AN INTELLIGENT E-COMMERCE PLATFORM FOR C2C TRADING AMONG STUDENTS

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Abstract*—Internet has grown tremendously over the past years. The accessibility and availability of internet easily has helped many technologies and industries to boom. E-commerce is one such industry and its growth has multiplied many times over the past decade. However there is an ever increasing demand for online trading platforms that help consumers sell their used goods. This paper proposes to solve the problem of selling and buying of used goods by students. The paper focuses on determining the selling price of the items through data mining and machine learning. A recommender system is proposed to solve the problem of recommending the desired items to the buyer. The aim is to provide a pleasant experience to the users.

***Index Terms*—e-commerce, online trading, used goods, data mining, machine learning, recommender system.**

I. INTRODUCTION

Online trading and e-commerce can be arguably considered as the major industries of the century. With almost all the brick and mortar stores opening their online websites so pump up their sales the trend will continue to grow and become a common phenomenon. The need for e-commerce website arises as everything is turning digital. Every one now a days has smartphone with internet connectivity and with the availability of cheap data plans everyone is "online". This has opened doors for e-commerce as products can be sold and bought using internet and "connected devices". Consumer to consumer trading, C2C as it is called is buying and selling of used goods by the consumers.

There are a lot of C2C trading platforms available today but there is no such efficient C2C platform especially for pupils of university. Such a trading platform would help the students of university to buy and sell their products among themselves. The above said platform becomes necessary especially while items need to be traded within a small campus or community. Some well-known online trading platforms are too generalized and global in nature. Existing websites are of very little help to students who would like to exchange or sell their used products among themselves or within their community.

In this paper, an online C2C trading platform is proposed. The site supports direct consumer to consumer trading with an emphasis on university students. Students can trade books, electronic gadgets, sports items etc. The web application needs to be simple yet effective and it should be easy to use. The paper aims to solve the problem of pricing the product by suggesting the price of the item to be sold. Other features include recommendation of items to the buyer which may be of interest to him. The system will have the intelligence to recommend the items to the user based on his interests, previous purchase patterns and products purchased by users similar to him. Naive Bayes algorithm is used to predict the selling price of the product. Techniques such as data mining, machine learning and decision support system are employed to solve the price recommendation problem.

The paper is organized as follows. In Section 2 a review on existing systems along with the problems experienced by them is discussed. Section 3 describes the architecture of the proposed system. In Section 4 we discuss the algorithms used for price prediction, Section 5 describes the recommender system. In Section 6 conclusion is given.

II. REVIEW ON EXISTING SYSTEMS

There are a lot of online market places in existence. However they are much generalized in nature and does not cater to the needs of university students. They are not exclusive to the students of the university. Anyone who has access to the internet can use it so the features of a trading platform are much generalized. One of the major problems faced by the sellers in a C2C trading platform is deciding the selling price of the product to be sold. There is no efficient method to solve this problem in the existing trading platforms. As a result most of the products remain unsold due to high and unrealistic selling price.

Another problem faced by the users of existing systems is authenticating the seller and buyer. In a usual C2C trading platform there are problems like false identity and fake items being sold. As users are not thoroughly verified and there is no realistic way to verify the authenticity of the product being sold or bought there are chances of fraud. In such cases the buyer might receive false items/ fake items or items which are not as described. Then there needs to be a whole painstaking process of complaining to the customer care if one exists and then the e-commerce platform trying to find the seller which might be very difficult if he has used false identity and the buyer is left unsatisfied.

In most systems the account setup process is very complex and takes up a lot of time. Many websites ask for credit cards while setting up the account which may not be desirable for the students.

With the existing systems there are chances of breach of data and hence confidentiality which may not be so easy in the proposed system as it is a closed environment and works only within the university network.

Then there are other issues with the existing systems like government rules and regulations. Some of them are mentioned below,

- Taxes
- Trademarks and patents
- Shipping restrictions
- License and permits, etc.

Problems such as those mentioned above can be overcome if a website works only within a university campus and is not accessible to the outside world.

This brings us to the core problem which is buying and selling of used goods to the desired customers is a challenging task in the current trading environment.

III. ARCHITECTURE OF THE PROPOSED MODEL

The proposed model is shown in figure 1. It shows the seller and the buyer. The seller puts the items for sale along with the characteristics of the item. The system uses data mining and machine learning to identify the selling price of the item. The products that might be interest to the buyer are recommended.

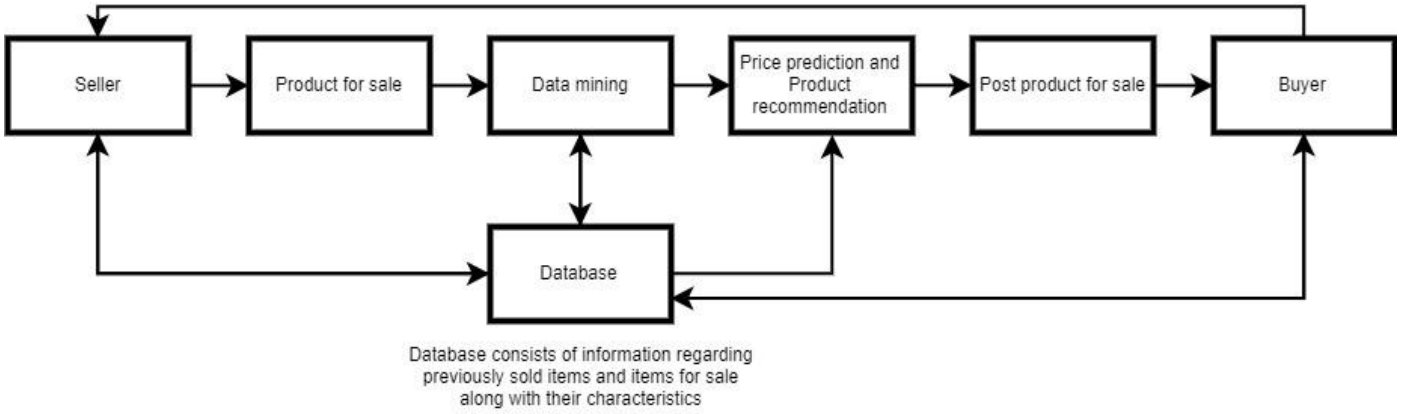

Figure1. Proposed Model

The main actors are administrator, seller and buyer. The administrator adds students to the system and provides them access to the system by registering them to the system. All the students of the university are registered to the system at the time of admission to the university. Since users are added by the administrator the users are authenticated easily as the students of the university.

The seller is the next actor. The seller who wants to sell a product logs into the website and uploads the details of the product along with the image and a brief description of the product is also added. The system checks for other products with similar features in the database which are already sold and determines the selling price of the item. Data mining along with machine learning is used to predict the price of the item to be sold. The Naïve Bayes algorithm is used to solve the problem of price prediction which is explained in the next section.

The third actor is the buyer. The buyer logs into the system with his credentials and he is shown the recommendations. Alternatively the buyer can search for the items himself. All the items which are up for sale are displayed to him. Recommendation of the items is an important aspect in e-commerce as it increases the salability of the item.

The items are recommended to the buyer using two models.

1. The items similar to the one that he has purchase or browsed earlier are recommended.
2. If the above two conditions are not met then the profile information of the buyer is used to search for users with similar profile and the products purchased by the similar users are recommended to the buyer. It is explained in the next section.

Once the buyer buys the items a notification is sent to the seller and the items are shipped by the seller.

IV. ALGORITHM FOR PRICE PREDICTION

The price of the product to be sold is determined using Naïve Bayes algorithm. The steps used for determining the selling price of the items is described below.

Step 1: Search the database.

Step 2: Find the probability of each feature [α, μ, β, γ].

Using the equation mentioned in the Step 3 to find the probability of occurrence of each value.

Step 3: Use the equation,

γ (attribute value(Θi)/subject value(Ɣj))=(μ + γβ)/(α+β)

Where:

α = number of anterior logs that can be used for training for which v = vj

μ = number of anterior logs for which Ɣ = Ɣj and Θ = Θi

γ = derivable estimate for γ(Θij Ɣj)

β = the equivalent sample size

Step 4: Multiply the probabilities by a priori estimate for γ(Θij Ɣj).

Step 5: In the final step we have to compare the value with the predefined set and classify the attribute.

V. RECOMMENDER SYSTEM

This is used to generate recommendations to the user based on his interests. It is divided into three steps,

- Recommendation process
- Generation of neighbors
- Generation of recommendations

Recommendation Process:

The steps to find the items for recommendation are as follows,

- Student information must be found and the previous purchase history of the student needs to be analysed and modelled to generate appropriate recommendation for the logged in student.
- The neighbour student needs to be found i.e., the student with similar characteristics as that of the logged in student needs to be found. This can be done by checking the buying history and with the help of collaborative filtering algorithm. With this the list of neighbourhood students can be calculated.
- In the final step the recommendations for the logged in student are found. The top 10 attractions will be recommended based on the purchase history of the neighbouring students which is found in step 2.

Generation of Neighbors:

- The students with similar profile viz same course, age, gender etc. are used for generating neighbors.
- Among all students the system can find the list of neighbor students and the top N students with high degree of similarity.
- We use cosine method to find the neighbor students based on similarity.

Students	Attractions				
	X1	X2	X3	X4	X5
Ɣ1	0	1	1	1	0
Ɣ2	1	1	0	0	0
Ɣ3	0	0	0	1	1
Ɣ4	0	1	1	1	1
Ɣ5	1	1	0	0	1

Table 1: Purchasing history of the customer

$$sim(Ɣi, Ɣj) = \frac{Si \cap Sj}{Si \cup Sj} \quad (1)$$

Based on the above equation we calculate the similarity is calculated as follows

$$sim(Ɣ1, Ɣ2) = \frac{S1 \cap S2}{S1 \cup S2} = \frac{1}{5} = 0.2 \quad (2)$$

$$sim(Ɣ1, Ɣ3) = \frac{S1 \cap S3}{S1 \cup S3} = \frac{1}{5} = 0.2 \quad (3)$$

$$sim(Ɣ1, Ɣ4) = \frac{S1 \cap S4}{S1 \cup S4} = \frac{3}{5} = 0.6 \quad (4)$$

$$sim(Ɣ1, Ɣ5) = \frac{S1 \cap S5}{S1 \cup S5} = \frac{1}{5} = 0.2 \quad (5)$$

Now depending upon the accuracy of the required result we can choose the value of Θ. For the above example we have chosen Θ to be 0.5 and the neighbor of Ɣ1 is Ɣ4.

Finding the recommendations:

In order to recommend the items to the buyer we need to find the purchase history of the neighbor. From the calculation above we know that the neighbor of Ɣ1 is Ɣ4. We can easily find items purchased by Ɣ4. From the table below we can conclude that items X3, X4 and X5 are the maximum purchased items by the neighbor, so we can recommend these items to the user Ɣ1.

Students	Attractions				
	X1	X2	X3	X4	X5
Ɣ1	1	0	1	1	1
Ɣ4	0	1	1	1	1
Total	1	1	2	2	2

Table 2: Purchasing history of neighbor customers

VI. CONCLUSION

Even though a lot of ecommerce websites are available, most of them are too generalized and are often not of much help to the university students. The students of university want a simple and user friendly website which is intelligent enough to cater to their needs. In future this kind of website can be developed to cater to the needs of people living in a small community. This helps to free the user from a complex account setup and payment procedure. From the point of view of security also this website shines. As the users are university students and the users are added by the admin as soon as they join the university it provides better security by keeping it a closed environment and thereby preventing any possible security issues or at least keeping them to a bare minimum.

For a seller the platform helps to arrive at the selling price of the item by considering the condition and the previous prices of the similar item. This helps the seller to sell his items quickly as the prices are realistic and are obtained by mining the already available previous data. The products will be sold quickly.

For a buyer the platform suggests the items based on his previous purchase history and also based on the purchase history users similar to his profile.

The platform developed will be efficient, robust, secure and easy to use for C2C trading.

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