

COMMERCE IN AGRICULTURE AND PRODUCT RECOMMENDATION USING STRUCTURAL BALANCE THEORY

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Abstract— E-Commerce is a successful platform for the purpose of buying and selling of any goods or items through online. Whereas there are different methods can be used currently to provide efficient service to the users. The main reason for the success of E-commerce is that the recommendation of appropriate or similar products to the users. Adopting the method of E-commerce in the Agriculture field for the welfare of farmers as well as agriculture. In addition to that the SBT(Structural Balance Theory) is chosen to recommend the expected product to be available easily for the user at reasonable price and quality. In Structural Balance Theory-based Recommendation (i.e., SBT-Rec) approach, we look for target user's "enemy" (i.e., the users having opposite preference with target user) and then according to "enemy's enemy is a friend" rule the recommendation can be done to users who can be "Possible friends". Similarly, "possibly similar product items" can also be found. The main goal of this project is to establish a direct interaction between the farmers and users and which also be an efficient E-commerce application.

Keywords— *E-Commerce, Agriculture, enemy, possible friends, farmers, similar products.*

I. INTRODUCTION

E-commerce is a method of purchasing goods online. E-commerce works on by means of technologies such as m-commerce, online money transfer, goods supply management, Internet banking, data sharing, inventory management and data management. E-Commerce mainly based on communication via Internet where all the information which are required for the functioning of the electronic way of commerce can be done through this World Wide Web. The main concept of E-commerce is the purchase of goods either tangibles such as clothes, books, electronic gadgets, home appliances, etc. or intangibles such as music, games, movies, eBooks, software, etc. Even vegetables can also be purchased via E-commerce. Online purchase can either as normal ordering of goods or like online auctions. The payment can be made as Cash on

Delivery(COD) or by online payment methods based on the policies of that organization. Agriculture is the most important field for human life responsible for producing the food items which is the important source of life. But now a days people forget the importance of agriculture. They depend on the products delivered at their door steps which leads to the depreciation of quality of food products. Customers don't get the quality products directly on time where they just get the preserved products. And also Farmers are not getting what they are deserved for. They are paid a very little amount by the intermediates where the intermediate business person earns much. To eradicate all the negative consequences faced by the farmers, an E-Commerce application is developed for Agricultural products where the user to user and business to user is applied. With the help of this application, there will be a direct connection can be established between the farmers and the end users. Along with this, an effective Recommendation system is build along with it which uses Structural Balance Theory based Recommendation. Structural balance theory(SBT) was proposed by Fritz Heider, which says about the change of attitude of the people. The theory proposed about the psychological balance of the people along with the cognitive consistency motive. The consistency motive is the constant attitude or behavior prolonged for an individual is noticed. He proposed in that theory about the behavioral similarities of the people who has common disinterest of something. In simple, it can be say as "Enemy's enemy is a friend".

Product item recommendation has been a hot research topic in E-commerce domain. Through analyzing the existing big user-product rating data, we can recognize user interest and preference precisely and further recommend appropriate product items to the target user, so as to improve the on line product sales significantly. Many people have investigated this recommendation problem and put forward various solutions. In, time-aware recommendation is introduced, where time is considered as an important factor for predicting product

quality. However, work only discusses the objective quality prediction, without considering the subjective preferences of different users. Matrix factorization technique is introduced in to realize the recommendation purpose; however, if the user-product rating matrix is very sparse, the recommendation effect is not as good as expected (e.g., over fitting problem). In, CAP approach is introduced to predict missing quality of product items, which is mainly based on the clustering idea; afterwards, precise product item recommendation is realized. However, CAP requires that the user-product rating matrix is dense; and therefore, CAP is not very suitable for product item recommendation with sparse rating data. In, a CF-based recommendation approach (named CF+QoS) is proposed, which recommends product items to the target user by considering the product items liked by user target's similar friends. However, when user target does not have any similar friend, the recommendation accuracy of CF+QoS is low. Monte Carlo algorithm named MCCP is brought forth to measure different users' personalized preferences towards different product items.

According to MCCP, user target's similar friends can be found by trust propagation; and afterwards, the missing product item quality could be predicted based on the obtained similar friends. Generally, MCCP can work very well if user target has similar friends. However, as introduced previously in this paper, we only focus on the specific recommendation situations when user target does not have similar friends; therefore, prediction accuracy and recall of MCCP are not as good as expected, which has been validated by the experiments

II. LITRATURE SURVEY

Structural Balance Theory is introduced as it is used for the recommendation of products appropriate for the users based on their likes and dislikes observed from the past data.[1]. The repeating purchase are analyzed for the purpose of predicting the pattern of purchase which can be used for predicting the behavioral similarities of the customers to suggest products.[2]. The intention of the customer for purchasing a product can be used to recommend the products related to that in the practice of bringing Business to Customers.[3]. Poison Lognormal model is adopted as an alternative for Gamma distribution model used for the frequency count in Negative Binomial Distribution(NBA).[4]. Principle of Maximum Entropy (POME) is used for deriving number of frequency distributions.[5]. Principle of Maximum Entropy (POME) is used for deriving number of frequency distributions.[5] Grey decision making is the method of making decisions based on the circumstances.[5]. Collaborative filtering Recommendation is a method of predicting or filtering the interests by of users by means of preferences or taste information.[6]. Government has planned to implement some changes in the agro field to enhance the agriculture by Smart Farming and the benefits will be obtained through Digital Revolution in Agriculture was suggested. This could be start with the usage of Solar Power in large amount all over the country. There were number of suggestions including Solar Power to River integration for Smart farming. Agri-Banking is also a method proposed which is a three cycle phase consists of Agri-banking, Agri-Storage

and E-Commerce. There are also some other ideas proposed to bring Applications and Gadgets for the digital revolution by using for several purposes such as pH testing, seed information, bio-manure information stored in a data base for the purpose of farming. The idea of bringing all technologies together such as applications, banking, radio, etc., which are all in one place.[8] Farmers will take some efforts to gain knowledge for their benefits at least to eliminate the middle man. The E-commerce in agriculture is highly suitable for get organic products into market at a reduced cost which can make a good relationship between famers and consumers. The technology gaps can be bridged by the E-retailers with FPO's. The switching over between B2B to B2C can be possible with this method.[9]. The new farmers take advantage of internet and meets agriculture with social responsibility, creativity and new way of marketing products,says a report by AliResearch.com[10].

III. PROBLEM STATEMENT

In the existing system, the farmers will sell their products to the shops. Online shops are procuring vegetables directly from the farmers and delivering them right to the customer. Finally, complete content and organizational editing before formatting. However, so far there has been almost negligible funding in this space as investors are wary about scalability and execution issues. "One of the biggest challenges in this area is to ensure timeliness of delivery, especially in case of any immediate requirements. The farmers don't have any benefits. Because the shops are buying vegetables and other products from the farmers in cheap rate and they will sell those products at a high price.

A. Existing System

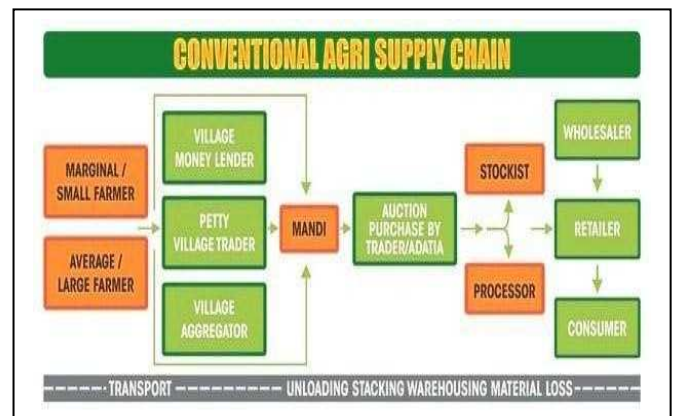


Fig. 1. Conventional method of agriculture supply chain

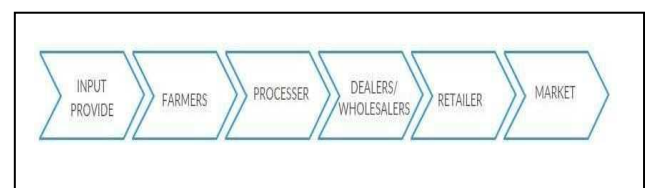


Fig. 2. Various levels in Agri supply chain

From the fig.1 and fig.2 , the conventional way adopted in the agriculture field can be understand. The chain starts from the farmers and hence with customers where many middlemen can be present. The food products produced by the farmers will be collected by the local traders and which are to be transported to warehouses, commonly called as Mandi. From there the products will be owned by other traders purchased through auction. After that it is that the processers who are responsible to make trade with the wholesalers. The people who are involved further in this chain are Retailers and finally the Customers who are the end users. This may results in various drawbacks especially to farmers who are affected much. The drawbacks which include the wastage of money via intermediate person. Less satisfaction for user and farmer. Confidence and trust between the sellers and the customers is less.

IV. PROPOSED SYSTEM

In this project we propose to develop an e-agriculture platform for the farmers to sell their products directly to the end users. In this case, the end users can get the products freshly and the farmers can also earn more. Thus creating an healthy ecosystem for the agriculture field. In this concept we integrate Structural Balance Theory-based Recommendation (i.e., SBT-Rec) approach. The product users may suggest and they may give the reviews for that product, by this reviews we may get best suggestion, so we may buy the product hopefully. There are various advantages which can be possible because of this proposed method. With this the time and money can be saved as it will be a direct dealing between the producer and the end user. The quality of the product will be high when compared to the preserved products which are supplied long days after harvesting. A trust and confidence will be built between the seller and the customers. With the use of recommendation system the users no need to see un preferred products and the quality can also be maintained with the help of customer reviews. The application is to be developed as user friendly and so it will be easier for the users to adopt to it and the usage will also be improved in large number. This project will must be prevailed as an important step for the country towards the digitalization. Smart techniques in farming will impact much youth to attract towards agriculture.

A. System Model

The Proposed System is classified into four modules.

1. User Interface - User can Add, Update, View, Delete and Order items.
2. Data Collection - Huge data can be stored in Server Database and when the user requests for data , the data will be retrieved.
3. Recommendation Module- Based on the preferences of users, the items will be suggested to the users according to their likes and dislikes.

B. System Arcgitecture

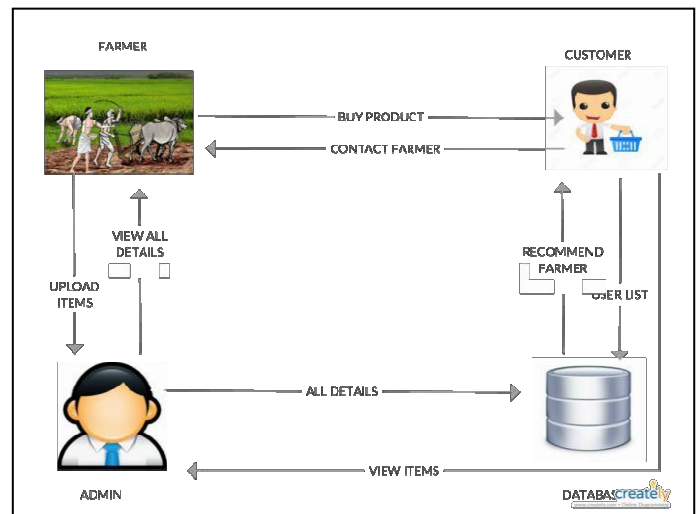


Fig. 3. System Architecture

The architecture of the proposed system shows that the E commerce in agriculture which can be done by the steps indicated in the above figure (Fig. 3). The system shows that the Farmers can upload the product by means of Admin and the products can be stored in the Server Database. The Customer have to create an account and he has the right to view the products uploaded by the Admin. The system which contains a recommendation system which make the system efficient. The orders made by the Customers can be directly delivred by the farmers. Here the admin plays a major role in uploading, updating and deleting the products from the database. The customers only can view the products and can place order. These can be tracked by the Admin and informed to the farmers. This helps in getting a quality product and the relation between the farmers and the public can be maintained.

C. Working Procedure of Proposed System

The agricultural products can be updated by the Admin on the request of the Farmers as well as directly by the Farmers by using their login. The users need to create a login by registering with their details through the web application. After successful registration of users, the information provided will be stored in the database. The recommendation of product will be done by using the past behavior of the users which would be stored in the database. The preference of the user will be compared to the other user's preferences where people with similar likes and similar dislikes can be considered as friends (Enemy's enemy is a friend). Once the products are uploaded by the admin or farmers, users can view the products through the user interface. They can see the product details and also can order the products by clicking order button. The order made by the users can be seen by the farmers to deliver the ordered products in time.

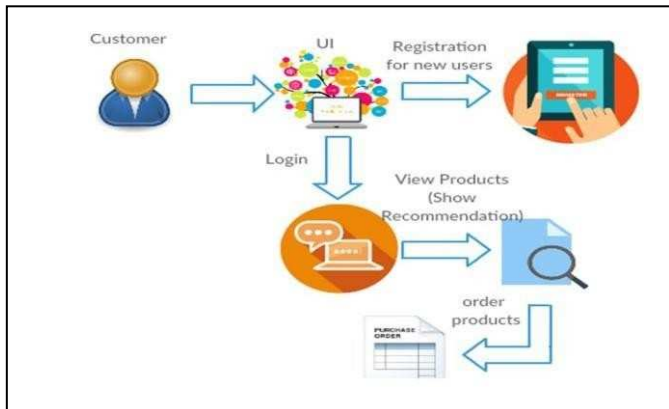


Fig. 4. User Interface

User interface is the primary view of all the users where the users are differentiated by means of their respective logins. There can be separate logins for both customers and the admin who manages the system. Only after the proper authentication, the user can visit into the application to view and order the products they prefer. The username and password is to be created at the time of registration. The products can be ordered through the order option at the bottom of description of each product. The recommended products will also be displayed at the user interface while they logging into their respective accounts.

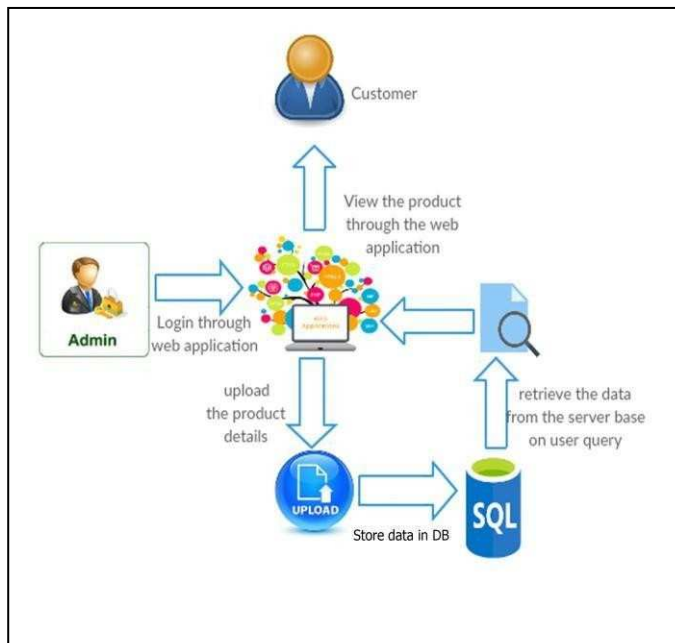


Fig. 5. Data Collection

The products which are displayed in the UI are uploaded by the admin with the request of farmers. The details regarding the products such as description, price, etc. are to be stored in the database in the server. These data can be used to display the products followed by the user queries such as category of the product to be displayed. The products will be stored according to the categories and sub categories in the database tables with unique id so that the retrieval will be more easier. The user interface possess search bar which will be useful to retrieve only the required product rather displaying the enter products. The orders are also maintained in the database so that it can be used to associate with the user details stored at the time of registration of new user. A large database has to be maintained in order to store and process large amount of data. The data collected should be updated constantly in order to maintain the application lively and this process will be carried out by the administrator who is responsible for managing the system with constant update and deletion. This can be done with the request from the farmers to upload their product in order to show that available for sale.

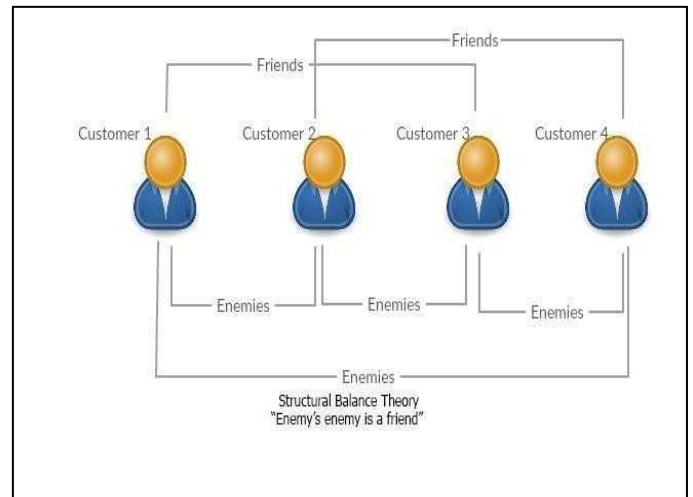


Fig. 6. Recommendation System

The recommendation system in the project is based on a theory called “Structural Balance Theory (SBT)”. The theory uses a principle Enemy’s enemy is a friend. Considering in terms of our project it means that the people with common disinterest can be considered and they will be suggested similar items based by considering them as friends. This can be based on the sentimental analysis of people depends on their interest. The usual recommendation is based only on the similarities among the products but SBT is based on the similarities among the users. In Fig. 6, Customer1 and Customer2 are considered as enemies as they do not share any similarities among them. Similarly Customer2 and Customer3 are also enemies. Since Customer1 and Customer3 are enemies to Customer2, it is considered as Customer1 and Customer3 are friends.

D. Steps involved in Structural Balance Theory based recommendation

Step 1. The product recommendation is based on Structural Balance Theory based on users. This can be used to find the possible friends by means of enemy's enemy is a friend rule.

Step 2. The recommendation which can also be done based on the items. The possible products will be recommended based on SBT.

Step 3. The product items obtained by means of Step 1 and Step 2 will be recommended by proper ordering by considering the target and the product.

V. RESULTS WITH SAMPLE SCREENSHOTS

From the theory proposed here, a sample project has been developed which is for the purpose of integrating customers with the farmers directly. The sample screenshots of the developed system has been provided below.

A. Home Page



Fig. 7. Home page

Home page is visible when the application is opened by entering respective URL in the browser where the Registration and Login option are available.

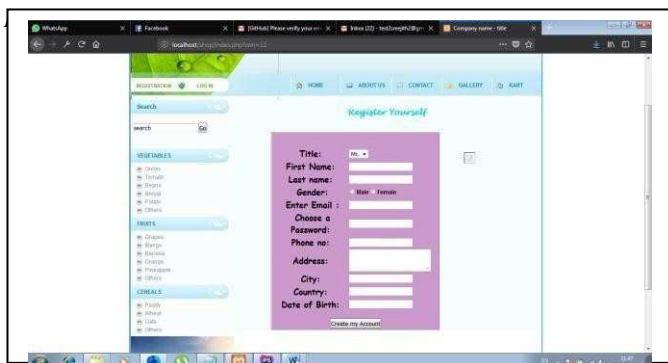


Fig. 8. Registration form

Registration page is meant for the registration of new user by collecting the details from the users who are using the application for the first time. On registration of new user, a unique login id and password will be created which can be used for the user to get into their respective accounts. The registration form which contains Name, Gender, Email, Address, Phone number, City, Date of birth and password. The email id will be unique and can be used as the user id and the password will be user defined. The details provided will be stored in the database which can be used in all other modules in this system.

C. Login Page



Fig. 9. Login page

User can login into their account by using the email id they provide during registration as user id and password. Forget password option will be used for account recovery during the time of forgetting password.

D. Product Gallery



Fig. 10. Product gallery

This is a short cut provided to order items based on the images by clicking it.

E. View by Product Category



Fig. 11. View by Product category

F. Admin Login

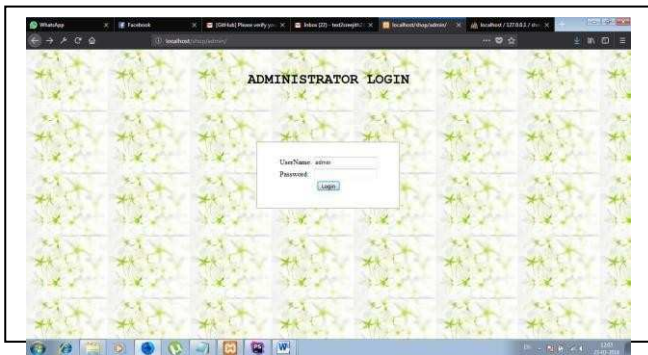


Fig. 12. Admin Login

There will be separate login for admin where he can login into his account by using unique id and password. The admin have the privilege to add, delete or update the products on farmer's request.

G. Product Uploading Page



Fig. 13. Product uploading page

The admin can be able to upload the products based on its category and sub category with image, price and description of the products.

VI. CONCLUSION

According to big rating data in E-Commerce, a novel agricultural product item recommendation approach is presented in this paper, for dealing with specific recommendation situations when the target user has no similar friends and the product item preferred by target user have no similar product items. This Structural Balance Theory based recommendation uses information of products purchased by customers. By means of this application we can establish a direct interaction between the farmers and users and which also be an efficient E-commerce application.

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