Implementation of Augmented Reality to Boost Restaurant sales

[1] Nisarga R Belegere, [2] Samarth H Chinivar, [3] Marthala Gukul Kumar Reddy, [4] B L Sreevatsa, [5] Prof. Deepa Pattan

[1] 8th Sem ISE Student, [2] 8th Sem ISE Student, [3] 8th Sem ISE Student, [4] 8th Sem ISE Student, [5] Assistant Professor
Department of Information Science and Engineering,
Sai Vidya Institute of Technology, Bengaluru, India

Abstract - The web application will aid in the creation of both supplies and suppliers, allowing the user to visualize the meal before ordering it. Users are currently presented only an image, but the key concerns of food are quality and ingredients used. This online application employs Augmented Reality (AR) to provide an interactive user interface meal menu to order from. It makes the ordering procedure much more engaging and distinctive by allowing the user to inspect the 3D model before ordering the food. Users can interact with both digital data and the physical world. It is possible to digitize the food business with this online application. Because this program provides a 360-degree picture of food, it has the potential to steadily improve restaurant revenues. It also assists the user in better understanding the quality and ingredients of the food products used in them, as everyone wants to consume healthy and appetizing meals.

Index Terms - Augmented Reality (AR), 3D modelling, Web Application

I. INTRODUCTION

Technology known as Augmented Reality (AR) blends virtual data with the physical world. Multimedia, 3D modelling, real-time tracking and registration, intelligent interaction, sensing, and other technical tools are used. Its guiding premise is to simulate the real world before applying computer-generated virtual information such as text, photographs, 3D models,music, and video to it. The real world is improved as a result of how well the two types of knowledge complement one another. Every cuisine has a unique style and set of components, yet a lot of people struggle to visualize it correctly.However, the biggest issue is that many hotels merely provide descriptions of their menus without any illustrations. Without any images, buyers must therefore just imagine the dish. They may occasionally receive satisfaction, but many clients wind up being dissatisfied. Some hotels go into great depth about their menus, however occasionally the actual execution may differ from what is said there. because the method or image could be altered. This paper will provide the ideal solution because it offers 360-degree photographs and an ideal description.

II. RELATED WORK

Under this section, we are going to discuss works related to Augmented Reality on Restaurant sales.

[1] Kandappan Balasubramanian and Rupam Konar in their paper have explore the potential of AR-integrated menu in healthy dining experience with nutritional information. Obesity has become a significant global epidemic, particularly in Malaysia, which has the fastest growing rate in the ASEAN area, with almost half of its people overweight or obese. Despite the fact that obesity is a serious problem, The hospitality business, as a social phenomenon, plays a vital role in determining the best transformation path to assist customers in adopting healthy dining with the use of the AR platform. The conversion of a regular menu into AR integrated menu can give healthy information such as allergy notes, nutritional information, and other health-related information to spark the customer's interest in visiting the restaurant for a fresh dining experience.The AR-integrated menu will alter the presentation of food and beverages in order to capture the attention of customers.Food and beverage consumption is a frequent everyday activity in human life that is difficult to control. In order to achieve a healthy society, all parties involved must collaborate to inform and persuade diners to adopt good eating habits. This is especially essential given the increased prevalence of noncommunicable diseases linked to poor dietary habits. As public healthcare expenses rise and society's production level falls, this situation may have a domino effect on the country's economy. Various steps are being implemented globally to educate consumers on healthy eating, such as portion control, but the AR-integrated menu can have a stronger influence because today's diners are closely tied to their devices.

[2] Dinushika Gunawardena and Kumuduni Sarathchandra has contributing the number of factors on making food decision and time consuming. The main issues that customers experience while making meal decisions when they visit a restaurant. In comparison to other similar programmes accessible, Best Dish stands out owing to the amount of problems it handles that other similar applications do not. Furthermore, when computing food item recommendations, this application's recommendation feature takes a wide range of criteria into account. In terms of future work, one prospective addition would be the incorporation of ingredient traceability functionality via blockchain technology. Furthermore, altering the system design to accommodate group dining scenarios can be a beneficial benefit.

[3] Wided Batat in their paper extended the use of realitytechnologies and AR dining experiences. The technological advancements by using a physiological and subjective viewpoint on food restaurant experiences to investigate the factors influencing the acceptance or rejection of AR technology in the servicescape. Furthermore, we identified key factors in our research that allow service providers to understand how AR can influence positively or negatively consumers' perceptions of their restaurant experiences across five dimensions, namely sensory (five senses' intensity), affective (pleasantness), behavioral, social, and intellectual.

[4] Efrain Zenteno, Zain Ahmed Khan, Magnus Isaksson and Peter Handel proposed technic relies on nonparametric method for modeling RF power amplifiers has been presented. The approach does not make any assumptions about the model structure beforehand. For example, The estimated amplitude and phase of the feedforward model in solid blue and the inverse (DPD) model in dashed green. The PA's inverse learning architecture was used to estimate the inverse model. Thus, throughout the identification phase, basis functions that explain its behavior are evaluated, leading to the development of customized parametric models. These customized models can be fitted with any desired structure, making implementation easier. Particularly, parameter-efficien models with minor mistakes can be produced, lowering the computational costs of development and deployment. The kernel estimator is used in the method provided here.

[5] Dan Li and Yanlei Shang has promoted the vigorous development of AR applications and Web-based applications are versatile and have good cross-platform capabilities. However, the Web's computing power is constrained by the browser framework, making it impossible to generate superior AR effects than native mobile applications. This paper exploits the mobile phone's native capability to complete the part of the AR application that involves a lot of calculation, realizes the mutual invocation of the Web and the original, and ultimately encapsulates the native capability that the Web may call into a handy API. At the same time, the AR scene is rendered using the hybrid rendering method, which combines native and Web rendering. AR application support in mobile browsers has been expanded.

[6] Alvin Candra Wijaya, M. Wiranto Aris Munandar and Fitri Utaminingrum defined that Internet users globally increasing every year.The development of a markerless AR for food advertising using Vuforia, followed by testing it using the System Usability Scale. The AR system includes six markers and three-dimensional objects from a meal menu (pizza, burger, fries, hot dog, bread, and coffee). To obtain people for testing this AR system, basic random sampling was used. There are 20 people that want to share their opinion on our AR system. average SUS score received is 51, which is still considered insufficient. The lowest score is in question 7, with a total score of only 60. This leads to the conclusion that users should learn more about the system before using it. The user encounters trouble when he or she cannot locate the marking. Because we employed markerless AR in this study and there are many users who are unaware of markerless AR. AR for food advertising will be improved in the future by creating a new marker that the user can easily recognise. With new markers, the user does not have to figure out when the marker appears, even if it is markerless.

[7] Vladimir Todorovic, Neda Milic and Milovan Lazarevic in there paper provided the information that customers need to know attributes, way of production and origin of food. Packaging functions are becoming more complex today, and the environments in which they must perform are leading to the optimisation of package design and the development of real, cost-effective packaging that provides information that consumers and other concerned bodies require, such as a variety of food attributes, country of origin, method of production, and so on. Despite the fact that a package must fulfill a variety of activities, this study focuses on the traceability functions of the food manufacturing line and prospective packaging interactions via Mobile Augmented Reality

application. Food processing with Augmented Reality Production will increase in the next few years, and independent gadgets will become more inexpensive. Allow for the dissemination of this technology and the development of a vast number of MAR-based applications. Augmented reality can provide creative and interesting ways to promote businesses, greatly assisting marketing campaigns. Having a distinctive marketing approach is difficult to achieve nowadays; one option is to incorporate AR into everyday marketing.

[8] Kirill V.Sysoev and Aleksey A.Frolov proposed the application apps with function of Augmented reality for daily use.AR applications in the current research were investigated. Currently, augmented reality is most commonly employed in games, marketing, medicine, education, journalism, and production. However, people hardly never employ augmented reality in their daily lives. An examination of existing applications was carried out, as well as an examination of the functionality and potential of using and employing mobile phones for AR. This investigation revealed that augmented reality can be completely utilized on mobile phones and can assist individuals in their daily lives.To do this, they created a prototype application that leverages augmented reality to find food at lower prices in surrounding marketplaces.

[9] Chao Gu, Tinting Huang, Wei Wei, Chun Yang, Jiangjie Chen, Wei Miao, Shuyuan Lin, Hanchu Sun and Jie Sun provided the effect of using AR Technology in takeaway food packaging.Interaction designers working in the restaurant marketing sector who want to incorporate augmented reality in their work might use this design as a foundation. Furthermore, we generated the important elements of business strategies for catering firms based on the text analysis of consumer evaluations and the path relationship of the built quantitative model. Unlike past food marketing research, this study investigates the content of user comments and considers how the interactive experience can be useful. It has been demonstrated that the technological inducement of augmented reality packaging can be beneficial in reducing unfavorable consumer remarks. Furthermore, it can increase consumers' readiness to buy through the intermediaries of flow, trust, and contentment. Restaurants having a high amount of unfavorable consumer reviews, in particular. In the case that a large fraction of the major customer group meets the characteristics of women and AR interactive experience, AR in packaging will be used to reduce negative consumer feedback.

III. METHODOLOGY

The methodology includes the following components:

1. Basic Block Diagram

The Basic Block Diagram in Fig.1. illustrates how the various components of the suggested framework are connected and related to one another. The camera is used to filter the item, after which its 3D model is created, then its AR model is created, and last it is augmented to the client's virtual screen, as should be obvious from the figure.

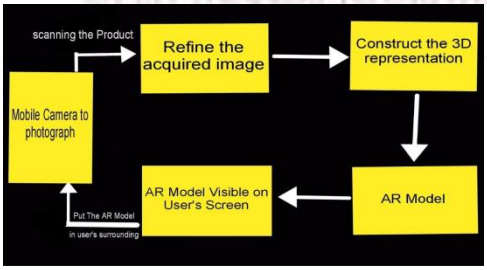

Fig.1.BasicBlockDiagram

2. System Architecture

This engineering representation of a model is an accurate description of a framework that is organized to enable thinking about the designs and behaviors in our application. This architecture is made up of the system parts and the created sub-systems, which together will implement the whole system. The MVC concept is demonstrated by the system architecture in Fig. 2.

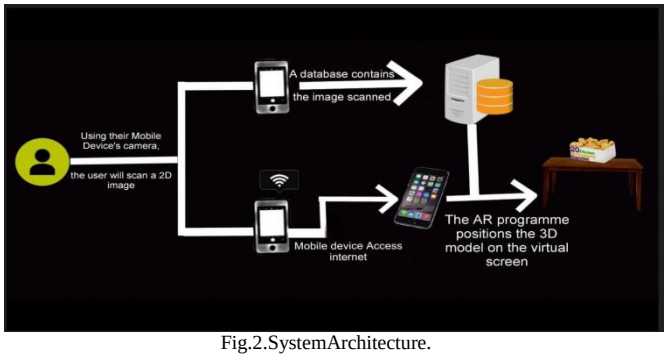

Fig.2.SystemArchitecture.

3. Flow Chart

Using this flowchart, you can solve our modules step-bystep. We show the user how to access the website in the flow chart in Figure 3. The user can now scan the 2D image of any item he wants to buy. He will then survey the area where he wants to position the object. Now, the user can scale the image appropriately by creating a 3D model of it.

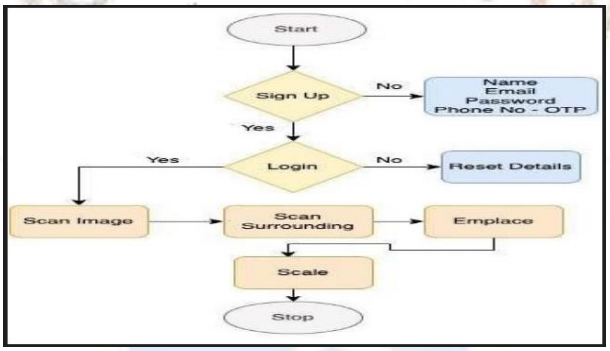

Fig.3.Flow Chart.

4. Use Case Diagram

For our suggested system leveraging web-based services, Fig. 4 shows the Use Case diagram. Through his smartphone, the user can access the application. As illustrated in the illustration, the user must first choose the model he wants to project before scanning his living space with a virtual screen and positioning the 3D model of the object he wants to see. The web application's objectives are organized hierarchically while taking into consideration the preferences and choices of the consumers. In contrast to conventional functional decomposition systems, the aim in this picture is broken down from the perspective of the users rather than the system.

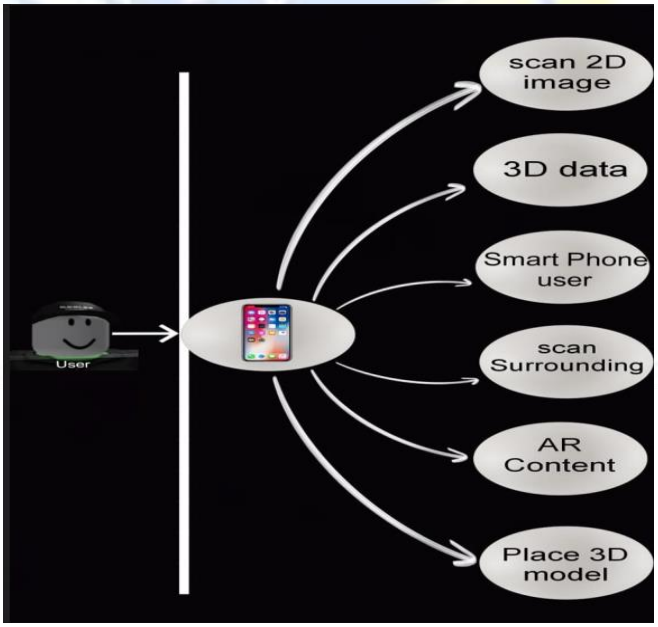

Fig.4.Use Case Diagram.

5. Sequence Diagram

It is evident from the sequence diagram that it depicts item interactions in chronological order. The user will open the web page, as shown in Fig. 5. The user will now scan the image that he wants to view from his mobile screen. In the database, this Image will be kept. The shot is then processed. A 3D model of the photograph will then be created and saved in the database. After that, the user will concurrently scan the area, which will aid in building the marker-less model and in determining where to position the object. The 3D model is then imported from the database into the user's mobile device and added to his virtual surroundings so that he can scale and size it appropriately.

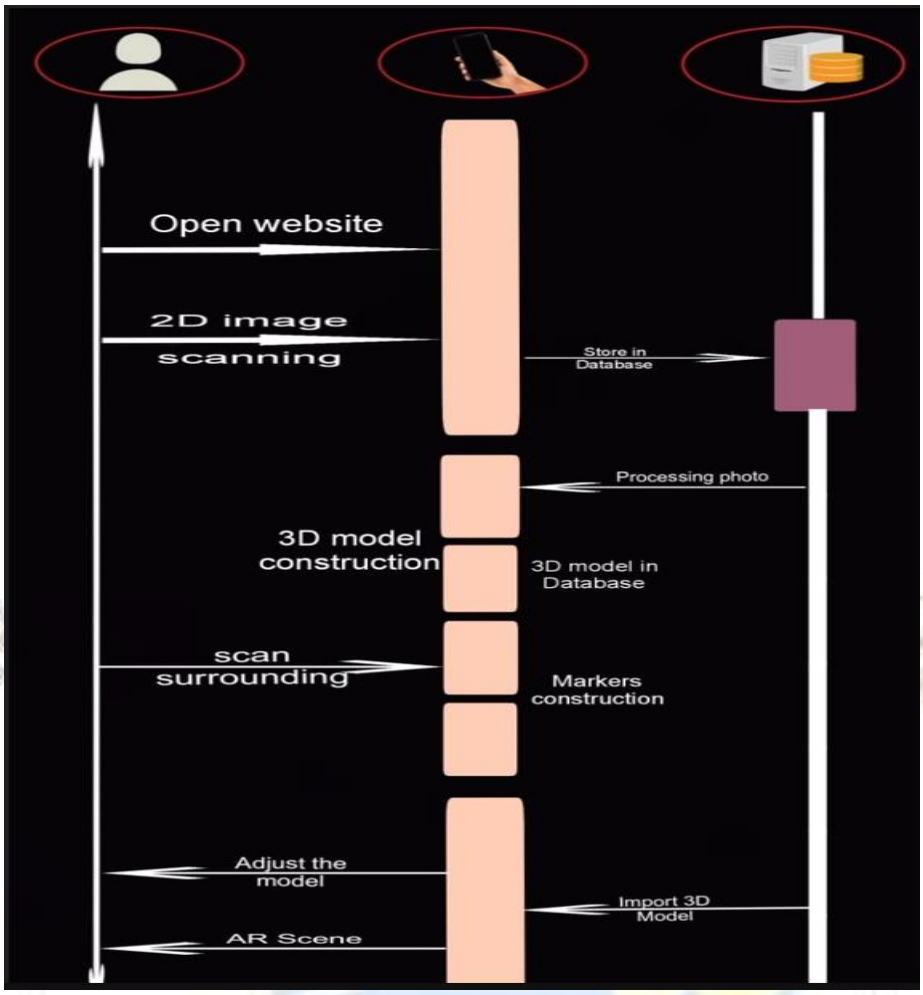

Fig.5. Sequence Diagram

IV. RESULTS

The results of our project are shown below: Fig.6 show the Desktop view of our web based application. Fig.7 shows the mobile view and Fig.8 shows the outputs.

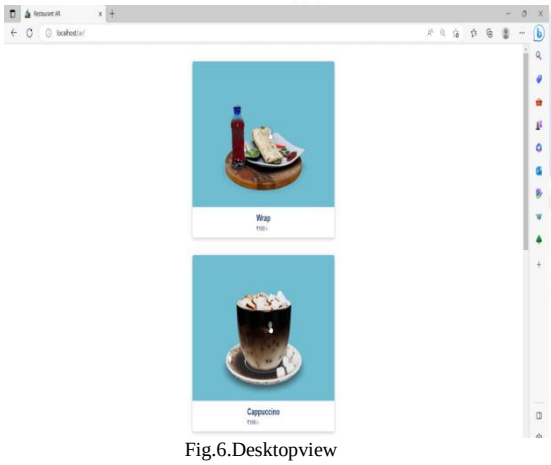

Fig.6.Desktopview

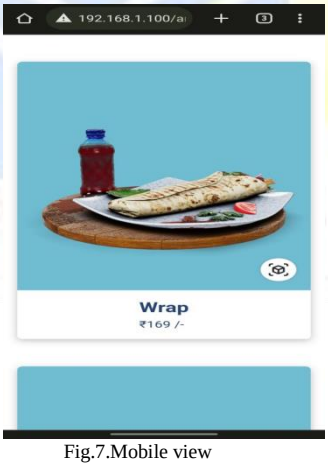

Fig.7.Mobile view

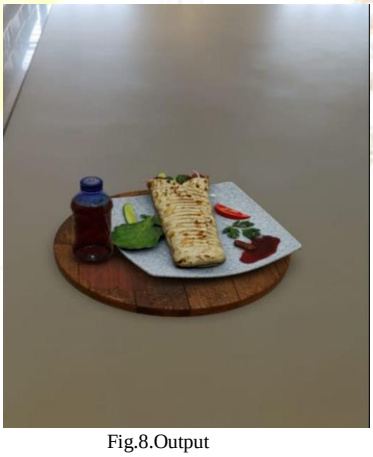

Fig.8.Output

V. CONCLUSION

vivid engagement in 3D representations, virtual experiments, and item demos is what our suggested system aspires to provide. Customers won't be hesitant to ask questions because they can use AR to visualize information about the cuisine in eateries. Restaurants may improve the client experience and draw in a lot more consumers by utilizing the suggested system. Customers won't encounter any difficulties using this online application through mobile browsers because the suggested system is web based, so no unnecessary program installations are required.

VI. References

[1] Balasubramanian, Kandappan Konar, Rupam. (2022). Moving Forward with Augmented Reality Menu: Changes in Food Consumption Behaviour Patterns. Asia-Pacific Journal of Innovation in Hospitality and Tourism (APJIHT). 11. 91-96.

[2] D. Gunawardena and K. Sarathchandra, "BestDish: A Digital Menu and Food Item Recommendation System for Restaurants in the Hotel Sector," 2020 International Conference on Image Processing and Robotics (ICIP), Negombo, Sri Lanka, 2020, pp. 1-7, doi:10.1109/ICIP48927.2020.9367357.

[3] Wided Batat, How augmented reality (AR) is transforming the restaurant sector: Investigating the impact of "Le Petit Chef" on customers' dining experiences, Technological Forecasting and Social Change, Volume 172, 2021, 121013, ISSN 0040-1625, https://doi.org/10.1016/j.techfore.2021.121013.
(https://www.sciencedirect.com/science/article/pii/S0040162521004455)

[4] E. Zenteno, Z. A. Khan, M. Isaksson and P. Handel, "Finding Structural Information About RF Power Amplifiers Using an Orthogonal Nonparametric Kernel Smoothing Estimator," in IEEE Transactions on Vehicular Technology, vol. 65, no. 5, pp. 2883-2889, May 2016, doi:10.1109/TVT.2015.2434497.

[5] Dan Li and Yanlei Shang 2019 IOP Conf. Ser.: Mater. Sci. Eng. 490042017, doi: 10.1088/1757-899X/490/4/042017.

[6] A. C. Wijaya, M. W. A. Munandar and F. Utaminingrum, "Usability Testing of Augmented Reality For Food Advertisement Based On Mobile Phone Using System Usability Scale," 2019 International Conference on Sustainable Information Engineering and Technology (SIET), Lombok, Indonesia, 2019, pp. 266-269, doi:10.1109/SIET48054.2019.8986118.

[7] V. Todorovic, N. Mili ´ c and M. Lazarevi ´ c, "Augmented Reality in Food production traceability – use case," IEEE EUROCON 2019-18th International Conference on Smart Technologies, Novi Sad, Serbia, 2019, pp. 1-5, doi: 10.1109/EUROCON.2019.8861734.

[8] K. V. Sysoev and A. A. Frolov, "Augmented Reality Application as a Food Purchasing Assistant," 2021 IEEE Conference of Russian Young Researchers in Electrical and Electronic Engineering (ElConRus), St.Petersburg, Moscow, Russia, 2021, pp. 703-706, doi: 10.1109/ElCon-Rus51938.2021.9396358.

[9] Gu, C.; Huang, T.; Wei, W.; Yang, C.; Chen, J.; Miao, W.; Lin, S.; Sun, H.; Sun, J. The Effect of Using Augmented Reality Technology in Takeaway Food Packaging to Improve Young Consumers' Negative Evaluations. Agriculture 2023, 13, 335. https://doi.org/10.3390/agriculture13020335

[10] U. Dampage, D. A. Egodagamage, A. U. Waidyaratne, D. A. W.Dissanayaka and A. G. N. M. Senarathne, "Spatial Augmented Reality Based Customer Satisfaction Enhancement and Monitoring System,"in IEEE Access, vol. 9, pp. 97990-98004, 2021, doi: 10.1109/ACCESS.2021.3093829.