A Digital Platform for Connecting Local Farmers with Markets

C.Sathya[1], S.Naveen Kumar [2], S. Surya [3] ,M.Gokul [4] ,T.Dhanavel [5]
[1] *Assistant Professor, Department of CSE, Tagore institute of Engineering and Technology, Deviyakurichi ,Salem, India*
[2] *UG Students, Department of CSE, Tagore institute of Engineering and Technology, Deviyakurichi,Salem ,India*

Abstract

This project presents an integrated AI-powered agricultural dashboard that combines crop disease prediction, crop recommendation, market price detection, weather forecasting, and a streamlined sales and delivery management system. Designed with a button-based interactive interface, the dashboard provides farmers and users with seamless access to essential agricultural insights and services.The **Crop Disease Prediction** module enables users to input text-based symptoms. Through natural language text preprocessing and feature extraction, the system employs Generative AI models to analyze the input and predict the most probable crop diseases. This assists farmers in early disease detection, minimizing crop loss and improving yield quality.The **Crop Recommendation** module provides year-wise suggestions for five optimal crops based on seasonal trends, historical data, and region-specific characteristics. Each recommendation includes detailed crop information to support informed decision-making for better agricultural planning.The **Price Detection** module performs a comparative market analysis to predict and display current crop prices across various markets, enabling farmers to make strategic selling decisions based on real-time economic insights.The **Weather Detection** module is location-based and generates accurate, real-time weather forecasts using geolocation data. This helps farmers plan their activities effectively, ensuring timely sowing, irrigation, and harvesting operations.The **Sales Module** includes user authentication and role-based access for farmers, customers, and delivery personnel. Farmers can add products to the platform, which users can view and purchase. Upon placing an order, the system generates a delivery notification. Delivery personnel can accept requests, triggering a confirmation notification to users, ensuring smooth transaction tracking and delivery updates.

1. Introduction

The agricultural sector in developing regions faces several inefficiencies due to traditional market systems that heavily depend on intermediaries. Farmers often receive a small share of consumer spending, while perishables suffer delays and waste. This paper proposes a technological solution to these issues through a digital marketplace platform that empowers farmers to manage inventory, track market trends, and transact securely with consumers and retailers.

2. Problems in Existing System

Characteristics:

- **Intermediaries** (middlemen, wholesalers)
- **Manual pricing** and sales negotiation
- **Offline transactions**
- **No real-time inventory or market data**
- **Lack of transparency**

Problems:

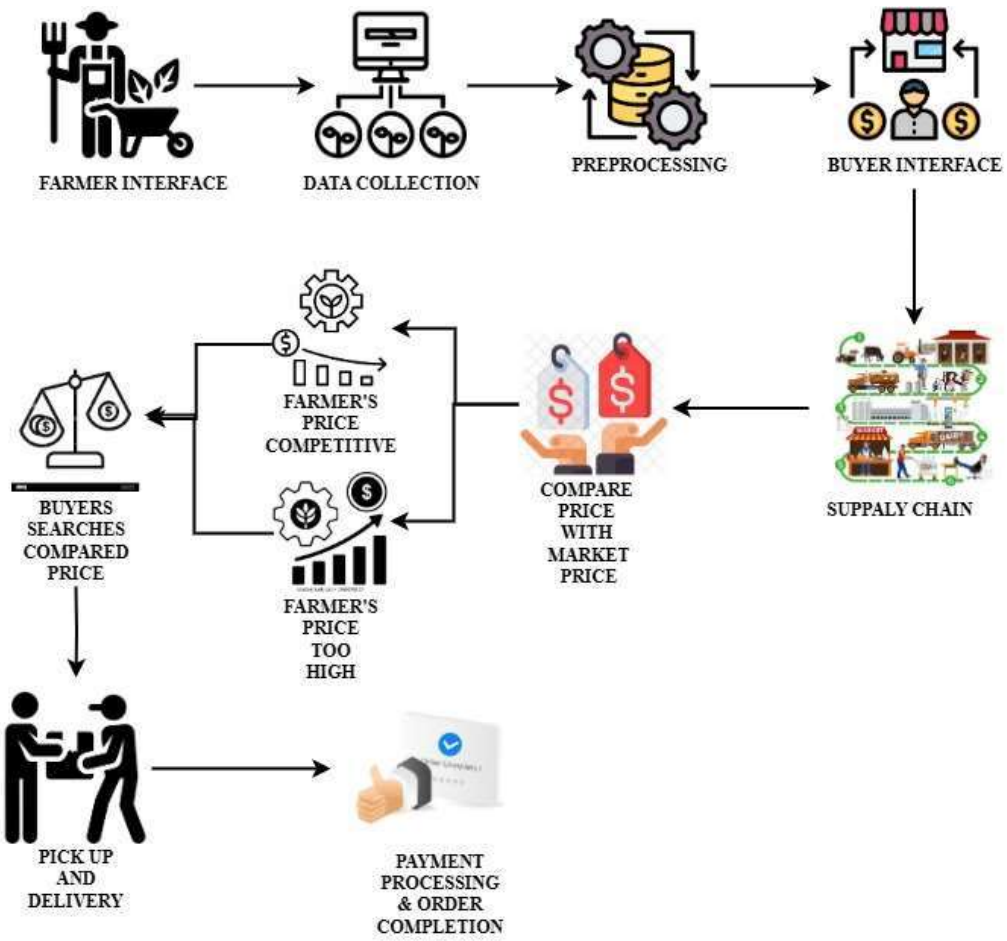
- Farmers receive low prices
- Delays cause spoilage
- Consumers pay more
- No insight into demand/supply data
- Poor scalability

3. Proposed System

Characteristics:

- Direct **Farmer-to-Consumer/Retailer** interaction
- **Digital inventory**, pricing, payments, and analytics
- **Transparency** and efficiency
- **Data-driven farming** via trends and insights

4. System Architecture



5. Proposed Algorithm:

1. Farmer Registration and Profile Management

- Farmers sign up with basic info
- Profile includes farm size, produce type, etc.

2. Product Listing & Inventory Management

- Farmers add/edit/delete products
- Inventory levels are auto-adjusted with sales

3. Market Trends and Data Insights

- Dashboard showing:
    - Trending produce
    - Seasonal demand
    - Pricing graphs

4. Transaction & Payment Gateway

- Consumers pay online
- Farmer receives direct deposit
- Invoice generated

5. Delivery & Logistics

- Consumer selects delivery or pickup
- Delivery partner receives location and schedule
- Real-time tracking via Google Maps

6. Consumer Module

- Users browse and filter produce
- Add to cart and checkout
- Ratings & reviews for products

7. Notifications and Alerts

- SMS/Email for:
    - New products
    - Order status
    - Promotions

8. Marketplace Analytics

- Sales reports
- Popular products
- Customer behavior

Conclusion

In this paper, we implemented and evaluated the use of the Nikaido-Isoda function in combination with a relaxation algorithm to compute Nash equilibria in non-cooperative games with continuous strategies. The approach proved effective in simplifying the equilibrium computation process, offering stable convergence and adaptability to various game structures. By leveraging iterative optimization, the method reduces the complexity typically associated with analytical solutions in strategic interaction models. The results confirm the viability of this algorithmic framework for use in real-world applications where multi-agent decision-making and resource allocation are critical.

Future Work

Future research will focus on extending the method to:

- **Multi-player games** with higher-dimensional strategy spaces.
- **Non-convex payoff functions** where local optima pose additional challenges.
- **Dynamic and stochastic games**, incorporating time-dependent strategies and uncertainty.
- **Application domains** such as local agricultural markets, distributed energy systems, and communication networks, to validate the method's practical relevance.
- **Integration with machine learning** to predict strategy profiles and accelerate convergence in large-scale simulations.

These directions aim to broaden the scope and impact of the Nikaido-Isoda-based approach in computational game theory and applied optimization.

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