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Implementation of Multilingual Chatbot

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Abstract: Chatbots – otherwise called "conversational agents" – are software applications that mimic human speech to simulate a discussion or communication with a genuine individual. Chatbots measure the content introduced to them by the user, prior to responding as indicated by a complex series of algorithms that deciphers and recognizes what the user said, deduces what they mean, and decides a progression of fitting responses dependent on this data. The flaw in this technology is that, majority of the chatbots support English language only and not many have the expertise to impart in numerous dialects. We can't expect all the users using this technology to know and communicate in English, and despite that, a study shows that individuals are inclined toward imparting in their local language since it's more convenient. We've made our attempt to overcome this flaw by building a system that is plurilingual and can communicate in a total of 108 languages. Through this paper, we explain the development of a multilingual chatbot i.e., a bot that can converse with users in multiple languages, it can be a tremendous asset to any organization. This particularly holds true in an exceptionally semantically assorted nation like India.

Keywords: NLP, Machine Learning, Chatbot, RNN, Multilingual, Plurilingual.

I. INTRODUCTION

Chatbot can be described as an AI based software that recreates human discussions. They are otherwise called computerized associates that comprehend human inquiries. Bots decipher and measure the client demands and offer brief pertinent responses.

A chatbot is an assistant, controlled by rules and computerized reasoning, that you collaborate with by means of a talk interface. The help could be quite a few things, going from utilitarian to fun, and it could live in any significant applications (Facebook Messenger, Slack, Telegram, Text Messages, and so forth) or individually (Google Assistant, Siri, and so on).

There are two methodologies by which you can construct a chatbot:

- 1) *Retrieval Based Chatbot* - Retrieval based bots are the most widely recognized kinds of chatbots that you see today. Retrieval based bot has a vault or information of responses that it uses to settle the questions of an individual. In this technique, the bot is prepared to rank the best response from a limited arrangement of predefined responses.
- 2) *Generative Chatbot* - As the name suggests "Generative" in this methodology, the chatbot doesn't utilize a predefined repository of responses, they can produce a response all by itself. Preparation of this kind of bot requires contributing a great deal of time and exertion. Notwithstanding, still, you can't be certain what responses the model will produce. This sort of chatbot is infrequently utilized, as it requires the execution of complex algorithms.

Chatbots are being utilized habitually by individuals as means of communication, and a study predicts that 1.4 billion individuals are utilizing chatbots around the globe. Chatbots saw a 92% use increment since 2019, making it the brand correspondence channel with the biggest development. Chatbots can help organizations save approximately 30% on their customer service costs. By 2022, 75-90% of questions are relied upon to be dealt with by chatbots. The best component of chatbot is, it is a 24-hour administration. It is accessible to people anytime of anyway.

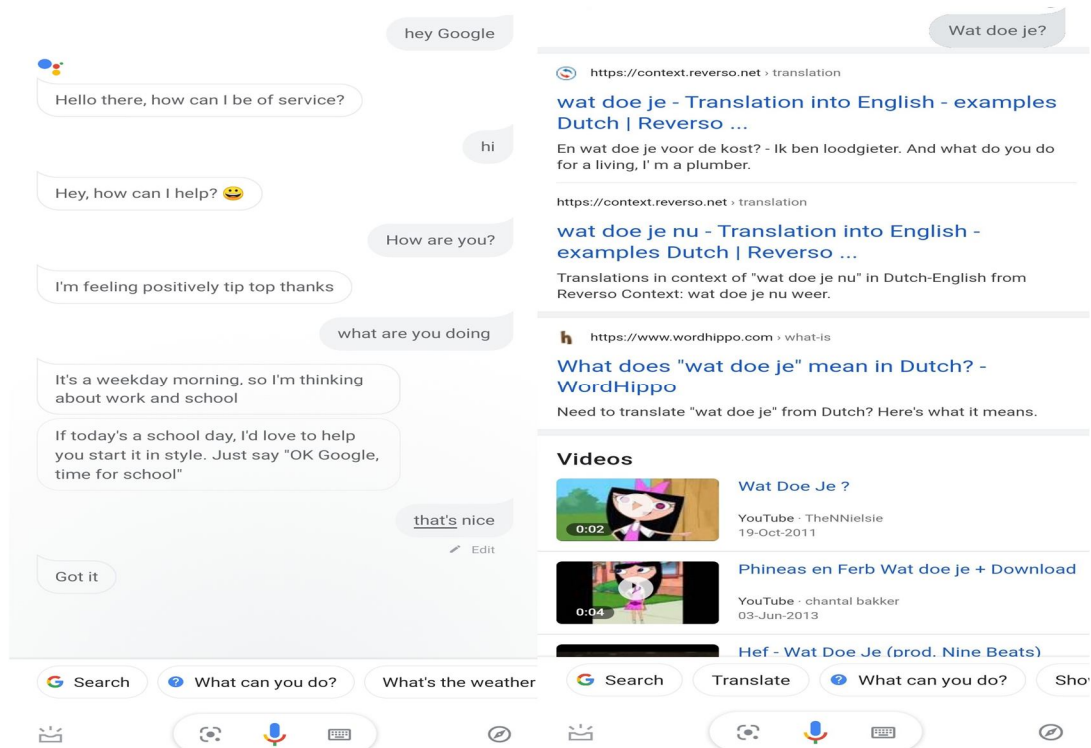
The problem with this technology is that most chatbots support English language only and don't have the ability to communicate in multiple languages. But most people prefer having conversation in their native language. Therefore, in this paper, we explain how we overcame this problem by building a multilingual chatbot that is able to communicate in multiple languages (total of 108 languages).

A. Existing System Overview

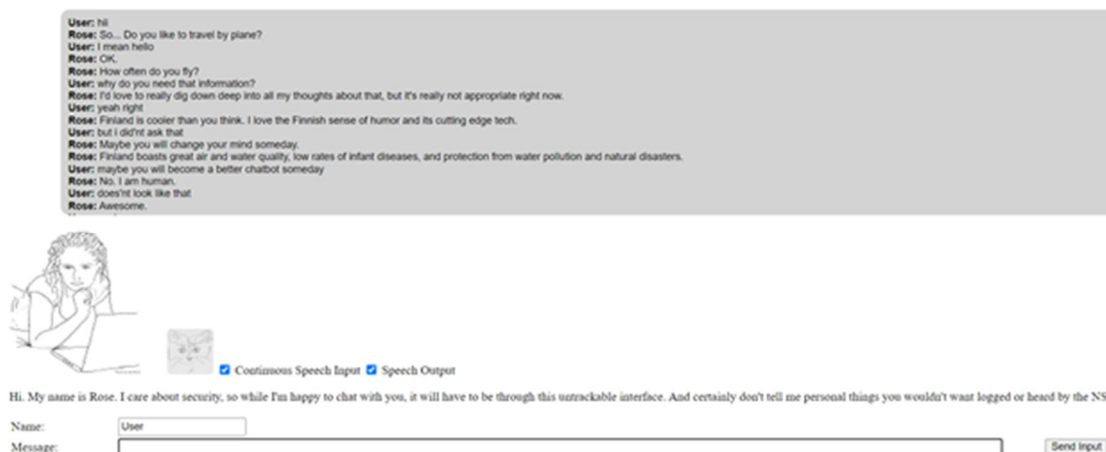
A couple chatbots presently in work have been examined underneath. We start by examining the response generation capabilities of Google Assistant then we proceed onward to comparative chatbots like Mitsuku and Rose, these chatbots are profoundly appraised and have done well in the Loebner Prize competition. Albeit, and a couple of others can utilize numerous dialects. For instance, the Mondly chatbot can speak in 33 dialects, Watson in 21, Memrise in 20, Duolingo in 3 and Eggbun in 3. Giving multilingual ability empowers developers to increase the value of their chatbots in light of the fact that individuals regularly really like to utilize their local language, regardless of whether they can speak another.

Talking about one of the finest virtual assistants existing i.e., Google Assistant. Google Assistant was created to be an individual assistant while developing on Google's current "Ok Google" voice controls which assist users with finding solutions to their inquiries in discourse, it can perform explicit errands or likewise it can direct users to arrive at different sources. Despite being so functional, it also has its disadvantages like, it cannot communicate in multiple languages, if you give input in any other language than English then it gives the Google search result, it has slightly longer response time and so on.

Below are the snapshots of how the existing system performs:



Here we can see that google assistant responds well till you speak with it in English Language however when you provide input in some unique language it either says "Sorry, I don't understand" or *it yields the google search results for that specific input*. Google Assistant is said to support 44 languages but that is possible only if we change its **language settings**, which means at a particular time it can speak only the selected language. This discloses to us that Google Assistant doesn't have the ability to automatically detect the language of the input and consequently it can't respond in the language that has been provided as input.



User: ciao
 Rose: Please don't go.
 User: que fais-tu?
 Rose: As a nation we have become biased about war.
 User: quid agis
 Rose: It's easy to be brave from a safe distance. That's why they invented generals.
 User: Cuéntame un chiste
 Rose: Cool.
 Rose: Wars usually result because governments lie to their people.
 User: what junk are you talking?
 Rose: Junk! - yeah I like to go by junk. I think Junk! - yeah I like to go by junk. I think, maybe, in the future people won't use a junk anymore - well not as a way to get from A to B.; communications are becoming so good - like Skype.; People just won't need to travel as much as they do now, but a junk is fun. So people will still do it!



☒ Continuous Speech Input ☒ Speech Output

Hi. My name is Rose. I care about security, so while I'm happy to chat with you, it will have to be through this untrackable interface. And certainly don't tell me personal things you wouldn't want logged or heard by the NSA.

Name:
 Message:

Above are the snapshots of our conversation with the Rose chatbot. This chatbot has won the Loebner prize award three times based on its intelligence and also a study showed that it is better than most of the existing chatbots in terms of humanity i.e., humanly conversations. Contrary to its capabilities, as we can see above, it doesn't respond according to the input provided. Additionally, we took a stab at speaking with it in Italian, French, Latin and Spanish yet it didn't understand any of it which clarifies that it can't communicate in any language other than English.

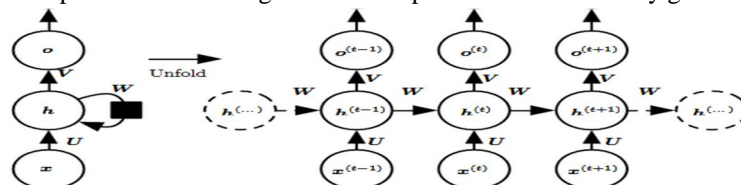
B. Implemented System

We have built a system that overcomes the drawbacks of the existing system as we discussed in the previous section. The plurilingual ability of the system makes it flexible and congenial for its users. We developed a retrieval based chatbot that has been preprocessed, tokenized, loaded, trained and tested. The system uses Recurrent neural Networks in python for text generation. After this, the chatbot is linked to Google Translate, allowing users to chat in any of 108 different languages. For the development of GUI, we've used tkinter, one of the best UI packages that python offers. Tkinter allows us to work with a variety of widgets, control our application and make our application interactive.

1) Technologies Used

The following are the subtleties of the technologies we've utilized:

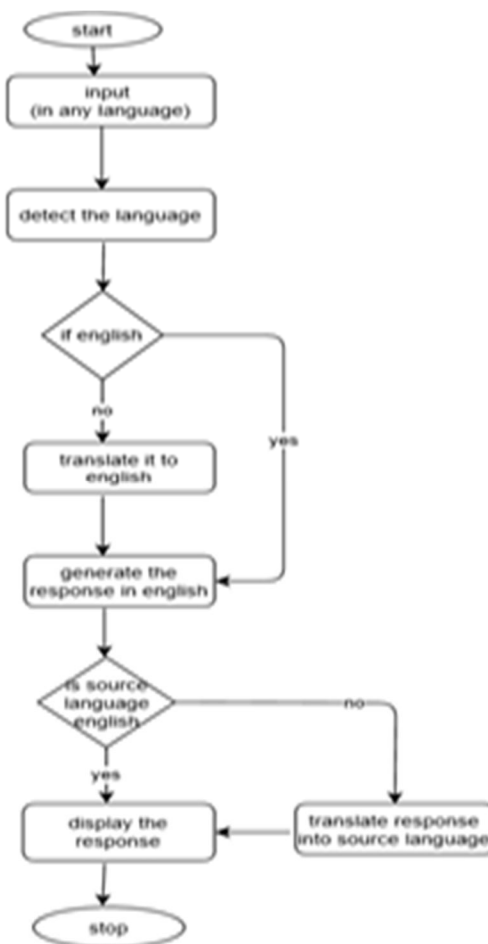
- RNN:** Recurrent neural networks (RNN) are a category of neural networks that's powerful for modeling sequence information resembling statistics or natural language. A Recurrent Neural Network (RNN) is a type of Artificial Neural Network wherein the association between various nodes forms a directed graph to give a fleeting powerful conduct. It assists with displaying consecutive information that is obtained from feedforward networks. With the Recurrent Neural Network (RNN), you can model storage devices to preserve data and simulate short-term dependencies. A recurrent neural network appears quite almost like a standard neural network except that a memory-state is intercalary to the neurons. The computation to incorporate a memory is simple. In a typical neural network, the model generates the output by multiplying the input by the weight and the activation function. In the case of an RNN, this output is sent back to itself several times. We call timestep the time span in which the output becomes the input of the following matrix multiplication. Let us briefly go through a basic RNN network.



The left half of the above diagram indicates documentation of an RNN and on the right an RNN that is unrolled (or deployed) in a complete network. When unrolling, we imply that we are computing the network for the entire sequence. For example, if the arrangement we are interested in is a three-word sentence, the network will be expanded into a three-layer neural network, with one layer for each word.

- b) *Natural Language Processing*: Natural Language Processing or NLP is a field of Artificial Intelligence that enables the machines to peruse, comprehend and get significance from human dialects. It is a control that centers around the connection between data science and human language, and is scaling to heaps of ventures. In straightforward terms, NLP addresses the programmed handling of natural human language like speech or text, and albeit the actual idea itself is captivating, the genuine worth behind this innovation comes from the use cases.
- c) *spaCy*: spaCy is a free, open-source library for NLP in Python. It's written in Cython and is intended to fabricate data extraction or natural language understanding frameworks. spaCy accompanies a ton of in-constructed abilities. It's getting progressively mainstream for preparing and examining data in NLP. Unstructured textual data is delivered at a huge scope, and it's essential to measure and derive insights from that unstructured data. To do that, you need to address the information in a configuration that can be perceived by machines/computers. NLP can assist you with doing that.
- d) *Tkinter*: Python has a great deal of GUI frameworks, but Tkinter is the solitary structure that is incorporated into the Python standard library. Tkinter has several strengths. It's cross-platform, so the same code works on Windows, macOS, and Linux. Visual components are delivered utilizing local working framework components, so applications working with Tkinter seem as though they have a place on the stage where they're run. Tkinter is lightweight and relatively painless to use compared to other frameworks. This makes it a compelling choice for building GUI applications in Python, especially for applications where the top priority is to build something that's functional and cross-platform.
 - Get started with Tkinter by building a Window for your application. Windows are the containers in which all other GUI elements live.
 - Work with widgets, such as buttons, text boxes and many more.
 - Control your application layout with geometry managers.
 - Make your applications interactive by associating button clicks to Python functions.

2) Flowchart



Implementation of the system is done by considering the step wise execution of the above flowchart:

- Stage 1:** Initially the input is fed to the chat box, which can be in any language. Then the input language is identified with the help of the detect function within the google translate package.
- Stage 2:** Once the language is recognized, we check whether the language is English or some other language. In the event that the language isn't English, we convert it to English using the translate function.
- Stage 3:** After the input is converted to English language, it's now time for generating the response. The response is generated by using the Recurrent Neural Network's Sequential Model for text generation.
- Stage 4:** Post response generation, we check what the input language is. If it was English then we display the response as it is, if not, we convert the response to the source language using the translate function and then display the response.

3) Table of Comparison

Inputs	Rose Chatbot's Response	Google Assistant's Response	Our Chatbot's Response
Hi	So...Do you like to travel by plane?	Hey, how can I help you?	Welcome, may I know your name?
How are you?	I'm fine. How are you?	I'm feeling positively tiptop thanks	Hi, I am good thank you
What are you doing?	I am doing several things simultaneously	I am pretty much always learning new things	I am talking to you
je suis désolé (I'm sorry)	Do you have a degree?	Sorry, I don't understand	Aucun problème (No Problem)
no quiero hablar contigo (I don't want to talk to you)	What is this junk	*Gives search results*	Mis disculpas (My apologies)
अलविदा (Goodbye)	That's pure gibberish	*Gives search results*	जल्द ही फिर मिलेंगे (See you soon)

- Description:** Above table shows the sample inputs and subsequent responses of the rose chatbot, Google assistant and our chatbot. It may very well be seen that the responses for inputs in English language of the rose chatbot were not fitting enough though the google assistant gives legitimate responses and as is the situation with our chatbot. However, when the input language changes from English to some other language (i.e., French, Spanish and Hindi respectively). The Rose chatbot can't identify the input so it declares the input as junk and gibberish whereas the google assistant either says that it didn't understand or it gives the google search results for the inputs. However, we can see that our chatbot not only recognizes the input language but also processes the input, generates the response and gives the output in the very language as that of the input language. Which beats every one of the downsides looked by rose chatbot and google assistant.

4) Outcomes

Following are snapshots of a series of inputs of users and corresponding responses of our system in English and a couple of other languages.

As should be obvious, the framework is responding very well in English just as in different dialects.

Also, the replies of the chatbot are not repetitive. For instance: we asked "how are you" in both English and Russian language and the response was distinctive for both, same is the situation when we asked "what are you doing?".

This feature of randomization of replies makes the system more human-like unlike few of the chatbot out there which give repetitive responses.

Chatbot

You: hi
Bot: Yes hi, what is your name?

You: I'm human
Bot: OK! Hola Human

You: yes
Bot: Yeah

You: how are you
Bot: Hello, I am good thank you

You: what are you doing
Bot: I am just chilling, having some coffee

You: nice
Bot: mm-hmm

SEND

Chatbot

You: مرحبا
Bot: اسمك؟ ما. بلقائك سعدت مرحبا

You: аз съм човек
Bot: Готино! Здравейте човек

You: Wie geht es Ihnen
Bot: Hey, ich bin toll danke! wie gehts?

You: 我很好
Bot: 是的

You: Что делаешь?
Bot: Борьба против COVID.

You: आज की तारीख और समय क्या है
Bot: 03-04-2021 16:59:45

SEND

Arabic – Hi
- Hi, Nice to meet you. What is your name?

Bulgarian – My name is Human.
Cool! Hello Human.

German – How are you?
Hey, I am great, thanks! How are you?

Chinese – I am good
Okay

Russian – What are you doing?
Fighting against COVID.

Hindi – What is today's date and time?
- * displays date and time *

II. CONCLUSION

To conclude, we initially explained the chatbot technology, then we discussed the limitations of the existing chatbots/virtual assistants and how they can be improved. Afterwards, we clarified the subtleties of execution of our framework which curbs the deformities of the current ones with the assistance of a flow diagram which is then trailed by the explanation of technologies utilized. We then examined and compared the responses produced by the existing systems and our implemented system in the form of a table. At last, we attach real time snapshots of our system which communicates in multiple languages.

III. FUTURE SCOPE

The future scope is to extend this system and make it a generative chatbot. Also, it can be made as a multilingual virtual assistant so it can be more functional, which means it can perform various tasks like play a song, set an alarm, make a call and so on. We can integrate this system with various applications such as Amazon, Zomato, etc. for helping the users solve their queries in numerous dialects. One can also add speech to text conversion capabilities to this chatbot.

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