



INNOVATIVE GROCERY SHOPPING WEB APPLICATION WITH INTELLIGENT WORD RECOGNITION

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Abstract: The purpose of this paper is to reveal novel design of robust web application catering e-grocers and helping them tackle inefficiencies present in current grocery shopping platforms. This paper also aims to help the users/customers who are less technically sound but want to take advantage of grocery shopping from their home. The implemented web application works in a efficient way i.e., bringing the business online rather than the centralized approach of merely the products being online, thereby providing a significant improvement to the customer as well as the owners of small and medium grocery stores. The web application also provides a novel feature of handwritten as well as printed Grocery List Items Recognition thereby helping in digitizing large number of documents and mitigation of computer vision problems that current state of art algorithms face.

IndexTerms – Web Application, MERN stack, Computer Vision, Intelligent Word Recognition (IWR), Optical Character Recognition (OCR).

I. INTRODUCTION

As online grocery shopping becomes more accessible due to advent of technology, so does the number of problems in the existing systems. One such problem is one of the fundamental business model problems i.e., concentrating on products rather than the shops, this creates a poor customer experience as well as the actual grocery business does not thrive as well.

To counter that specific issue, we cater a web application to which will be extremely fruitful for customers and small businesses. But offering a similar web application may not provide significant improvement so there is an innate need to offer a web application which can provide a great value to small and medium sized shops helping them become self-sufficient and grow their online presence which will help them to scale globally and also expand their local presence.

This can be only achieved if novel value-added services be provided to the owner as well as customers, one such application is list item recognition which could help a lot of future use cases to digitize documents thus providing a significant contribution to modern computer vision tasks.

The idea of the web application also deals with novel experimental use of Convolutional Recurrent Neural Networks (CRNN) for Intelligent Word Recognition (IWR) in grocery list items recognition. The idea is to demonstrate practical use of a novel way to provide brick and mortar shops a relevant platform to scale businesses globally while remaining local(physically).

II. LITERATURE SURVEY

Applying Technology acceptance model (TAM) on online grocery shopping the perceived usefulness of online grocery shopping directly impacts in intention of placing orders [1]. The existing disadvantage of online grocery shopping is delivery costs and additional usage costs [2]. The Covid-19 pandemic had a significant contribution in adoption of Online Grocery shopping as more senior age groups were impacted by it and show

greater adoption among them [3]. It is difficult to provide a personalized shopping experience via physical retail stores, hence developing robust web applications presents as an optimal strategy to answer this need. But due to various online grocery platforms present it becomes important to introduce various value-added feature which a grocer as well as customer can take advantage. Recently with the advancement of Deep Learning the Optical Character Recognition technology has significantly benefitted from [4]. Constraints in text extraction from handwritten documents have been significantly reduced [5]. The Convolutional Recurrent Neural Network (CRNN) proves to be robust in task of OCR achieving a 0.44% Character Error Rate (CER) from 10,000 lines of data [6].

III. PROBLEM DESCRIPTION

As there are only handful of the E-grocery online platforms which actually provide value added services to the customers as well as the owners of the businesses do not have much resources and due to a slow service, the online market does not grow.

Which in turn creates a devastating result for small and medium business owners and the customers who shop online for their groceries. And due to more orders, the frequency of the delivery to the end user is very low.

Which in turn results to less customer satisfaction and a headache to the owners as they are physically constrained to their shops which does not provide feasibility to the customers.

The big corporations sure do exploit the already crumbling businesses keeping their hands tied from actually reaching globally by following a centralized approach.

The exploitation also happens as small/medium scale business owners are not tech savvy and are unwantedly forced into the business models that these corporation use. Therefore, it becomes essential to help them reach globally with cutting edge machine learning concepts as an added feature. It also becomes essential to design a web application which all users from all technological spectrum can seamlessly use with minimum support and added ML features that makes it unique from others.

IV. USER CLASSES AND CHARACTERISTICS

4.1 Owners of The Business

This user class consist of the owners of the grocery stores who intend to sell their grocery products online.

This above group have peculiar characteristics: -

- i. Ease of doing business i.e., fewer number of clicks to deal with even for large number of orders.
- ii. Take great care of their inventories and want few hassles in modifying them.
- iii. Taking care of the payments for multiple users even though seems many but take efficient care of the payment and related methods.
- iv. Willing to deliver products in few minutes in areas of vicinity.

4.2 Customer

This user class consist of customers who intend that their grocery shopping experience be seamless.

This user class have specific characteristics:

- i. Every customer/person needs to fulfill basic needs for survival i.e., Food
- ii. All customers want their products to be delivered as soon as possible
- iii. Customers also do not want to compromise their basic quality standards or how they like their products to be without any tampering and also upholding the optimal measuring samples

iv. Customers also do not want to change their traditional grocery shopping routine so important to minimize hassle by providing a greater number of features

v. As in shopping online they also expects a certain kind of discount to continue using the platform or expect a sort of loyalty bonus points in form of coupons, e-coins, special discount codes etc.

V. PROPOSED SYSTEM

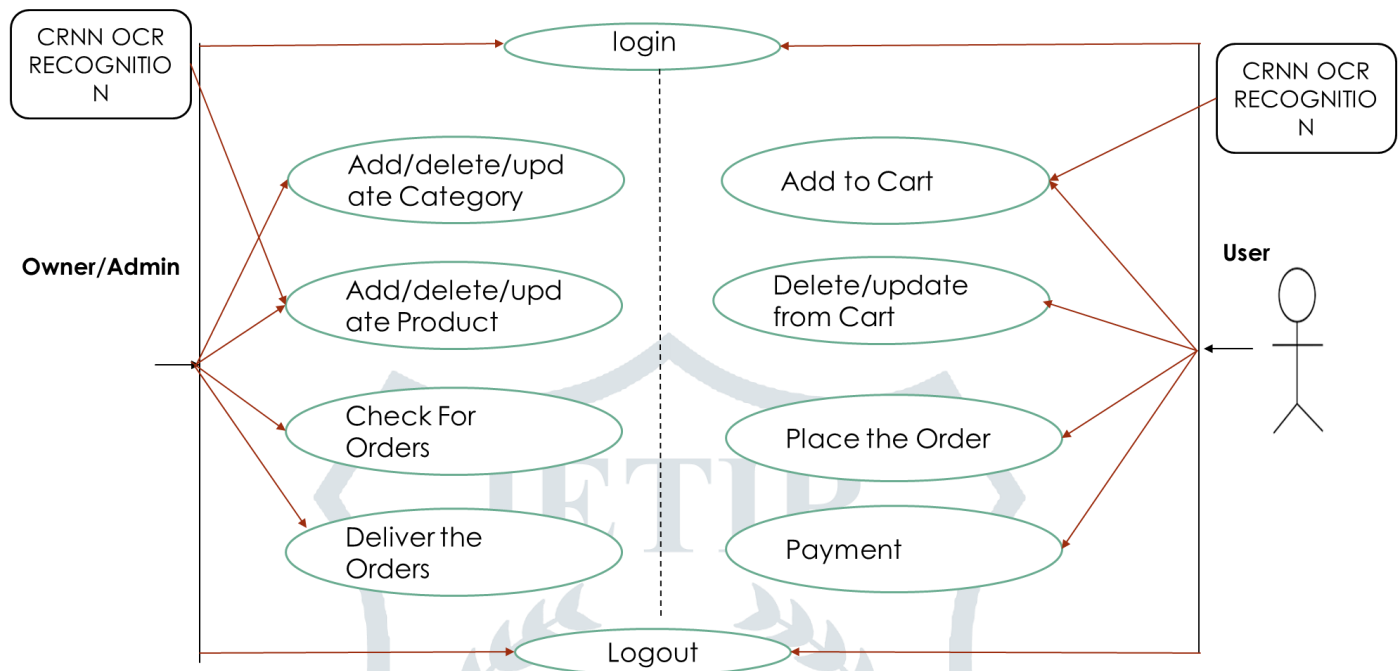


Figure 1: Proposed System Overview

Figure 1 depicts proposed system architecture overview. The design proposed clearly divides the architecture into Owner and User modules each consisting of various sub modules, namely Add to Cart, Delete/Update from Cart, Place Order, Payment for User module and Add/delete/update Category, Add/delete/update Product, Check Orders, Delivery for Owner modules. The Login and Logout modules remain the same for Owner and User modules. Excluding the mentioned modules there is an addition of Convolutional Recurrent Neural Network (CRNN) OCR module which supports both User and Owner modules. Using this a individual interested in using the application may upload grocery list, both handwritten as well as printed words describing various grocery items are acceptable. Using the state-of-the-art Convolutional Recurrent Neural Network (CRNN) algorithm the module processes the image to extract all the list items and give a recommendation as well as option to adjust the quantity parameters to proceed placing the order. This makes optimal use of Intelligent Word Recognition (IWR) in extracting the grocery items either handwritten or printed format.

5.1 Module Implementation

It is important that the software specification be precise and concise in order to be accurate and fast loading web application we have designed it to be in such a way. Software requirements of the project include requirement of using the MERN web development stack(MongoDB-ExpressJS-ReactJS-NodeJS) for developing the frontend and backend of the project and there is requirement of using the machine learning libraries in python such as NumPy, pandas, Keras to accurately design a machine learning model that can recognize the grocery item.

This web application decentralizes the business model in conceptual way. This project not only has the implications of providing valuable services to small grocery shop owners who want to make their product reach a global scale but also providing the recognition to individual shops that the existing online grocery application platforms offer.

VI. ADVANTAGES OF PROPOSED SYSTEM

6.1 Responsive Web App Design

- Makes the web app frontend look more lucid and completely catered towards the end user no matter the device
- This requires handling of the CSS queries better i.e., using the media queries wherever required
- Great strategy to attract only mobile users

6.2 Grocery Item List Recognition

- This additional feature makes the web app friendly to use for the customers who have their grocery lists ready and just have to upload the image
- This requires additional feature of using the responsive API which caters to the need of the users for fast shopping cart loading
- This feature promises further advancement in one of the ML topics of Computer Vision which is character recognition
- Further improvements can be done on the feature to also support Devanagari alphabets

VII. CONCLUSION

With addition of modern computer vision problems as feature to research upon and implement will provide a valuable impact to owners to serve their needs and put and manage their orders quickly with more efficiency thereby truly ready to go global.

Customers can take advantage of unique features for hassle free order placement and providing appropriate feedback to the owner of businesses rather than platforms.

One of the main problems in grocery platforms is the delivery speed, to improve this we plan to integrate blockchain based system that would provide rewards to individuals who volunteer to deliver the products in future. Overall, we conclude the web application will have a positive impact on significantly improving shopping experience of customers as well as grocers.

REFERENCES

- [1] BAUEROVÁ, R. & KLEPEK, M. 2018. Technology Acceptance as a Determinant of Online Grocery Shopping Adoption. *Acta Univ. Agric. Silvic. Mendel. Brun.*, 66, 737-46.
- [2] https://extension.usu.edu/news_sections/home_family_and_food/pros-cons-online-grocery-shopping (Last accessed May 2022).
- [3] Niklas Eriksson, Minna Stenius, Online grocery shoppers due to the Covid-19 pandemic - An analysis of demographic and household characteristics, *Procedia Computer Science*, Volume 196, 2022, Pages 93-100, ISSN 1877-0509, <https://doi.org/10.1016/j.procs.2021.11.077>.
- [4] Drobac, S., Lindén, K. Optical character recognition with neural networks and post-correction with finite state methods. *IJDAR* 23, 279–295 (2020). <https://doi.org/10.1007/s10032-020-00359-9>.
- [5] Memon, J., Sami, M., Khan, R.A. and Uddin, M., 2020. Handwritten optical character recognition (OCR): A comprehensive systematic literature review (SLR). *IEEE Access*, 8, pp.142642-142668.
- [6] Liebl, B. and Burghardt, M., 2020. On the Accuracy of CRNNs for Line-Based OCR: A Multi-Parameter Evaluation. *arXiv preprint arXiv:2008.02777*.
- [7] V J Dongre, V H Mankar , A Review of Research on Devnagari Character Recognition, *International Journal of Computer Applications* (Year: 2010) (<https://arxiv.org/abs/1101.2491>)
- [8] S. Prabhanjan and R. Dinesh , Deep Learning Approach for Devanagari Script Recognition, *International Journal of Image And Graphics* (Year: 2017) (<https://doi.org/10.1142/S0219467817500164>)

Aradhana A Malanker , Prof. Mitul M Patel, Handwritten Devanagari Script Recognition: A Survey, IOSR Journal of Electrical and Electronics Engineering (IOSR-JEEE)(Year: 2019) (<https://www.iosrjournals.org/iosr-jeee/Papers/Vol9-issue2/Version2/L09228087.pdf>)

[9] Shalini Puria, Satya Prakash Singh, An efficient Devanagari character classification in printed and handwritten documents using SVM, International Conference on Pervasive Computing Advances and Applications (Year: 2019) (<https://www.sciencedirect.com/science/article/pii/S1877050919306854>)

[10] Shalaka Deore, A. Pravin, Aditi Banait, Ravindra Karande, Neha Lokre, Supriya Chougule, Hybrid Handwritten Devanagari Word Recognition System, International Journal of Grid and Distributed Computing (Year: 2020) (<http://sersc.org/journals/index.php/IJGDC/article/view/28782>)

[11] Zbigniew Wojna, Alex Gorban, Dar-Shyang Lee, Kevin Murphy, Qian Yu, Yeqing Li, Julian Ibarz , Attention-based Extraction of Structured Information from Street View Imagery (Year: 2017) (<https://arxiv.org/pdf/1704.03549.pdf>)

[12] www.supermarketnews.com

