SpiAuc: Development of an Online Platform to Sale the Spices in Sri Lankan Market

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Abstract: Sri Lanka's spice market is significantly impacting the global spice market. In the current context, farmers are encountering practical issues such as high production costs, difficulties finding international markets, and high margins from intermediate sellers. Moreover, farmers are less aware of reaching the international market due to several barriers. This paper presents an online user- friendly auction system that allows bidders and sellers to interact through an online platform. The proposed system is low-cost and includes many features such as price forecasting, complaint management, etc.

Keywords: Online Auction Systems, E-commerce, Price forecasting, time series

1. Introduction

The Sri Lankan economy is primarily based on agriculture. More than 70% of the population living in rural areas of the country is dependent on agriculture as the primary source of livelihood. The sector contributing to Sri Lanka has always been renowned for producing delicious spices. The spice sector is an essential sub-sector of the Sri Lankan economy, contributing 9% to agricultural GDP and exports (Central Bank of Sri Lanka, 2021).

The global reach of the online auction market allows buyers and sellers to overcome geographical constraints and purchase products anytime from anywhere over the internet. The online auction market provides consumers with a great advantage of low process, more excellent product selection, and greater efficiency compared to the traditional offline market. The objective of the online auction system is that the user can better choose their investment. All market participants would use price forecasts to make informed decisions. In the Agriculture field, Farmers must have a clear idea about how the market prices are moving forward to sell their product at a better price.

Most of the time, spice farmers are from rural areas, and they are not aware of available online opportunities in modern days. Also, due to the lack of study related to various worldwide markets, they have to sell their products in the local market. Further, many buyers and dealers of products are unaware of the production, quality, quantities, and availability of different spice products. Buyers don't have time to spend buying the product in the market.

The best solution for this situation is the auction procedure. However, in the primary manual auction, a minimal number of the general public are involved. There is a chance of corruption and other factors for not providing transparent bidding. The manual bidding process restricts most interested bidders out of the city or country from declining their offer or interest as they are available on the day of the auction. Another flaw of this method is the piles of paperwork that must be maintained and kept safe for the future. They must keep track of the bidders and the sellers until their final settlement. It is a fatiguing and time-consuming process. So basically, No facility is present for the farmers to forecast market future price shifts. It limited direct access to merchants.

The real profit goes to the intermediaries, who buy up the farm products at almost giveaway prices and sell them at outrageous prices to the wholesalers. Farmer's unawareness of the market leads to crop losses while wasting their time, money, and hard work. Also, local farmers have low English literacy and cannot use the most available web applications. When selling their products, farmers must have a clear idea about how the market prices are moving forward to sell their products at a better price. Creating reliable preharvest price expectations and making postharvest storage decisions depend heavily on accurate forecasts. Without accurate forecasts of basis levels, it is impossible to make fully informed decisions about whether to accept or reject a given price and whether and when to store the harvest. So, there is a clear need for a system that enables users to predict price shifts more accurately and helps bypass the middleman by profiting the farmers according to their hard work.

Spi Auc is a web application that will provide the facility to the farmer(users) to sell their products at a fair price and in a better manner and provide value-added services to the bidders and sellers. This application will help bridge the gap between farmers and buyers by creating a market that enables farmers to connect buyers to sellers. The web application will allow the farmers to sell the products to the desired person by analyzing the price shifts in the market.

After login to the system, farmers can post the images and details of the product. The farmer can get the idea for a start margin price using predicted prices using historical data. Then the farmer can set a margin to start bidding by using graphs of forecast market prices. The buyer can select the product and bid accordingly. The bidding will have a specific time duration, which the seller will set. The product will be sold to the highest bidder at the end of the time limit. Or the farmer can close the bid for the desired price. If there is a problem in the last bid, the proposed system will get the latest second bid as the final bid. When placing the bids, the farmer will get notifications regarding the new bid. The users can communicate and pay through the system, and the system will also provide functions to add complaints and ratings.

The final product will be a simple and functional web-based graphical user interface to the users that is available in both Sinhala and English languages. The existence of Spi Auc is to raise awareness of the exploitation of middlemen in the agriculture sector through purposely overestimated deduction rates to secure their profit margins, leaving farmers with inadequate income. Through the novel system, farmers' financial power by providing a bidding integrated e-commerce platform to increase their income. Also, improve the accessibility of the market as well as accurate and latest market information by providing a transparent market information platform to the farmers and end consumers.

2. Related Works

Nowadays, the online auction has become one of the fastest-growing modes of online commerce transaction; sellers and buyers have started preferring to go online for purchasing and selling products, respectively.

N. Kumar, A. Kumar, and S. Tyagi (2016) introduce the NAM portal that provides a single-window service for all APMC-related information and services. The proposed work includes commodity arrivals and prices, buy, and sell trade offers, and provision to respond to trade offers, among other services. According to the author, the proposed work help to the reduction in bookkeeping and reporting system with better monitoring and transparency. It also helps in the reduction of workforce requirements as tendering/auctioning process takes place through the system. A closer look at the research paper, however, reveals some shortcomings. Although it enables direct participation in the traditional local trade, reducing intermediation costs, the paper did not comprehensively discuss the system's user-friendliness.

A. Kolkova (2018) also thinks about the possibility of using technical analysis indicators in forecasting prices in the food industry compared with classical methods, namely exponential smoothing. This research paper confirms simple forecasting tools from 2009 to 2018. The analysis was completed using data on the primary raw materials of the food industry, namely wheat food, wheat forage, malting barley, milk, apples, and potatoes, for which monthly data from January 2009 to February 2018 was collected and analyzed.

The author argues that, while using indicators as a default setting is inappropriate in business economics, their accuracy is not as strong as the accuracy provided by exponential smoothing. Additional studies are required to understand the critical tenets of moving average forecasting.

Ivanovski. Z (2018) investigates the time series analysis's forecasting capacity to predict tourist trends and indicators. The authors found evidence that the time series models provide accurate extrapolation of the number of guests quarterly for one year in advance. Research results confirm that the moving average model for time series data accurately forecasts the number of tourist guests for the following year.

Most of the works above mention did not provide a way to predict the margin price of the agriculture market. Some related used time serial models for the price predictions. Still, they are unrelated to agriculture, and there are no available features to add their complaints and rating aspect of the products or users. Spi Auc web application would benefit both farmers and sellers equally.

This application eliminates intermediaries; hence it's a direct communication platform between the farmers and the buyers. However, this web application not only provides the highest price for the farmers but also possesses many additional features which serve the application as the most accessible, most reliable, and user-friendly application which would, in turn, help users who are new to this computer era. The Complaints and rating features forum allows users to post their perspectives about the product and the users. The price Prediction graph is provided the best margin price they could set for their products. In addition to all these facilities, the translation feature will be most beneficial for farmers who lack English literacy.

3. System Design

Spi Auc will enable users to predict price shifts more accurately. The gap between the farmer and the buyer should be removed, and the middleman should not interrupt the marketing process.

This application directly works with cooperatives and farmers to bypass middlemen by profiting the farmer according to their hard work. This will result in better business from the farmer's point of view, and this application will connect the farmer with the world differently.

This web application contains four modules i.e Admin, User, Security and Authentication, and Reports.

Figure 1. Use Case diagram of the system
Source: Author

Figure 2. Class diagram of the system
Source: Author

Figure 3. Sequence diagram of the system process
Source: Author

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Security and Authentication Module: It is the first phase of the application. Both users must (Seller and Buyer) first will have to register by using their details; otherwise, they won't be allowed for further process. Once the user signs up successfully, they can log in anytime using their registered is and password. All the transaction information regarding the auction and user personal details was encrypted, which prevents information leakage.

User Module: This is the second phase of the application. In this module, the seller can upload their product details along with images. Then the seller can set a margin to start bidding by using graphs of forecast market prices. Spi Auc has two user roles as Buyer and Seller.

Predicting prices – Moving averages are the method used in the price prediction of this web application. It calculates price averages over a certain period and automatically draws lines on price charts based on these calculations. The simple moving average is used in this Spi Auc. A simple moving average (SMA) adds the most recent daily closing prices and divides the figure by the number of days to create a new average for the next day. Each average is connected to the next, creating the singular flowing line.

Implementation – When sellers create an auction, they add the start margin price along with the product details. After bidding starts, the product will be sold to the highest bidder at the end of the time limit. The highest latest bid price regarding a product during the day takes to calculate the predicted market price for the next day. SMA is calculated in SQL for 5 days on the latest bid prices. This means each row will consider 2 rows before and after the current record, calculate the price sum and then divide it by 5. Since there are no rows before that, the logic remains the same for the first row, but only the 2 later records are calculated. Similar is the case for the last record where only the 2 previous records will be calculated since there are no records after that.

```
Algorithm
Begin

SELECT
 [Date]
 ,[Close]
 ,AVG([Close]) OVER (
   ORDER BY [Date]
   ROWS BETWEEN 2 PRECEDING AND 2 FOLLOWING
 ) MovingAverageFiveDay
FROM [TABLE]
End
```

Output is visualized to users as graphs in this application. It is observed that a simple moving average attains minimum error at the short-term period of 3 months; however, gradually, the error increases for the long-term period of 12 months. So, in this application, the time series used for price prediction is limited to 5 days.

On the other hand, buyers can view the uploaded products in the Dashboard. If the user wishes to buy the product, they must bid for it according to the base amount and time for the bid the farmer decides. If the product is on auction, the rules of auction and bid history can be viewed, and bids can be submitted for that product. The product will be sold to the highest bidder at the end of the time limit. Or the farmer can close the bid for the desired price. If there is a problem in the last bid, the proposed system will get the latest second bit as the final bid. When placing the bids, the farmer will get notifications regarding the new bids. The system can also get a notification about the auction's winner at the end. The users can communicate and pay through the system and the system will also provide functions to add complaints and ratings. The rating and the complaints will be displayed under each user. This will also help to get an idea about each user. A payment gateway is available for purchasing procedures.

Admin Module :
The admin module consists of five components.

i. Add new categories of products, districts, and cities.
ii. Take action according to the complaints of the users.
    This feature enables the admin to remove users if there is dissatisfaction. The admin handles the authority of controlling users.
iii. Maintain the status of categories and users.
iv. Cancel any auction if any violation or fraud activity takes place.
v. Allow the users to view the details of the products and monitor the progress of the various auctions.

Reports :
In this module, different actors can generate different types of reports according to their access.

4. Testing and Results

Spi Auc has mainly two user roles: Admin and the user. All the administration parts of the system are handled by the admin as shown in fig.4.

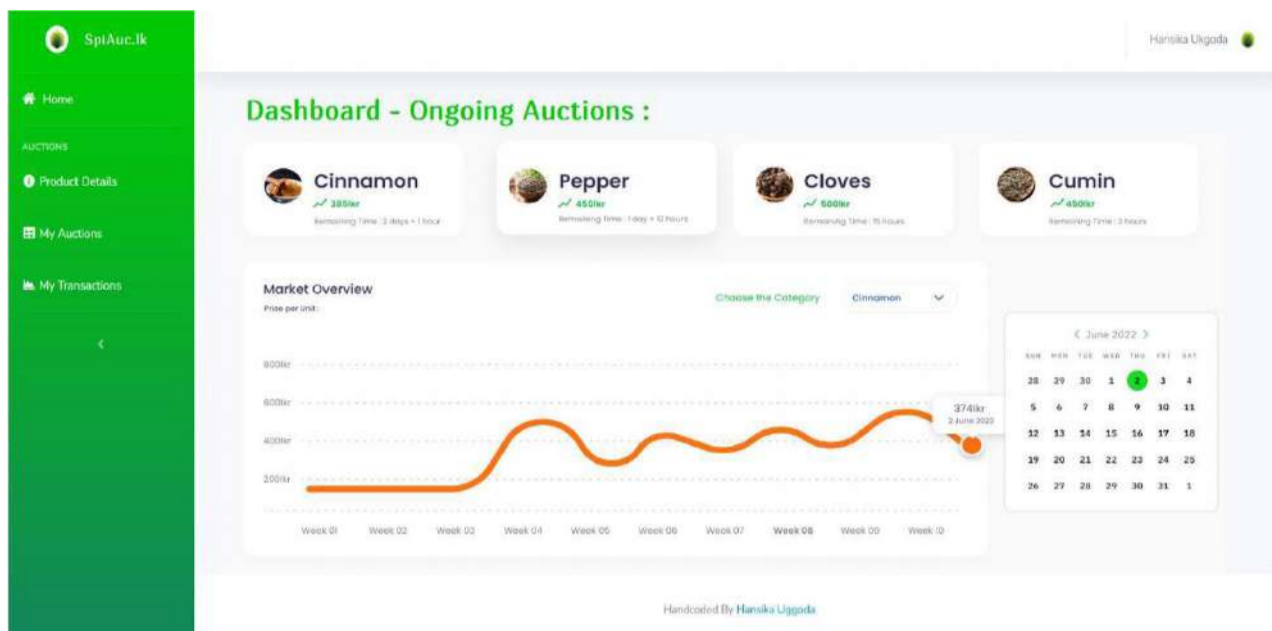Figure 4. Admin Module – Site Administration
Source: Author

Figure 5. Home Page Source: Author

The administration is divided into two parts Site administration and User Administration. In Site Administration, all the cities and categories are handled. User administration allows the admin to take action regarding the complaints of a user. In the User Module, if the user is already registered, then enter the required details and log in. if a new user needs to fill in all required details as required in the register.

Sellers can set their start margin price using the price prediction graph. This graph shows the predicted price for the day according to the product category. Fig.6 shows the Dashboard that is available to both users.

Figure 6. Product details filling page
Source: Author

As well as the details of the ongoing auctions are displayed In the dashboard. So, this is convenient for both users.Fig.5 is for sellers, after successfully logging in to the system-seller can add their product details with a start margin price. Fig.7 shows the current bid product and all other bid product details uploaded by the seller. It also shows the latest bid placed by the seller for a particular product and the remaining time it takes to end the ongoing auction.

Figure 7. Auction details
Source: Author

The seller can search the category they wish to bid on, then add their bids. If they win the auction, they get a notification from the system, and then they can proceed to the payment procedure. After a successful transaction, both users can add their complaints and rating regarding the product or user.

5. Conclusion

This paper presents a simple and user-friendly online platform for farmers to sell their products in the international market. Compared to the traditional auction schemes, the proposed scheme is quick, reliable, and can be done anywhere.

Therefore, the result of this study is to develop an application that helps bridge the gap between farmers and buyers by creating a market that enables farmers to connect buyers to sellers. The price will allow the farmers to sell the products to the desired person by analyzing the price shifts of the market. Also, if there is dissatisfaction with a product or a user, both parties can complain, and the admin can take action according to the responses. Moreover, The proposed system will enable users to predict price shifts more accurately using the predicted price graphs based on the time series model. This will result in better business from the farmer's point of view, and this application will connect the farmer with the world differently.

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