International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 05 Issue: 06 | June - 2021 ISSN: 2582-3930

FARMER VOICE USING MACHINE LEARNING

Ayushi Singh[1] ,Rishabh Bansal[2], Harsh Miglani[3] ,Amit Pandey[4]
[1,2,3]Student, [4]Assistant Professor
Department of Information Technology
[1,2,3,4]Dr Akhilesh Das Gupta Institute of Technology and Management

Abstract- This paper presents a strategy based on Machine Learning and Query System by Chatbot in order to provide a better service to farmers and solve their queries immediately as well as provide them alert of weather. Here we first need to get the exact data of farming that is the question that are frequently asked by farmers ,so we collect out the data from the government website where call recordings are available. Secondly we need to filter the dataset in order to remove repeated questions. This idea is achieved by NLP (Natural Language Processing) which processes the match found and provides the corresponding informa4on pertaining to the ques4ons asked. In order to convert the text answers to audio for convenience of farmers, the Google API is used that can easily convert the text into speech so that the farmer can hear the answer. Hence, using these strategies to achieve low complexity and beBer performance.

Keywords: Natural Language Processing, Machine Learning

1. INTRODUCTION

Agriculture is the major provider of employment in many parts of the world .The technology in the field of agriculture is developing day-by-day. Also, lots of software are being developed, to educate the farmers with this new technological information. Most of them provide static information and require large number of searching steps to get the correct information and they don't provide user friendly interactive way of querying and response[1]. The Farmer Voice application will allow the farmers to solve the queries of all the farming related issues by sitting at home and getting some real time information. According to a survey, every year around 10 million farmer in India don't have the proper knowledge of latest farming methods and face a lots of difficulty. These farmer due to lack of proper knowledge can't able to make a huge profit. So this application bridges the gap between the same. And provides them support 24×7. This application uses Natural Language Processing which is a field of Artificial Intelligence that gives the machines the ability to read, understand and derive meaning from human languages[2]. The input obtained from the user can be either textual query or speech which will undergo pre-processing steps in order to find the category it belongs to and provide the corresponding response.

2. RELATED WORK AND BACKGROUND

If we look into the past of Voice Assistant Applications being developed, the first voice activated device was 'Radio rex' in 1911 and in 1964 IBM displayed another unique apparatus called shoebox[3].Every company who are master in intelligent voice assistant had applied their own methods for development, which in turn affects the final product. Voice assistant using Natural Language Processing provides a variety of services using artificial intelligence systems equipped through the user's voice commands. When we talk about voice assistants the first thing that comes to our mind are Google Assistant, Cortana, Siri, amazon's Alexa etc. which are mainly controlled by users voice commands. Once user sends a voice command to these devices, it processes into text, converts the data processed into speech after returning it and passes it to the output device. Some other main technologies related to this field are voice activation, automatic speech recognition ,Text-To-Speech, voice translator, named entity recognition.[3]

3. NATURAL LANGUAGE PROCESSING

Natural Language Processing (NLP) is a tract of Artificial Intelligence and Linguistics, to make computers understand the phrases or words written in human languages[4]. Natural language processing came to ease the user's work and allow them to communicate with the computer in natural language even if the sentences are not grammatically correct or incomplete.

The steps involved in the NLP are:

- Tokenization or Phonological analysis
- Noise Removal
- Lexicon Normalization
- Bag Of Words or Vector Space model

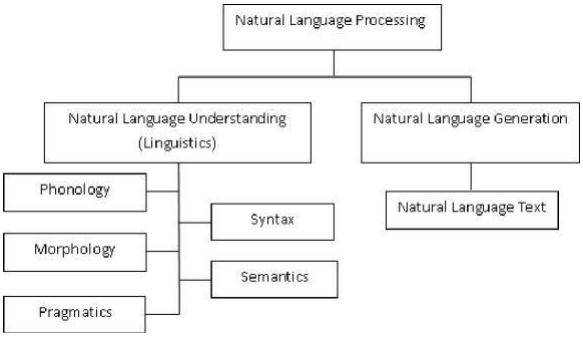

Figure 1: Classification of NLP [4]

There are many challenges that are faced by a machine while understanding like Lexical Ambiguity which can occur when a word makes different sense, i.e. having more than one meaning and the sentence can be interpreted differently. Lexical ambiguity can be resolved to by using parts-of-speech tagging techniques. Syntactical ambiguity which means when we see more than one meaning in a sequence of words. Next step is Natural Language Generation which means producing meaningful sentences.

It involves –

Text planning – It includes gathering the relevant information from knowledge base.

Sentence planning – It includes choosing required words, forming meaningful sentence and setting the tone of the sentence.

Text Realization – It is a technique to map sentence into a structure.

As the source of language can be either speech or text. Hence the corresponding NLP tasks are performed.

Figure 2- Levels of NLP[5]

Phonological Analysis: is performed when the origin of text is a speech. It deals with the speech sounds within and across the words. *Speech Recognition* is a technology that enables a machine to identify words from spoken language .The system is using Google's online speech recognition system for converting speech input to text. NLP is a way to simplify speech recognition processes and make them less time consuming. Morphological Analysis: Deals with understanding distinct words according to their morphemes which is the smallest units of meanings. Further, lexical analysis is performed to identify and analyze the structure of words

Tokenization is the first step in NLP that is the process of breaking down a text paragraph into smaller chunks such as words which is the minimal unit that a machine can understand and process. Tokenization is the technique of splitting a raw string into meaningful tokens[5]. Next step involves Stopwords removal which is considered as noise in the text such as words that contain is, am an,the etc which just takes up the space in database. Further the words are converted to its base form.

Bag of Words is NLP technique of text modelling which Farmers Voice assistant

application is using. It is a simple and flexible way of extracting features from text. This model is used to pre-process the text, by converts it into a bag of words, which keeps a count of the total occurrences of most frequently used words. The model is only concerned with whether the known words occur in the document or not. And helps to convert variable-length texts into a fixed-length vector[6].

4. METHODOLOGY

The process is divided into four major steps:

Firstly, collecting the dataset of all the call recordings from different states kisan call center owned by government in the form of csv file. Second major step is cleaning of dataset by performing NLP operations. Third step is to train the dataset and manage the priority and words accordingly so that results will be favourable. Last step is to provide query input which will be handled by smart assistance.

A. SYSTEM ARCHITECTURE

The user inputs the query in the form of speech to the smart assistant which gets converted to textual query that undergoes pre-processing stage.Pre-processing stage includes Tokenization where the query is tokenized into words using bag of words technique and then the stop words are removed using nltk corpus and stemmed to their root words.

B. DEVELOPMENT AND TRAINING

The dataset file contains thousands of agricultural queries and their responses. The dataset is then processed and converted into a vectored format. To obtain the most frequently used words a dictionary is declared to hold bag of words. For each word in sentence, it checks if the word exists in the dictionary .If it does then the frequency of that word is incremented by 1.If it doesn't then the new word is added to dictionary with a count value of 1.[7] The trained data is saved for future use.

C. RESPONSE RETRIEVAL

A vector is constructed from the trained dataset to know the frequency of a word in each sentence.If a word is a more frequent then the value is set as 1,else it is set as 0. TF-IDF stands for frequency-inverse document frequency which is a statistical measure for evaluating how important a word is to a document in collection thus forming the corresponding final response.

- **Term Frequency (TF)**: is a scoring the frequency of the word in the document. Since every document is different in length, it is possible that each term would appear more number of times in long documents. The term frequency is divided by the length of document to normalize.[8]

$$TF(t) = \frac{Number\ of\ times\ term\ t\ appears\ in\ a\ document}{Total\ number\ of\ terms\ in\ the\ document}$$ [8]

- **Inverse Document Frequency (IDF):** is a scoring of how rarely a word came in a document. It measures how rare a term is. the more it's rare, more is the IDF score.[8]

$$IDF(t) = log_e(\frac{Total\ number\ of\ documents}{Number\ of\ documents\ with\ term\ t\ in\ it})$$ [8]

Thus,

$$TF - IDF score = TF * IDF$$ [8]

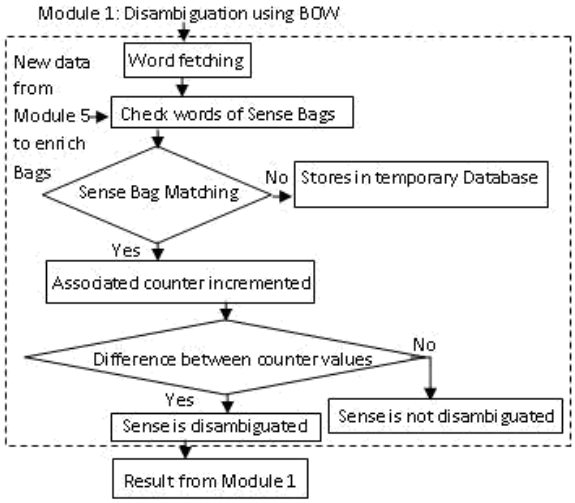

Figure 3- Bag of Words Flow chart

D. RESPONSE IN FORM OF SPEECH

The textual output generated is passed through Text-to-Speech API. The API gets text input and converts it into speech and provides it as output. The output is heard through the speaker.

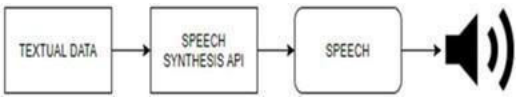

Figure 4- Text to Speech

5. RESULT AND CONCLUSION

This voice based assistant understands farmers' natural language queries and provides corresponding response and will be activated by user's voice and not background noises. This answering machine gives a feel to farmers as if they are speaking to an agriculture expert without any interference. Along with this they also get live updates of weather. And if a query is not resolved by assistant then it dials up to nearest kisan call center. It also provides flexibility of asking a query in either Hindi or English Language and thus getting a response in respective language.

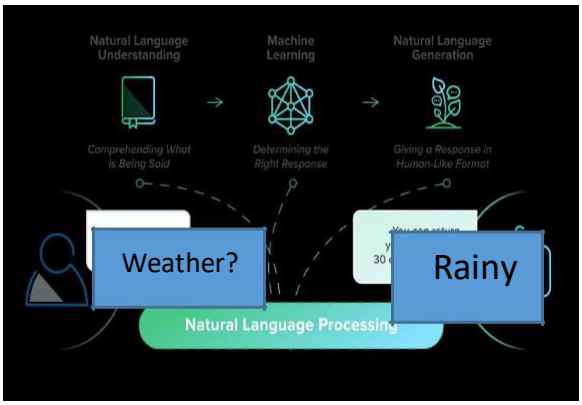

Figure 5: Voice Assistant

REFERENCES

[1] J. Vijayalakshmi, K. PandiMeena ,"Agriculture TalkBot Using AI" International Journal of Recent Technology and Engineering (IJRTE) ISSN: 2277 – 3878, Volume-8, Issue-2S5, July 2019

[2] Diego Lopez Yse,"Your Guide to Natural Language Processing", January 5 ,2019

[3] Lalit Kumar, "Desktop Voice Assistant Using Natural Language Processing (NLP)", International Journal for Modern Trends in Science and Technology, 6(12): 332-335, 2020.

[4]] A. Gelbukh, "Natural language processing," Fifth International Conference on Hybrid Intelligent Systems (HIS'05), 2005, pp. 1 pp.-, doi: 10.1109/ICHIS.2005.79.

[5] Dibyendu Banerjee, "NLP Simplified" 14 April 2020.

[6] Zhang, Yin & Jin, Rong & Zhou, Zhi-Hua. (2010). Understanding bag-of-words model: A statistical framework. International Journal of Machine Learning and Cybernetics. 1. 43-52. 10.1007/s13042-010-0001-0.

[7] GeeksforGeeks, "Bag of Words model",8 March 2019

[8] Jocelyn D'Souza,"An Introduction to Bag-of-Words in NLP" April 3 2018