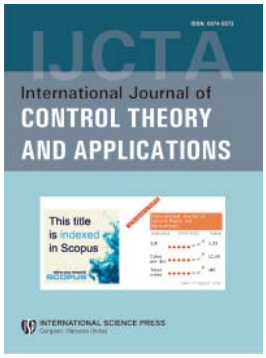

International Journal of Control Theory and Applications

ISSN : 0974–5572

Volume 9 • Number 42 • 2016

Enhanced user Rating (Eur) Technique For Recommednation System

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Abstract: Recommendation Systems aims to generate significant Recommendation to various users based on their interest in various fields. A common of example of that would be suggesting books or songs from various websites. Recommendation Systems are designed to be compatible with the amount and type of data available. In this study, we have proposed a recommendation engine that rates a movie based on users scale of rating movies, this way we can predict, what will the user rate the movie after watching it. Accuracy of this system is determined by computing the predicted RMSE (Root mean square error) of the system against the actual rating of movie. We also use MSE (Mean Square Error) to set a cap to the error value for calculating accuracy and increase in accuracy as we increase the MSE cap value. This being a concept can be applied to or be the base of any of the base technology recommendation system.

Keywords: *RMSE (Root mean square error), MSE (Mean Square Error).*

1. INTRODUCTION

As the World Wide Web continues to evolve at an enormousrate, complexity of several sites grow with it. For the users of these sites it becomes time consuming and very difficult to take out the information that they are looking for. User interfaces could help users get the information that is in usefulness with user's interests by personalizing a site. Some websites show the users with personalized information by making them choose from a huge sample space of predefined topics of interest. Users not always know what they are interested in and thus their set of interests change with time. Recommender system shows personalized information by knowing the users interest from time of interaction with the same user[1].

A recommender system is a type of system performing information filtering to bring information items such as music, books, movies, news, images, web pages, tools and various other aspects to a user in accordance with its interests. This information is filtered so that it is similar to the interest the user. The main aim of a recommender system is often to "help consumers learn about new products and desirable ones among large number of choices". Information filtering systems, aim at removing unwanted or redundant information from an information base. They aim at reducing the information overload and presenting relevant information while improving the signal to noise ratio at the semantic level. According to Ujjin's review of some literature in 2001,

"it seems that the definition of 'recommender system' varies depending on the various author. Some researchers use the concepts 'recommender system', 'social filtering' and 'collaborative filtering' interchangeably". They also added that "others regard ' recommender system' as a generic descriptor that represent various prediction/ recommendation techniques including social, content and collaborative based filtering, association rules and Bayesian networks. "Ujjin concludes this discussion by telling that he will use the second definition in the rest of its publication". This is the current assumption nowadays in this field and it is also chosen by Herlocker et al.[1]

Recommender systems are essentially meant to help users find relevant and vital information on the web. For an instance, systems like Google act as recommenders by enabling the users to sort through huge amounts of information in their datasets. Used by more than 32 % of all internet users, it could be said to be the most popular recommender system on the web. It is one of the great importance for the progress of E-commerce and IT industry nowadays, and gradually gaining popularity in large number of applications (*e.g*. Google news, Netflix project, Amazon and many more). Most likely, a recommender system makes up the user's profile based on its previous records, and compares it with some reference features, and attempts to predict the 'rating' that a person would give to the product he/she had yet not evaluated. In most of the cases, the recommendation system points to a large scale data mining problem by Herlocker et al [1].

Recommender systems can now be found in various applications that expose the user to a large collections of items. Such systems specifically provide the user with a list of recommended items they might prefer, or supply guesses of how much the user might prefer every item. These systems help users to decide on suitable items, and ease the task of finding suitable items in the collection.

2. METHODOLOGY

We needed a flexible database to experiment varied approaches.

We used simple tasks to fill up the database in this recommendation system:

1. Used the best way to get genuine database without any ambiguity (*i.e* social media)
2. We did a social survey for rating the item
3. Linked that survey to a google data sheet
4. Accessed all the rated information, and inculcated that during the processing of the algorithm.

Table 1
Database with user rating

	AF	*AG*	*AH*	*AI*	*AJ*	*AK*
1	Taare Zameen Par	DDLJ	A Wednesday	Bhaag Milkha Bhaag	Terminator	Casion Royale
3	8	7	9	10	4	6
4	10	3	10	9	10	8
5						
6	9	10	9	8	9	7
7						
8						
9	9	10	10			
10	8	4	8	7	7	8
11	3	3	4	5	4	4

	AF	*AG*	*AH*	*AI*	*AJ*	*AK*
12	8	9			8	
13	8	3	5	8	6	
14						
15	8		10	7	8	8
16	9	5	9	9	8	8
17	6	4	2	6	4	3
18	6	6	8	7	8	7
19	6	7		9	8	
20	8	8	10	7	9	6
21	10	10	10	8	6	8

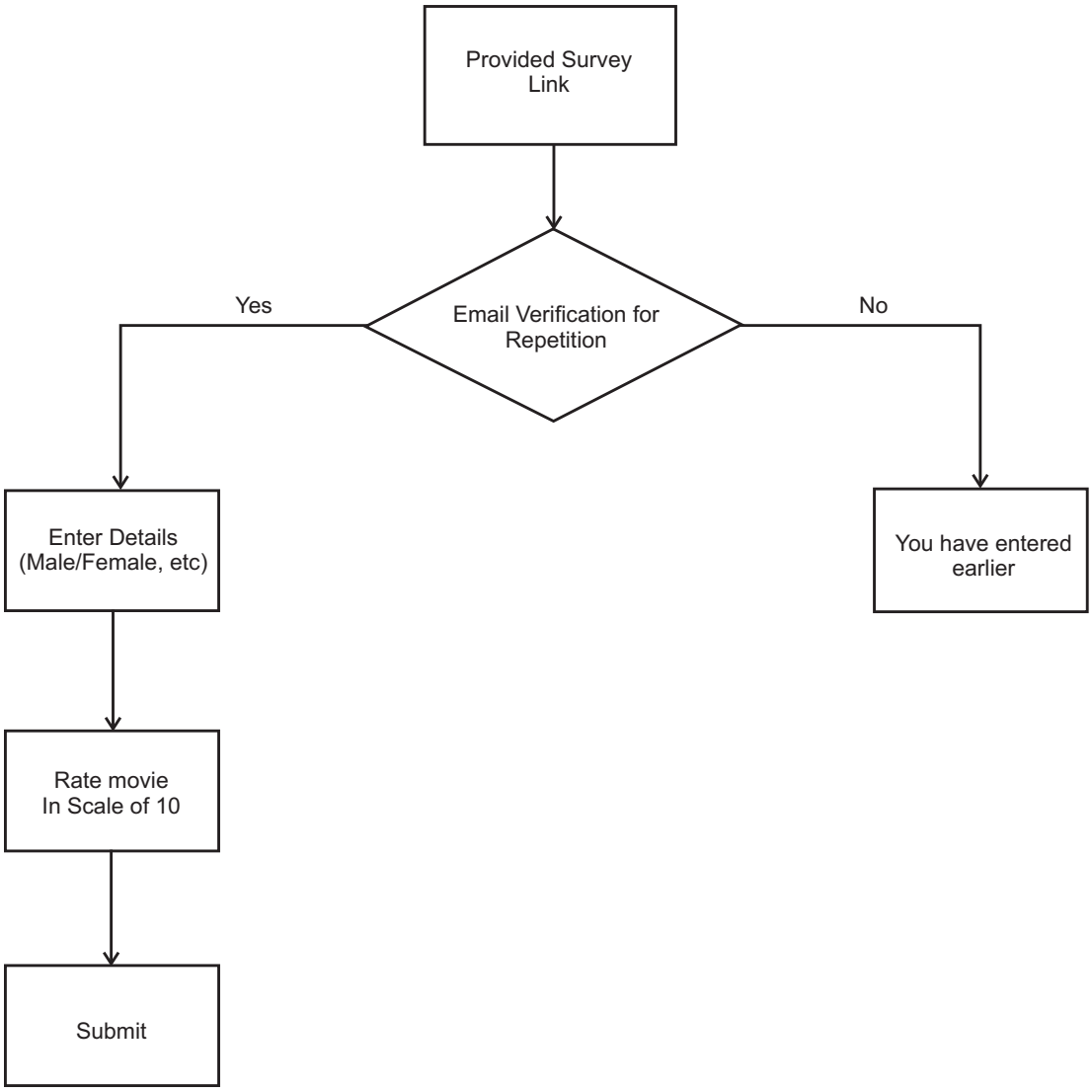

Figure 1: Data Flow Diagram for database

Once we had obtained the users rating, we designed algorithm Figure 1 to calculate his scale based on his previous ratings and comparing it with other users rating, providing a scale to each one them. Now for each rated movie, predictions were made(assuming as if that particular rating is unavailable). Following is the pseudo code for the above,

1. Assemble rating database into metrics format.
2. Rows → user rating and columns → movie rating.
3. Compute "U_A" & "M_A" , and respectively store them in the arrays.
4. Compute "U_{AA}" .
5. If movie rating missing at [*i* , *j*] location then compute " $\bar{x}$ " (*i.e* predicted value).

   Assuming "*x*" → actual value , compute MSE & RMSE (using equation given below).

Here U_A is User average rating for all the movies he/she rated. M_A is the movie's average rating, rated by all users(who viewed them). U_{AA} is average of average user scale of ratings for all users. We finally get the predicted value for each movie for each user as '$\bar{x}$'. Following are the formulas used for implementing above algorithms:

$$U_A = \frac{\sum_{i=o}^{n} U_{Ri}}{n} \text{(User Average)} \quad (1)$$

Here U_{Ri} is user rating for movie 'I', *n* is total number of movies. U_A is user average calculated for each user individually.

$$M_A = \frac{\sum_{i=0}^{n} M_{Ri}}{n} \text{(Movie Average)} \quad (2)$$

Here M_{Ri} is movie rating given by 'I'th user and *n* is total number of ratings provided. MA calculates movie average for all the movies individually.

$$\bar{x} = \frac{U_{Ai} \times M_{AJ}}{U_{AA}} \text{(Predicted Value)} \quad (3)$$

Here U_{Ai} is user average for '*i*'th user, M_{Aj} is movie average for '*j*' th movie and U_{AA} is average of all user averages. $\bar{x}$ calculates the final predicted value.

$$MSE = (x - \bar{x})^2 \text{(Mean square error)} \quad (4)$$

MSE is the Mean Squared Error term used to calculate algorithms efficiency. '*x*' here is actual movie rating whilst $\bar{x}$ is predicted value. Capping our MSE values at different intervals shows varied accuracy as shown later.

$$RMSE = \sqrt[2]{\frac{\sum_{i=0}^{n} MSE_i}{n}} \text{(Root mean square error)} \quad (5)$$

The root-mean-square deviation (RMSD) or root-mean-square error(RMSE) is a measure of the differences between values (sample and population values) predicted by a model or an estimator and the values actually observed.[3]

3. RESULTS

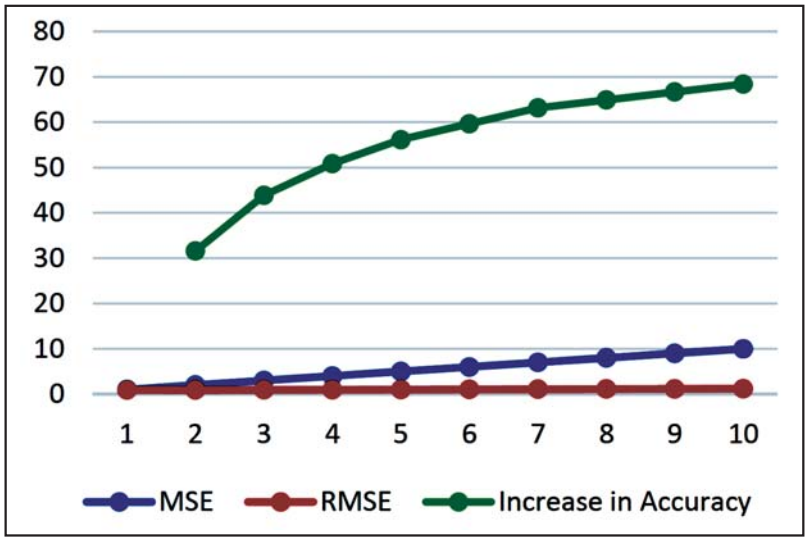

Figure 2: The graph shows the increase in accuracy corresponding to the MSE & RMSE value

MSE	RMSE	Increase in Accuracy
1	0.946585705	
2	0.922210269	31.57894737
3	0.952913894	43.85964912
4	0.984587557	50.87719298
5	1.025356065	56.14035088
6	1.06413932	59.64912281
7	1.103592755	63.15789474
8	1.141284207	64.9122807
9	1.173808915	66.66666667
10	1.204962771	68.42105263

Figure 3: Numerical data for plotting the graph in figure 2

In Figure 2, we can see the increase in efficiency with increase in capped MSE value as promised above. For a mere MSE cap of '1' our accuracy is 57% which increases significantly to 75% as we raise cap value to '2'. The above is a representation for increase in accuracy compared to cap of '1'. And Figure 3 is the numerical data for the same.

We achieved RMSE values as low as 0.922 at a cap MSE value of '2'. That is if we provide error acceptability of 1.414. Figure 4 & 5 depicts the same.

The Figure 6 show a perfect relation between the MSE values and the accuracy attained at each value. We observe a steep increase in accuracy in transition from an MSE value of '1' to '2'.

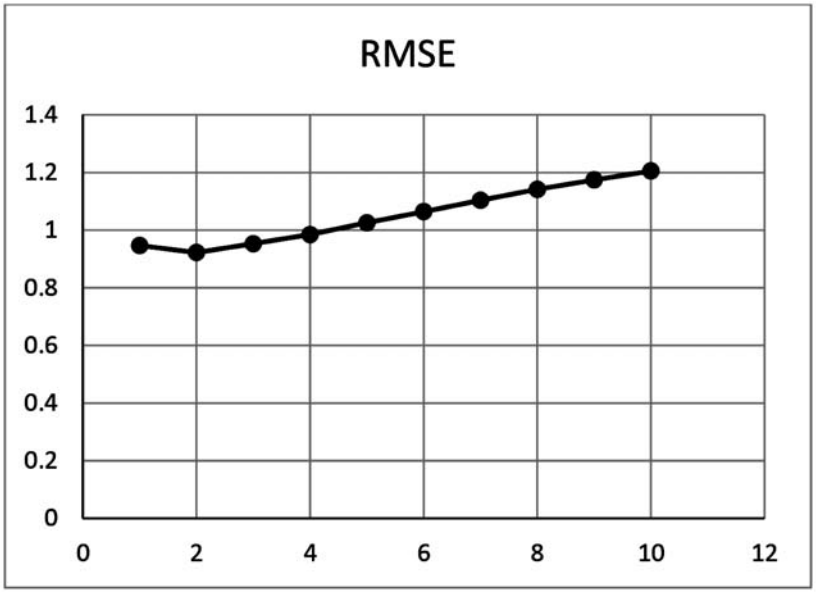

Figure 4: Shows the RMSE values and its variation at different MSE values

MSE Value less than	RMSE
1	0.946585705
2	0.922210269
3	0.952913894
4	0.984587557
5	1.025356065
6	1.06413932
7	1.103592755
8	1.141284207
9	1.173808915
10	1.204962771

Figure 5: Numerical data for plotting the graph in figure 4

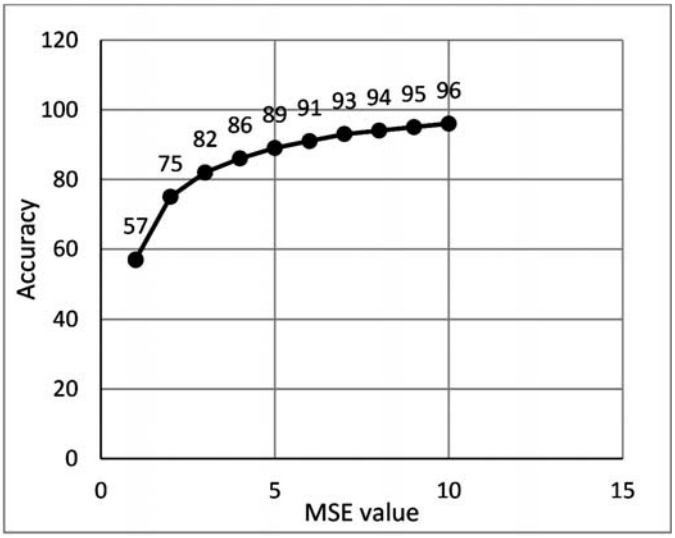

Figure 6: Relation between the MSE values and the accuracy attained at each value

4. CONCLUSION

In our proposed algorithm we have laid our focus on the user's scale of movie rating, we understand that a user likes a movie and rates it 10/10 on the other hand a different user may also like the same movie as much but rate it 8/10 this shows that different user may have different scale of rating movies. In previous papers we referred, we observed that users having similar ratings were only considered, to predict rating but we see that our algorithm

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