist, with recommendations, from a wireless device.

Theater. The second scenario is that of deciding which movie currently showing in the theater to see. For this use scenario, our user may be standing outside the local megaplex, at a restaurant, or in a hotel trying to decide which movie to see after dinner. When making a movie decision, users will consider the proximity of the theater and the times the movies are showing. To support this scenario we allow users to get a list of theaters that are nearby. For each of the nearby theaters we provide a list of recommended movies along with their showtimes. Finally, we provide a short plot synopsis to help users with their decision.

We now turn to the details of the interface design, as shown in figure 1. The first three links provide continuity for users with the MovieLens home page. Movies that they see on the homepage under these headings will also be available on MLU. In addition, the second and third links 'Recent DVD', and 'Recent Home Videos' support the video scenario. Clicking on either of these links brings up a list of videos along with a numeric recommendation on the scale from 1–5. The movies are displayed in order from highest recommended to lowest.

The fourth link in figure 1, 'My Theaters', supports the scenario of selecting a movie that is currently showing in the

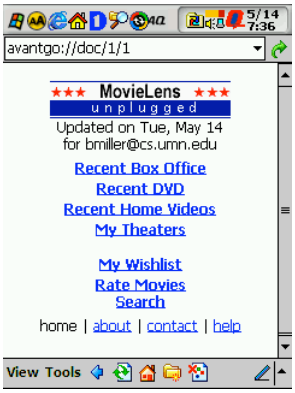

Figure 1: MovieLens Unplugged Home Page, illustrating key features of MLU.

theater. Tapping on this link displays a list of theaters near the user's home zip code as illustrated in figure 2. Selecting a specific theater displays the list of movies showing at that theater along with recommendations and current showtimes.

Figure 2: Recommendations for movies showing in nearby theaters, with showtimes, shown on Palm.

The fifth link in figure 1 gives a user access to her wishlist. This link is helpful for the video scenario. Clicking on this link shows the user the movies that she has placed on her wishlist, ordered from highest to lowest according to the recommendation for each movie. Selecting the movie displays its synopsis.

The sixth link allows users to see a list of movies that they have marked as seen, but have not yet rated. We thought that this would be an especially good feature for MLU because users could take advantage of spare moments to rate movies they had seen recently.

The last link provides a search capability, similar to that provided on the MovieLens site. Users can select a genre, and/or decade in which a movie was released and get recommendations for movies that match the criteria.

4. FIELD TEST

In November 2001 we launched an AvantGo channel for MovieLens to test our design for a wireless interface. Since then we have had 180 people use MLU on their PDAs. We set up the field trial as a service to MovieLens users with-

out any obligation on their part to provide feedback. We recruited users to be a part of this field test by putting a graphical link on the MovieLens home page advertising the service.

Over the course of the AvantGo field test we have collected data on usage patterns through the use of log files which allow us to monitor the features of the AvantGo interface people use most frequently. In addition we recently e-mailed a survey to all of our AvantGo users to find out about their experience. To date, more than 21% of the users have responded to the survey.

5. ANALYSIS OF THE USER EXPERIENCE

Because we ran the field test on AvantGo for over nine months we were able to learn about the long-term impact on the usage of the MovieLens web site for users of the MLU interface. To do this, we tracked the average number of website visits per week both before and after a user signed up for MLU. We found that visits to the web site dropped by an average of 1/2 visit per user per week after users signed up for MLU.

The fact that users visit the web site less is very encouraging for the success of MLU, but somewhat surprising given that users repeatedly stated their preference for the website. We asked our users directly whether they preferred MLU or a desktop browser interface to MovieLens better. Most users said they preferred the desktop for reasons similar to this user:

> *Desktop. I need to find additional information on film to weigh the value of a recommendation. Read up on IMDB about it, look for reviews, etc.*

The previous comment points out one of the design decisions that must be made make in building an interface for an occasionally connected device: How many pages to download to the PDA. We chose to make our synchronization fairly shallow, both to avoid using lots of memory on the PDA, and to keep the interaction simple. One outcome of this decision is that users only have access to a limited number of recommendations. A second outcome is that we do not synchronize links that are external to the MovieLens domain. As a result, AvantGo users do not have access to reviews and other information about the movie from sites like the Internet Movie Database (IMDB), a feature that users repeatedly asked for in our followup survey.

In the early part of the field study we monitored the usage of the interactive features of the AvantGo Channel such as searching and rating movies. What we learned was that most users tried the interactive functions at least once, but very few used them more than once. Table 1 shows the frequency with which users tried to use the interactive features of the MovieLens channel. The table shows that although 67 users tried the search feature, only 4 users used it more than 5 times. Other interactive features went similarity unused.

We believe that the reason these features went unused was that the user did not get meaningful feedback about their action until after the next time they synchronized. In fact the feedback they got was quite confusing. For example if a user were to tap on the wishlist checkbox for the movie "Wild Strawberrys" in figure 3, then scroll to the bottom of the screen and tap submit, the user would see a dialog box that said "Your submission has been recorded and will be sent during the next synchronization." When the dialog box was dismissed the user would see that the screen was restored to its initial state with the checkbox cleared. The lag time in processing a request also made the search function very confusing. tapping on the search link would bring up the list of recommended movies corresponding to the results of the search that the user entered *before* their most recent synchronization.

Feature	1x	2x	5x	10x	more
search	67	15	4	0	0
rate	33	17	19	10	7
wishlist	24	10	19	5	7
change zip	40	10	12	2	1

Table 1: Summary of interactive feature usage by users for AvantGo channel.

The usage data collected, led to a second iteration of the interface in which we removed many of the interactive features. Figures 3 and 4 show the difference between iteration one and two. Notice that the ability to add an item to your wishlist or mark a movie as already seen was removed.

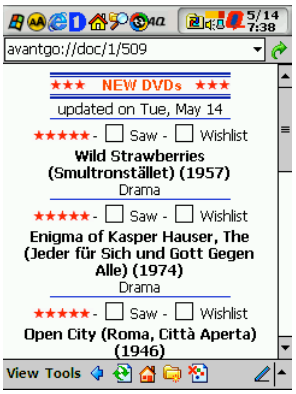

Figure 3: MovieLens Unplugged DVD recommendations: iteration one shown on a PocketPC

Figure 4: MovieLens Unplugged DVD recommendations: iteration two

The final question we investigated, with respect to occasionally connected devices, was whether there were times when users could not accomplish their chosen task because they were offline. The responses from our users were fairly

evenly split. Some users could accomplish all of their tasks without any additional online information. Other users missed the ability to search interactively. Still others found the unavailability of outside reviews to support recommendations to be an obstacle. A final point of confusion for many users of the AvantGo channel is summed up by the following user:

> *The "My Theaters" section would be more useful if it was downloadable through a wireless connection, rather than through syncing. I have a Palm VII, and can download directly to my Palm from other websites that are compatible. After I leave work on Friday, the movie times in the "My Theaters" section get stale...*

What users do not understand is that most movie theaters change their schedules only once a week. Other recommendation applications may need more timely access to supporting information, but movies change relatively slowly compared to device synchronization.

6. CONCLUSION

Our research shows that recommender systems can be valuable services on mobile devices. Users value having the recommendations with them at the point-of-decision. This is supported by the following comments from users about their preference for MLU versus the desktop interface:

> *MLU–Much more convenient (video store, in front of the Tivo, etc.)*

> *In my attempt to find a recommended movie, I will now hand my PDA to the Video Store Clerk, so he can check his inventory and see if he has any of the obscure movies that are recommended. I am now known as the "Guy with the List".*

Our recommendations for future designers of recommender systems for occasionally connected devices include:

Choose the correct data to synchronize. Users clearly indicated that they need other data such as a movie synopsis or third party movie review to support the recommendations. The AvantGo channel interface makes it possible for the designer to subscribe to an external source for this data and reformat it for a small device.

Limit false interactions. Because of the lag between data entry and synchronization it is best to limit data input to areas where users clearly understand that a time lag is OK before that data gets to the online system.

Maximize available interactions. One alternative for a recommender system designer to consider is to create a dedicated client that is fully interactive, and only needs to have a database of information downloaded periodically. For example, rather than synchronizing a set of html pages through AvantGo, a user might synchronize an xml file of recommendations, for all movies in the MovieLens database. This alternative would allow the interface to provide real-time feedback for interactive features, such as searching and rating.

There are many additional challenges associated with providing recommendations on wireless devices. In this paper we have focused on just one of them. Future research could explore other mobile devices and interface techniques to provide recommender systems wherever people shop.

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