
SHOPAIDE: VOICE BASED AI ASSISTANT FOR E-SHOPPING

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Abstract

Number of E-commerce users has improved leaps and bounds over the past few years. This has also led to increased competition in the e-commerce industry. This leaves people confused about the vendor to choose for purchasing a product. To solve this dilemma and make people find the best products at best prices, a mobile application which can compare products across multiple e-commerce sites will come handy. Traditional comparison and search applications are all text-based making the process difficult for illiterates and few other sections of the society. So such an application will provide more comfort and satisfaction to people if it supports voice based search, which makes the process quicker while also providing a feel of human interaction to people.

Key words: Ranking Algorithm, Natural Language Processing, Artificial Intelligence, Application Programming Interface, Voice bot

Introduction

The number of people using e-commerce in the world is expected to increase by almost 400 million in the coming year. Finaria has provided some data mentioning that the covid outbreak in the year 2020 has helped in increasing the total number of e-commerce users across the world by 9.5% year-over-year, which made the count to exceed 3.4 billion. It is expected that the trend is set to continue for 2021 leading to a growth of another 10% year-over-year. This will increase the e-commerce users across the world to 3.8 billion. Finaria has forecasted that the e-commerce users across the globe will reach 4.9 billion in number by the year 2025. It is also expected that the global e-commerce revenue will reach to 2.7 trillion dollars in 2021 and will continue to grow over 3.4 trillion dollars by 2025. The expected revenue for the year 2021 shows that the approximate year-over-year increase will touch 11%[1]. The surge in the number of consumers purchasing online can be attributed to covid-19 outbreak around the globe. E-commerce transactions reached about 82.5 billion dollars by May of 2020, which is an increase of 77% as compared to that of 2019. If not for covid-19, it would have taken about 4 to 6 years to reach such a number and this estimation is based on the traditional year-over-year increase[2].

Even in countries like India where the majority of the population hails from rural India, there has been a steady rise in the e-commerce sector. There has been an upward growth trajectory in the Indian e-commerce industry for the past few years. It is even expected to surpass the United States, thus becoming the second largest E-commerce market in the globe. It is expected that this distinction can be achieved by India by the year 2034. As per Payoneer report, Indian e-commerce industry is currently ranked ninth in the world for its cross-border growth. This growth in India has been attributed to the increased number of internet and smartphone users[3].

Overall number of smartphone users is expected to increase to almost 83 crores by the year 2022 in India. The management consulting partner at KPMG India, Mr. Neeraj Verma said that the increase of smartphone users in India is due to the decrease in the Average Selling Price of smartphones. He even attributed the increase to the growth of the number of users in rural and vernacular areas of the country. He also mentioned that open operating systems like android have contributed to the reduction in smartphone prices while also providing increased functionality. The report also mentioned that the smartphone user base in India has grown to 50 crores, of which almost 40 percent are users from rural parts of the country. It even added that the rise of rural smartphone users in India have grown from 9 percent in 2015 to around 25 percent in the year 2018. Moreover, the report specified that 97 percent of internet users in the country have used mobile devices to access internet facilities[4]. Thus e-commerce is expected to increase leaps and bounds over the next few years. But people

have found it difficult to purchase the best product at best price from the best dealer across various e-commerce websites. Moreover, there isn't any application that can aid people to search for products using their speech.

Voice assistant e-commerce is revolutionizing the ways in which people perform a search while buying a product. It not only provides a great shopping experience to customers but also helps them find products online easily. Voice based software has influenced each and every area of e-commerce brand development which includes logistics, security, payment processing, purchasing, inventory management and fulfilment services. The growth of voice assistant AI has been triggered by a variety of reasons like convenient and easy shopping, bringing point of sales closer to the users and provision of personalized experience. E-commerce voice assistants greatly help the end-users to reduce their dependencies on hardware as they can conveniently use voice commands to make their purchase[5]. Proposed system considers use of voicebot for consumers due to the above mentioned benefits that it reaps.

The proposed system will enable people to search for products through voice interaction with the AI based voice bot. Once all requirements have been specified, the system triggers API calls to various e-commerce websites for fetching the product details. The results will be filtered based on the input specifications provided by users, following which the products will be ranked using a ranking algorithm. Ranked results will be made available to the people for making purchases.

Review of Literature

A lot of websites are available for comparing prices across various e-commerce sites. But most of the websites just fetch details from various sites, leaving it upon the users to compare and find the best product. They depend on text inputs provided by users to search for products. Few of these websites don't even consider factors other than price to compare products.

Application Programming Interface(API)s have been widely used for quite a long time now. API is an interface between two softwares that allows any two applications to exchange data between them. Whenever we visit a website or check weather conditions on our phone or perform any similar operations we are making use of an API. Whenever we use an application, it connects to the Internet through which the data will be sent to the server. Then the data will be retrieved by the server, following which interpretation of data will be done. Then the necessary actions are performed on the data and the required information will be sent to users in a readable format. All this processing will happen through APIs. An analyst at Forrester Research, Josh Walker, has mentioned that building applications without APIs are like building a house without any doors. He added that the only way to open doors and exchange information is by using APIs[6]. Nowadays, APIs have become an integral part of applications being developed. These interfaces help perform tasks efficiently.

A system which was earlier proposed for comparison namely Product Rank Based Search Engine for E-Commerce makes use of web data mining and web crawling technology. This technique requires a lot of time and the results obtained are updated once every hour, meaning that the users are not always displayed with updated results[7]. So, the proposed system makes use of APIs to fetch product details from various e-commerce sites. This ensures quick retrieval of data from multiple websites, which in turn makes the application more responsive and helps people to find updated results all the time.

Ranking the products is important for comparing products. Many comparison websites rank products simply based on price and even the system that was proposed earlier uses price along with popularity of the product for comparison. As per the proposal mentioned, popularity of the product refers to how often the product has been searched over the internet on that particular day[7]. But such ranking tends to be less effective because a product will be ranked high just because it has been searched by a massive number of people even though it's not been purchased by any of them. There is even a possibility that products purchased by a handful of people is ranked low just because it has been searched only by those who purchased it while a product with more searches but no purchases might be ranked at the top. To overcome this, the proposed system makes use of a ranking algorithm that considers several parameters which any e-commerce user takes into account while purchasing products online.

Another proposed system namely Customized Ranking for products through Online Reviews makes use of online reviews for ranking the products. But the system only considers reviews as the criteria for ranking products, which may not always provide the right idea about the product. The reviews are analyzed based on sentiment analysis to do the ranking. In addition to this, the system also provides an option of ranking solely on brands, which might be unsatisfactory for many people. It also focuses on providing personalization to people[8]. In contrast, the proposed system mentioned in this paper considers several parameters for ranking products because any person considers several parameters while purchasing online. The system doesn't even lay emphasis on personalization because it aims to provide the comfort that one can get from a human assistant in any store.

Proposed System

3.1. Objectives

The main objective of this system is to facilitate voice based search and to assist the user in choosing the best product. The proposed system focuses on enhancing the user experience in addition to saving time and money. Every time a user request has been made, multiple API calls will be triggered, fetching data from multiple sites. The fetched products will be ranked based on several parameters and will be displayed to the users in a sorted manner with the top most product result being the highest ranked one. Users can choose the required product from the obtained results.

The purpose of the system is to enhance the customer's shopping experience and it doesn't deal with any kind of payment facilities. It serves as an assistant to choose the best products and is not associated with any kind of product promotions or e-commerce site promotions.

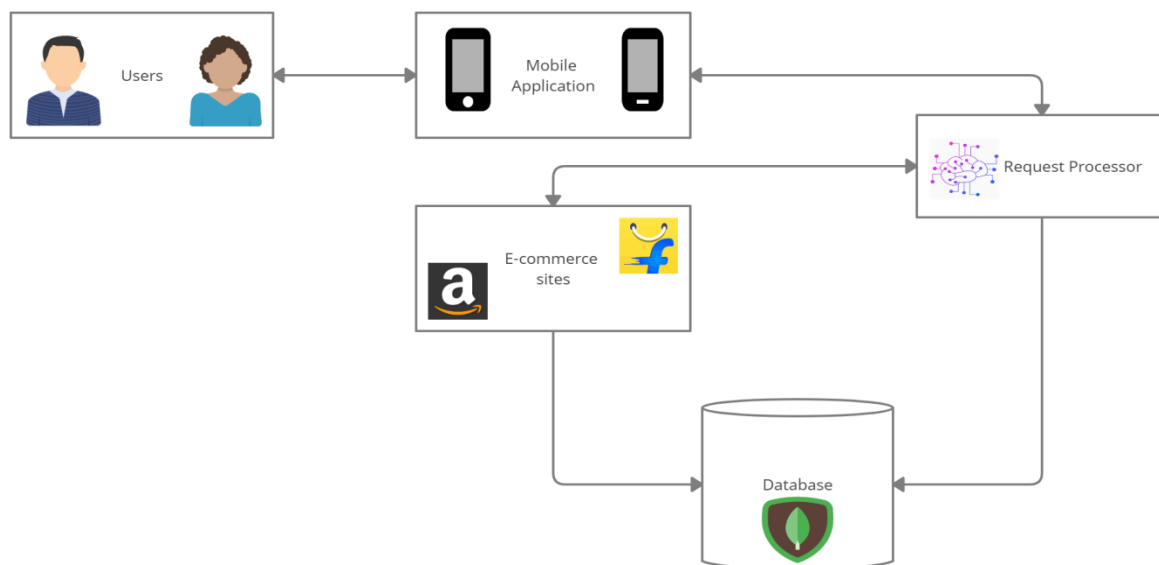


Fig 3.1:Architecture of Voice based AI assistant for E-shopping

3.2.Design and architecture

The existing system restricts itself to providing details about products from various e-commerce sites without carrying out any comparisons. People find it difficult to search products in a customized manner. They are unable to express their requirements fluently as they are constrained by the non-interactive capacity of the text input. In some situations, the search results are not relevant to what they intend to find. There are a considerable number of people, who are unable to use such comparison sites or applications just because they lack technical knowledge.

This system differs from that of other existing systems as it enables users to fluently specify their requirements using their natural mode of communication, which is voice. Voice bot, built using AI technology will interact with the users to intake all their requirements. It would also help resolve ambiguity of users in all possible stages of purchasing. Whenever a customer is fuzzy about the way a product has to be searched, voice bot will come to their aid. It will provide suggestions for customized searches being made, thereby helping users to better understand what they want and thus improves user experience.

The dynamic and interactive nature of voice bot helps achieve maximum accuracy and efficiency in terms of results being displayed. Multi-lingual support provided by the voice system helps people interact in their own and familiar local languages. The voice based interaction makes use of Natural Language Processing technology for better performance.

Fig 1.1 shows the architecture of the entire system. People will use this voice system to request for the products they want. In order to display most relevant results to the people, a feature extraction model will be used to extract the features of the requested product. These features will be used for retrieving the products with given specifications from various e-commerce sites as well as filtering out products that are irrelevant to the search.

Upon receiving the request, API calls will be triggered to several e-commerce sites. These calls will be made with all specified requirements alongside the product. The API calls in turn, will fetch all details about the requested product. Few important details that will be fetched includes price, ratings, replacement policy and delivery constraints.

Filtration is a process that is used to display only the products that match specified requirements. The purpose of this process is to get away with unnecessary results, thus helping the ranking algorithm to work only with necessary products. Thus the effectiveness of filtration adds to the effectiveness of the ranking algorithm. This process even helps in improving the processing time.

Ranking algorithm named as ratioProductumTransientes was developed using the concepts of ratios. It has been developed such that a high valued product will have a lower rank, in other words lower priority, while a low valued product will have higher priority. The concept of ratios ensure that the algorithm is simple but still effective to use.

The effectiveness of the algorithm owes to the various parameters it considers like price of a product, ratings of a product, time for delivery, delivery fee, availability of replacement and total number of ratings given to the product. This set of parameters covers all aspects that any individual considers while making an online purchase and this results in achieving better satisfaction.

3.3.Voicebot Model

Natural Language Processing is a branch of Artificial Intelligence that has been growing in importance over the past few years. A variety of concepts in NLP are being widely used in several applications. Few of the popular concepts include POS(Part Of Speech tagging), lemmatization, tokenization, stemming, NER (Named Entity Recognition).

The concept of NER has been used in this system for the purpose of extracting the products and features that have been requested by people. The extracted details will be used to search for products in e-commerce sites. These details will also be used to filter out products that don't match the specified requirements, as the system aims to show only the relevant products to the people.

Named Entity recognition also known as named entity identification is a process of extracting all the named entities from a sentence where each entity can be a product, feature, person, place or anything else[9]. The entities can be customized according to the system's requirement. These customized entities can be used for training a model which will act as a model for extracting features from inputs given by the people. The outputs of NER model will act as input for APIs associated with various e-commerce sites.

Bots (like chatbot and voicebot) is another area of NLP being predominantly used in applications. Several AI models are available, which can effectively act as interactive bots for interacting with users. Models like LSTM, seq2seq, seq2seq with attention and memory network are commonly used with NLP applications to act as bots.

LSTM known as Long Short Term Memory models are a part of Recurrent Neural Networks (RNN), which are capable of remembering the long term dependencies. They consider each and every word to check if it has any value to be held. If a word is considered to be unimportant for usage, then the state of the cell in that neuron will act in a way that the network forgets that information. Information at the cell state of each neuron depends on the value from the previous neuron's cell state and also the value based on the word input to the current neuron[10]. Thus LSTM models can act as models for predicting outputs by observing the inputs, based on the data with which the models are trained.

Sequence to sequence model, abbreviated as Seq2Seq model can be used for dealing with sequence of words. It consists of an encoder and decoder where encoders are trained with input sequences while the decoders are trained with output sequences. An additional tag of start and end are added to each of the encoder and decoder sequences respectively. The given input passes through an encoder, which internally uses an LSTM or any other kind of RNN to compute the cell state. The decoder receives the cell state from the final cell or neuron of the encoder as one of its input. Then this state will be used along with its learning and few other gates used inside each cell, to predict the output sequence. It is generally used in applications where sequence is important like machine translation and question answering[11].

Seq2Seq can be used with attention for better results. Attention is a concept that introduces a hidden state into the neural network. It also calculates a context vector at each step. The value of the context vector depends on the value of all hidden states and a weightage assigned to each of these states. This context vector can be helpful in predicting the output by considering the sequence and importance of each part of the sequence. This model can be a good one to act as a bot for any query resolving systems[12].

There are several other models like Bidirectional LSTMs and end-to-end memory networks which can be used for NLP related tasks. But all these models are not so effective for the proposed system as it requires the bot to consider not just the sequence of words in input sentences but also the previously given input sentences. Based on all these inputs, the next output will have to be generated by the bot and it must also ensure that no question put forth is irrelevant or repetitive.

3.4.Pseudocode

Input : A list of product details from e-commerce sites

Output : A list of ranked products

Function **ratioProductumTransientes()** // meaning Ratio Product Grading

Set maximum price of product from list of all products as **maxPrice**

Set maximum delivery fee of product from list of all products as **maxdelivFee**

for products in input

Add **ratio of price and maxPrice** to params

Add **ratio of 4,5 star ratings and total ratings** to params

Add **ratio of 1,2,3 star ratings and total ratings** to params

Add **ratio of deliveryFee and maxdelivFee** to params

Add a **value** indicating priority of product based on **delivery time** to params

Add a **value** prioritizing products with **replacement availability** to params

Add a **value** prioritizing products with **more reviews** to params

Update all items with some **weights** in params

Set sum of all values in params as **productRankPoints**

sort products by productRankPoints

Table 3.1: Pseudocode

Ranking algorithm considers several parameters like price of a product, ratings of a product, delivery fee and delivery time associated with a product. All these parameters will be assigned with some points based on their values and the ratios that were calculated using them. Each of these points is associated with weights.

Weights assigned to each parameter depends on how much the parameter contributes to the product quality. These weights have been assigned after considering perspectives of a variety of people and were gathered by conducting a survey. These weights can also be updated dynamically with time based on the changing interests of the people. Thus the total ranking points of any product depends on both the points and weights assigned to each parameter. Once the ranking points are calculated for each product, the products will be ranked in ascending order of points. The sorted results will then be displayed to the users in ranked order. People can choose their preferred product from the list of displayed products, simply by selecting the product details. This will redirect people to the corresponding e-commerce sites from where the purchase can be made.

3.5.Implementation

The system has been implemented in a way such that the business logic of the system has been completely separated from the presentation logic of the system. The working of the system begins with an OTP based login, where the OTP will be auto verified by the system. The interaction with the bot begins as soon as the person logs in. The interaction will happen in the form of voice between people and the bot.

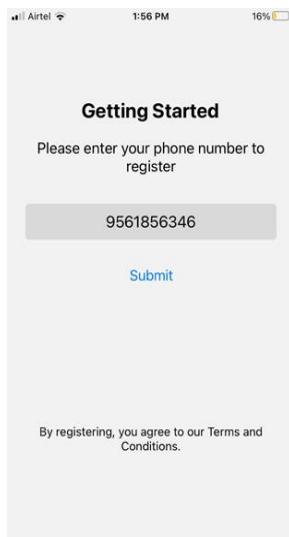


Fig. 3.2. Registration

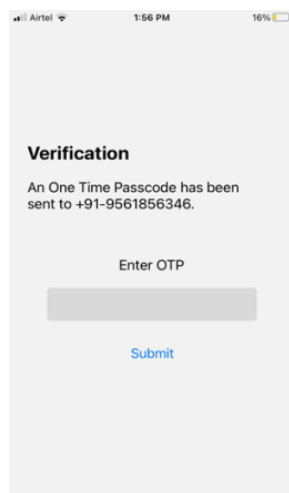


Fig. 3.3. OTP Validation



Fig. 3.4. Home Screen

The above picture depicts the initial invite message given by the bot to the person. Once the person specifies an input, the bot will raise some questions in order to better understand the requirements or to gather more details about the requirements.

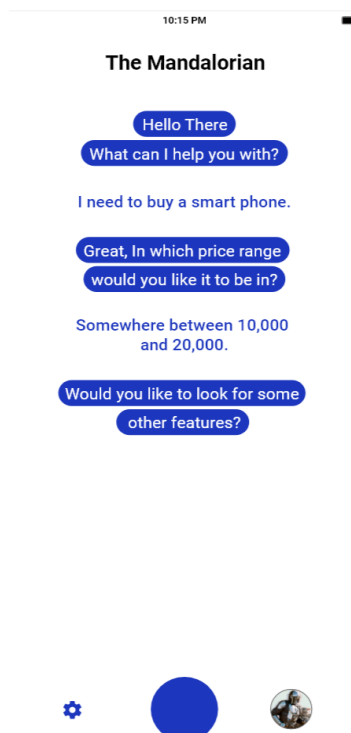


Fig. 3.5.1. Voicebot Interaction 1

The above picture depicts a scenario where the bot asks about the preferred price range for the person who wants to buy a smartphone.

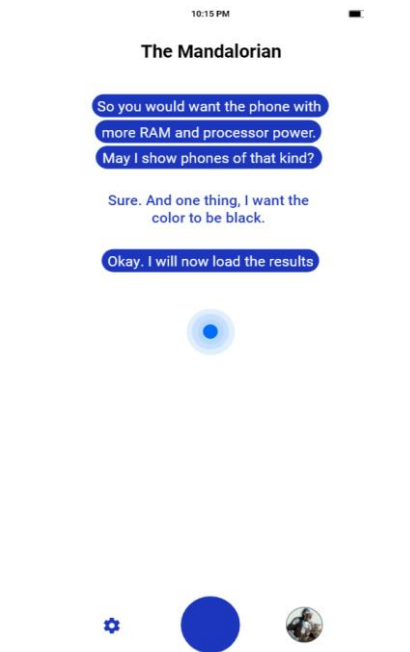


Fig. 3.5.2. Voicebot Interaction 2

The results will then be loaded and will appear to the person as in the below image.



Fig. 3.6. Results

Conclusion

The increased competition in the e-commerce industry has created hardships in the choice of right product from right dealers for purchase. This system will aid people in the selection of the best possible product. It also ensures equal importance to dealers from across all e-commerce sites and ranking will purely depend on the quality of product and its service, evident from the parameters considered for ranking them. Thus, the system will benefit both e-commerce customers and sellers.

There are occasions where some dealers portray themselves to be selling some products which they actually don't. So, the system can be extended to verify dealers and provide feedback about such dealers to the websites so that appropriate action can be taken. The system can be further enhanced to provide customization by saving individuals preferences so as to suggest products in an even better manner.

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