Survey of Stubble Management System using a Web Application

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Abstract - Stubble is considered as the leftover after grain segregation. To dispose it, farmers carry out stubble burning on a large scale. Stubble burning results in the emission of smoke which if added to the gases present in the air like methane, nitrogen oxide and ammonia, can cause severe atmospheric pollution. These gaseous emissions can result in health risk, aggravating asthma, chronic bronchitis and decreased lung function. Burning of crop residue also contributes indirectly to the increased ozone pollution. To avoid stubble burning, it can be reused or recycled by many factories for many purposes. But nor the farmers are unable to reach out to the factories neither the factories are able to reach out to each farmer individually which would be a hectic task. Hence, to build a bridge between these two, we created a web application which will act as a platform for buying and selling of stubble. It will be an online connection between the farmers and consumers without reaching out physically. Also, this business solution can also act as another source of income for farmers who are suffering financial crisis. Therefore, to prevent stubble burning and creating a link between farmers and consumers with less physical involvement we propose this eco-friendly solution in a form of an online web application.

*Key Words***:** Stubble burning, atmospheric pollution, web application, business solution, eco-friendly solution.

1. INTRODUCTION *(Size 11, Times New roman)*

Stubble burning causes severe pollution of land and water on local as well as regional scales. It is estimated that burning of paddy straw results in nutrient losses viz., 3.85 million tons of organic carbon, 59,000 t of nitrogen, 20,000 t of phosphorus and 34,000 t of potassium. This also adversely affects the nutrient budget in the soil. It results in the emission of smoke which if added to the gases present in the air like methane, nitrogen oxide and ammonia, can cause severe atmospheric pollution. These gaseous emissions can result in health risk, aggravating asthma, chronic bronchitis and decreased lung function. Burning of crop residue also contributes indirectly to the increased ozone pollution.

We provide a solution to this problem in the form of a web application which will act as a bridge between farmers and factories/companies. This web application is a type of e-commerce platform where the business (buying and selling of stubble) will be carried out between the farmers and companies. This application is built using Django framework. Django is a high-level Python Web framework that encourages rapid development and clean, pragmatic design. This is an open-source tool used for web development in Python programming language.

In this application, we have designed separate dashboards for farmers and companies each. This application is connected to our PostgreSQL database where the data is regularly updated. We have created modules in this project like login and signup which carry out authentication successfully. Farmers can register their products on this site for selling purposes. Companies/Factories have to create their account and are able to view farmers and their products. We have also created a recommendation system which will recommend the best rated products to the consumers.

2. PROPOSED APPROACH

2.1 BASIC CONCEPTS/ DEFINITIONS:

Web development is the building and maintenance of websites; it's the work that happens behind the scenes to make a website look great, work fast and perform well with a seamless user experience.

A Web Framework (WF) or web application framework (WAF) is a software framework that is designed to support the development of web applications including web services, web resources, and web APIs. Web frameworks provide a standard way to build and deploy web applications on the World Wide Web.

The MVT (Model View Template) is a software design pattern. It is a collection of three important components Model View and Template. The Model helps to handle database. It is a data access layer which handles the data. The Template is a presentation layer which handles User Interface part completely. The View is used to execute the business logic and interact with a model to carry data and renders a template.

Machine learning algorithms in recommender systems are typically classified into two categories — content based and collaborative filtering methods although modern recommenders combine both approaches. Content based methods are based on similarity of item attributes and collaborative methods calculate similarity from interactions.

2.2 LITERATURE SURVEY:

This section of Literature Survey explains the extracted relevant content from various research papers and websites and analysis of many author's work as follows:

1. Parmod Kumar, Surender Kumar introduces the amount of crop stubble produced and the extent of this being burnt in the field. Also have concentrated on the health impacts of pollution due to stubble burning. They have presented the management of crop stubble, like in situ, alternate uses of crop stubble, cost of alternate uses and end use of rice residue.

2. Anoop Kumar Devedee, Ritesh Parihar have stated alternate uses of agricultural waste like stubble in following ways:

Use of Rice Residue as Fodder for Cattle

Use of Crop Residue for Mushroom Cultivation

Use of Rice Residue for Making Bio Gas

Incorporation of Paddy Straw in Soil

3. Authors Georgia Isaac, Sofia Meacham, Hamed Hamzeh, Angelos Stefanidis, Keith Phalp have provided the steps to build an adaptive e-commerce application using web frameworks and implementing machine learning in it. They have also explained the adaptivity and recommendation methods have been explored and implemented for an e-commerce web application of an online e-shop system, utilising Python web framework technologies.

4. Singh, P.K., Pramanik, P.K.D., Dey, A.K. and Choudhury, P. (2021) have presented an overview of Recommendation Systems that cover the recommendation approaches, information retrieval techniques, and associated challenges and problems in Recommendation Systems. The primary aim of this paper is to study and map the research directions in the area of RS. As RS has attracted a lot of researchers from diverse fields of study, the amount of research publications on related topics is growing with a steep curve. A view on the future scope and trends of RS has been presented. The aim of this part is to provide the future researcher on RS a preliminary overview of various prospective research areas.

5. Adamya Shyam, Nitin Mukesh:

The authors have illustrated a website model with the help of which Students can be able to access class notes, previous year question papers, syllabus, and can sell their old books from the same digital platform as well. The paper also describes the role of software engineering in project development. The project is developed on Django Framework; the backend development is in Python, Jinja2 and SQLite. The frontend consists of HTML, CSS and Java. Appropriate SDLC Model and Testing techniques have been used in the development process.

6. https://getbootstrap.com/docs/4.6/getting-started/introduction/

This is the official link to the documentation of bootstrap version 4.6 which is a framework used to develop the frontend of the web application.

7. Django Tutorial for Beginners

https://www.youtube.com/watch?v=SIyxjRJ8VNY&list=PLsyeobzWxl7r2ukVgTqIQcl-1T0C2mzau&ab_channel=Telusko

This is the official link to video tutorials of whole web application development in Django framework on YouTube Channel of Telusko.

2.3 RELEVANT MATHEMATICAL MODEL:

Collaborative filtering is best suited to problem with known data on users but lack of data for items or difficult to do feature extraction for items of interest.

Unlike content-based approach, collaborative recommender systems try to predict a user's utility for an item based on other users' previous utility with the item.

A. Memory-base Example:

Reusing the rating system example, memory-based methods essentially are heuristics that predicts a user's rating for an item based on the collection of rating for the item from other users, i.e.,

$$r_{i,c} = agg_{c' \in C}\, r_{i,c'}$$

where C is the user set excluding the user c of interest.

Several realization of the aggregation function are

$$r_{i,c} = \frac{1}{N} \sum_{c' \in C} r_{i,c'} \qquad (1)$$

$$r_{i,c} = \frac{\sum_{c' \in C} sim(\omega_c, \omega_{c'}) \cdot r_{i,c'}}{\sum_{c' \in C} sim(\omega_c, \omega_{c'})} \qquad (2)$$

$$r_{i,c} = \bar{r}_c + \frac{\sum_{c' \in C} sim(\omega_c, \omega_{c'}) \cdot (r_{i,c'} - \bar{r}_{c'})}{\sum_{c' \in C} sim(\omega_c, \omega_{c'})} \qquad (3)$$

(1) is simply an average rating for the item from all other users. (2) is trying to weight other users' ratings by how close they are close to user c, and one way to measure that is the similarity function between two users' feature vector. (3) is to address the issue that users may have different rating scale for what they mean "like", for example, some users may be more generous to give a top rating for the item they like.

B. Model-base Example:

Similar to model-based content-based filtering, model-based collaborative filtering use historical data (from other users) to learn a model. For the rating example, a model-based way is to build a linear regression model with user profile as features and rating as target for each item separately.

Limitation:

Similar to the limitation of content-based approach, collaborative filtering methods are also subject to some constraints listed below

Data sparsity, for less popular items with few ratings, it is difficult for the collaborative algorithm to make accurate predictions.
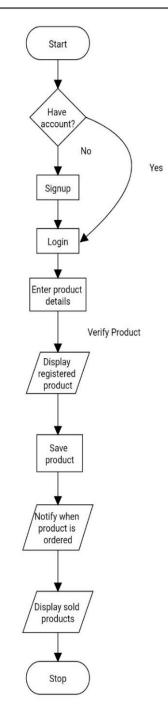
New item, which is an extreme case of less popular items, and hence, make collaborative filtering approach not applicable.
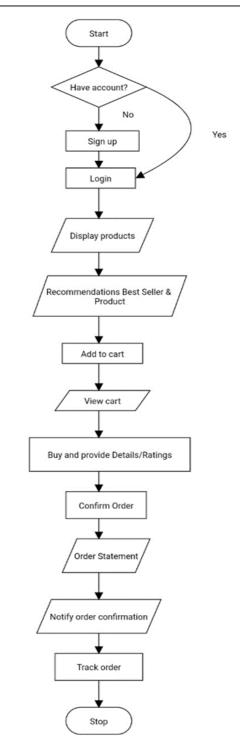
2.4 SYSTEM FLOW:

The system for the web application is divided into two flows:

1. Farmer's platform:

2. Consumer's platform:

2.5 ADVANTAGES:

[1] This application will act as a bridge between farmers and consumers which will allow consumers to book the product on the platform without going to the field physically.

[2] This will be a great solution for farmers as another source of income.

[3] The main advantage of this project will be reduction in stubble burning and getting explored to many eco-friendly ways of using stubble recycled products.

[4] The web application is developed in Django framework which provides rapid development and security admin to application with strong backend.

[5] Also, this application uses machine learning algorithms for recommending products to consumer which makes easy for customer to buy the best products.

3. CONCLUSIONS

As it was hard and tedious task for the farmers to reach out to factories/companies they were disposing the stubble by burning it. Hence our application will reduce this complexity efforts and will help the factories to reach out to the farmers on our websites by buying their stubble collected. Farmers will also have a platform to sell their stubble without going anywhere. Our application is responsive with latest technologies and strong database systems used. We are promoting eco-friendly solution and digitization which is a need for today's world and will help the farmer's growth financially.

ACKNOWLEDGEMENT

REFERENCES

1. The Extent and Management of Crop Stubble Parmod Kumar(Institute for Social and Economic Change), Surender Kumar (University of Delhi)

2. Agricultural Waste / Stubble Management (Waste to Wealth), Alternative to Burning Anoop Kumar Devedee (Institute of Agricultural Sciences), Ritesh Parihar(Banaras Hindu University).

3. An Adaptive E-Commerce Application using Web Framework Technology and Machine Learning
Georgia Isaac, Sofia Meacham, Hamed Hamzeh, Angelos Stefanidis, Keith Phalp, Faculty of Science and Technology, Bournemouth University, Fern Barrow, Poole, Dorset, BH12 5BB, UK.

4. Singh, P.K., Pramanik, P.K.D., Dey, A.K. and Choudhury, P. (2021) 'Recommender systems: an overview, research trends, and future directions', Int. J. Business and Systems Research, Vol. 15, No. 1, pp.14–52.

5. A Django Based Educational Resource Sharing Website: Shreic Adamya Shyam (Department of Computer Science, Banaras Hindu University), Nitin Mukesh (Department of Mathematics, Indian Institute of Technology, Mumbai).

6. Bootstrap Documentation:
https://getbootstrap.com/docs/4.6/getting-started/introduction/

7. Django Tutorial for Beginners
https://www.youtube.com/watch?v=SIyxjRJ8VNY&list=PLsyeobzWxl7r2ukVgTqIQcl-1T0C2mzau&ab_channel=Telusko