The Development of Mobile Movie Tracking System and App in China

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Abstract

This case study is to introduce a Mobile Movie Tracking System (MMTS) and its internal system developed by a theater company which operates 17 theaters in China. Through this case study, from a business perspective, components within the MMTS can be identified. Further, reservation information by individual and segment level can be collected through the MMTS and put into a database. Then, through mixture modeling, a list, time, and theater of recommended film contents that a mobile phone user would most likely to reserve is shown on the application screen. From an academic point of view, post-hoc segmentation such as mixture modeling has been reported frequently, but in the film industry, mixture modeling is rarely used in practice. Especially, the output example in fuzzy clustering algorithm by mixture modeling in MMTS shows the probability of when, where, and which movie a potential moviegoer choosing movies.

Keywords: China, Mobile Movie Tracking System, Mixture Model

1. Introduction

China is the newest rising film market. Movie revenue in the North American region including the U.S. and Canada ranked the highest with $10.8 billion, and China stepped up to the second place with $2.7 billion. Japan has always maintained its position in the second place next to the U.S. and Canada, but China overtook this position for the first time last year. The global movie industry revenue in 2012 was $34.7 billion, increased by 6% from 2011. Movie revenue in the U.S. and Canada has also increased by 6%. However, within the same period, the film industry in China has increased by 36%, the fastest growing pace in the world [1].

As shown in Table 1, the film sales in China increased by 40% yearly between 2009 and 2012, while the number of moviegoers increased by 31% yearly. This number shows a steady increase in the price of movie tickets during these years. In other words, despite the increasing price that a moviegoer must pay, the number of moviegoers has increased.

Table 1. Growth of Chinese Film Industry

	YR 2009	YR 2010	YR 2011	YR 2012	CAGR (%)
Number of movie theaters	37	38	39	46	8%
Number of theater sites	1,680	1,993	2,796	3,680	30%
Number of screens	4,723	6,256	9,286	13,118	41%
Revenue (100 Million RMB)	62.06	101.72	131.15	170.73	40%
Number of moviegoers (100 Million)	2.10	2.84	3.70	4.67	31%

Source: The State Administration of Radio Film and Television (2013)

The sales increase of film industry has stimulated film suppliers. The number of theaters playing movies increased by 30% annually between 2009 and 2012. And the number of screens increased by 41%. It shows that theaters have become bigger. Besides, the number of companies in film market increased by 8% in the same period [2].

Table 2. Growth of Chinese Mobile Market

	YR 2009	YR 2010	YR 2011	YR 2012	CAGR (%)
Mobile Phone Sales (Million RMB)	152,170.1	183,048.0	238,913.0	308,494.0	26.6%
Mobile Phone Sales Volume (Million Units)	164.5	216.4	243.8		21.8%
Mobile Phone Users (Million Units)	747.4	859.0	986.3	1,112.2	14.2%
Smart Phone Sales (Million RMB)	44,433.7	76,723.0	153,853.0	255,518	79.2%
Smart Phone Sales Volume (Million Units)	21.5	47.2	97.9		113.6%
Non-Smart Phone Sales (Million RMB)	107,736.5	106,325.0	85,060.0	52,975	-21.1%
Non-Smart Phone Sales Volume (Million Units)	143.0	169.2	145.9		1.0%

Source: Euromonitor (2013)

In that period, sales through mobile increased rapidly. Revenue through mobile phone increased by 26.6% yearly from 2009 to 2012, which was the time when the number of mobile phone users was increasing by 14.2% annually. In particular, smartphone sales reached the annual increase rate of 114% [3].

These two rapidly growing businesses, films and mobile phones, can be combined to present a new sales opportunity for the film industry. This can be accomplished by providing applications to search and buy tickets to movies via a mobile phone. This is already widespread in Korea, but not in China yet [4].

This case study is to introduce a mobile movie tracking application and internal system developed by a theater company which operates 17 theaters in China. Through this case study, from a business perspective, components within the movie reservation system can be

identified. Further, reservation information by individual and segment markets can be collected through this reservation system and put into a database. Then, through mixture modeling, a list of recommended film contents that a mobile phone user would most likely to reserve is shown on the application screen. From an academic point of view, post-hoc segmentation has taken center stage, but in the film industry, mixture modeling, which is rarely used in business, is being used [5].

2. Mobile Movie Tracking System (MMTS) in China

2.1. Structure of MMTS

Authors call a system that future moviegoers will use for searching for and reserving movie tickets through their mobile phones, Mobile Movie Tracking System (MMTS). The reason that authors used the word "tracking system" is that the system actively recommends movies that a user will be most likely to reserve tickets for by tracking down the previous movies that the user purchased tickets for and provides the result on the screen instead of just showing movies that are playing at the moment.

MMTS is composed of five systems as shown in Figure 1: proactive (or push based) movie information system, movie theater selection system, date/time selection system, payment system, and reservation confirmation system.
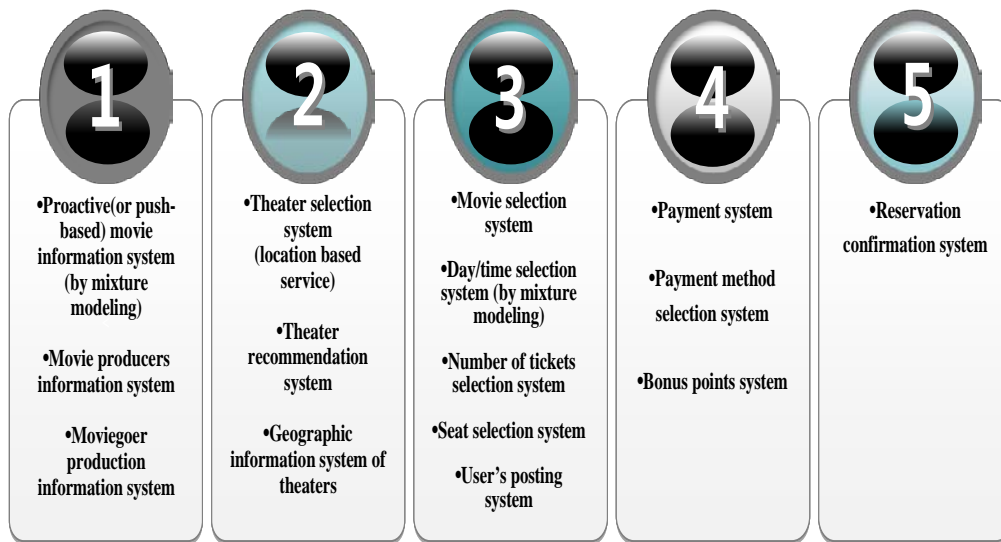
1	2	3	4	5
•Proactive(or push-based) movie information system (by mixture modeling) •Movie producers information system •Moviegoer production information system	•Theater selection system (location based service) •Theater recommendation system •Geographic information system of theaters	•Movie selection system •Day/time selection system (by mixture modeling) •Number of tickets selection system •Seat selection system •User's posting system	•Payment system •Payment method selection system •Bonus points system	•Reservation confirmation system

Figure 1. Structure of MMTS

2.2. Proactive (or push-based) Movie Information System

A proactive (or push-based) movie information system provides largely two types of information. One is provided by the filmmakers to attract moviegoers. It is the first piece of information that a user connects to the application (app.).

Once the app is downloaded on the mobile phone, the user can see the most popular movies that are playing in the theater on the phone screen. If the user has a history of purchasing a ticket through the application, mixture modeling at the application's database (DB) will calculate which movies the user would most likely want to watch and show them on the phone screen instead of the latest movies.

For the users who purchased tickets on the app before, information such as the frequency of watching movies, time period, type (genre and country of origin) of the movie, number of people accompanying him, and the price paid (each movie might have a different price in China) gets recorded on the DB of this movie company. In particular, for users who purchased a VIP card, which is widely used in the movie industry in China, demographic variables can also be included on the DB.

If a moviegoer has n number of movie watching records, the probability (p_{ns}) of one record i showing up on a specific segmented market s shows up as the likelihood of the movie watching record y_n showing up under (θ_s), the condition (θ) of the variables of the specific segmented market s (Formula 1). In other words, it adopts a fuzzy clustering algorithm. The probability density function at this point can take on various forms of normal distribution, Poisson, binomial, and negative binomial. Irrespective of the scale, mixture modeling can include all variables and calculate the probability of choosing a specific object [6, 7].

$$p_{ns} = \frac{\pi_s f_s(y_n | \theta_s)}{\sum_{s'=1}^{s} \pi_{s'} f_{s'}(y_n | \theta_{s'})}. \tag{1}$$

Table 3. An Example of Choice Probability Estimated by Mixture Model for a Moviegoer

The Day-of the Week	Time	Genre	Choice Probability
Monday	Bt noon to 5pm	Comic	16%
		SF	*51%*
		Drama	3%
		Musical	15%
		Chinese Action	15%

Therefore, the moment a moviegoer opens the mobile app, he/she sees on the screen the result of what has been already calculated to be the probable genre, playing time, and theater location of a movie as well as with whom the user would likely watch the movie shown at Table 3. Of course, the now-playing movies and the future-playing movies are already saved on the DB by the movie producers. Therefore, MMTS can be called a knowledge based information system [8-10].

A subordinate system of an active movie information provider system is the moviegoer production information system. In this system, real-time moviegoer reviews on the now-playing movies are provided. The recently established MMTS does not simply provide all the reviews posted by the moviegoers. Negative words among the reviews are searched as prohibited words in advance, and reviews with these prohibited words are not provided on the user's mobile phone.

Figure 2. Mobile Page by Proactive (or push-based) Movie Information System

Figure 3. Review Posting System for User

2.3. Theater Selection System

Just like the movie information provider system, this system is designed to target customers. The first target applies to the existing users who use the application to search for a movie. The system first suggests the theater where the individual would visit. The visit probability is calculated by the mixture model using the previous visit database [11].

However, in case of newcomer to application, the proposed system is designed to suggest the theaters by using location-based information. The system uses Google Maps to provide such geographical information.

Figure 4. Mobile Page by Theater Selection System

Figure 5. Theater Location Guide with Google Map

2.4. Date/time Selection System

The proposed system gathers detailed information used for reservation at a specific movie theater. The standard process involves the selection of the date and time first and then that of the number of tickets and the seats. A scroll bar is placed to increase the interest of the users when choosing date, time, and number of people. Of course, the mixture model makes it possible to calculate the probability of the preferred day and time of the existing users. Therefore, as soon as the user touches a button to select the preferred date and time at a specific theater, the screen can provide the day and time often selected previously by the user.

Figure 6. Date and Time Selection

In case of the Chinese theater company, the moviegoers are shown to have the day-of-the week effect. In other words, theaters attract a higher number of visitors on specific days than on the other days. Therefore, the probability of specific clients preferring specific days is calculated by tracking the existing moviegoers, and this can be used as illustrated in Figure 6.
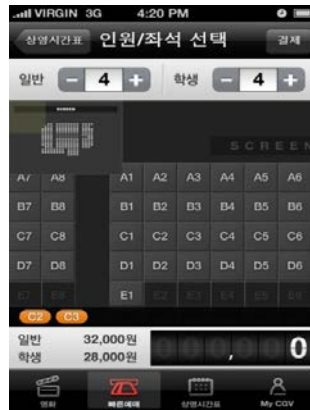
Figure 7. Seat Selection

2.5. Payment and Reservation Confirmation System

These two systems implement general and commercialized services. The payment system must include the selection of a payment method and link the applicable discount system. Depending on the payment method, a sub-payment system must be additionally established. For example, if a user pays with a credit card, a system called "Alipay" is used in China. Figure 8 shows the payment process.

The reservation confirmation system lets moviegoers check all their previously selected contents on the app. That is, it can display a user's reservation history, cancelation history, point information, and setting options.

This reservation information is not only provided on the app provided by MMTS but also on the user's mobile phone as an image. This image is automatically sent as the user finishes the reservation process.
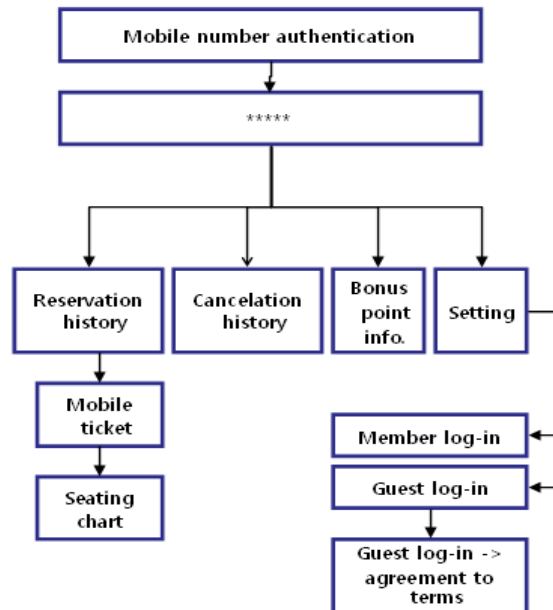

Figure 8. Payment and Reservation Confirmation Process

The MMTS introduced above is based on Android 2.2 and has a network system shown at Figure 9. Customers can use 2G, 3G and wi-fi.
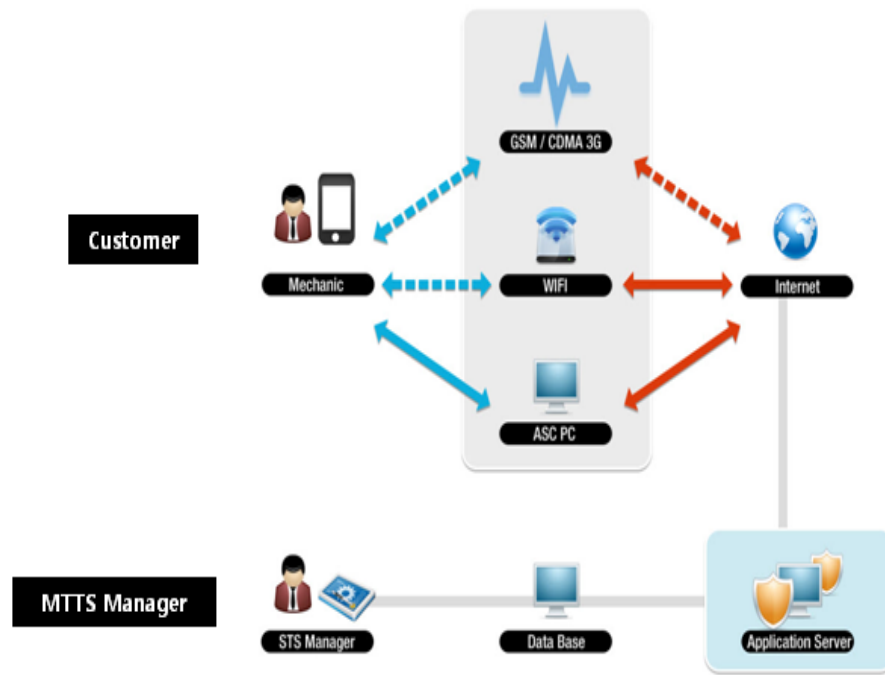

Figure 9. The Conceptual Network for MMTS

4. Prospects for MMTS

Among the MMTSs introduced above, a location-based theater recommendation service is what ordinary people are familiar with. On the other hand, workers in the film industry or academia are not familiar with a customized movie information service, theater location providing service, and preferred day and time providing service provided by the mixture model for the existing moviegoers. However, users can see their preferred movie genres, time, place, and day from the very first page of the screen without having to go through other uninteresting movie genres, time frames, or places. In order to make this possible, the collection of and the construction of a DB of the movie watching information of the existing users are essential. Therefore, the future MMTS development direction depends on how much information of how many users can be accumulated on the DB.

The second development direction is strengthening the earning power. The existing system only has a simple payment function. However, the future payment system must calculate the moviegoers' frequency of watching movies as well as the price elasticity in advance, and provide the movie price by day/time/genre/number of people accompanying the user. For example, some of the moviegoers of this theater frequently watched movies on Tuesdays and the price was inelastic, and those that watched movies on weekends had to pay an elastic price. Therefore, increasing the movie ticket price on Tuesdays will not reduce the number of moviegoers.
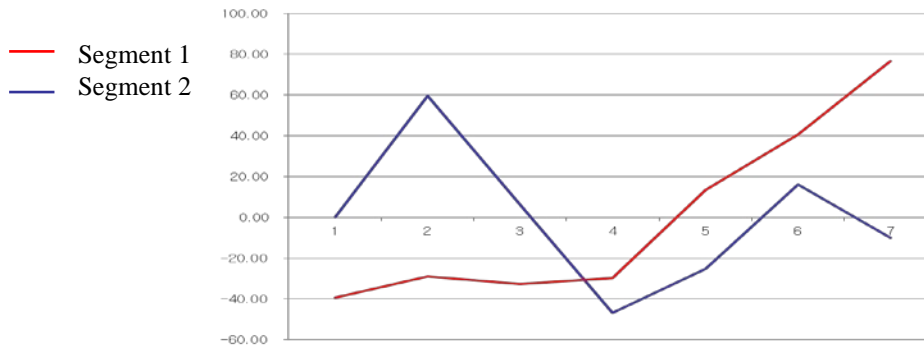
Figure 10. Two Different Segments of Variation in the Number of Moviegoers by Day
(Y axis: variance-to-mean ratio of the number of moviegoers, X axis: days of the week)

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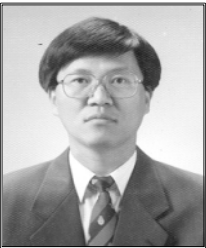
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