Augmented Intelligence Multilingual Conversational Service for Smart Enterprise Management Software

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Abstract. Conversational agents are gaining popularity in the corporate world as a way to increase customer experience and economic competitiveness. Additionally, developments in augmented intelligence systems employ natural language processing to provide the industry with natural and clear interaction experiences. Multilingual conversational bot or Chabot is important in every area of life, especially in a multicultural community recognized for its numerous accents and slang among many social groupings Moreover, most present Chabot systems only handle one language at a time, and the training session is cumbersome since it needs various dialects for different purposes. This research presents a multilingual chatbot that allows clients to converse in many languages as if they were conversing with a real person to achieve a smart enterprise management software. The proposed system was implemented using React.JS and python programming language on a Pentium III processor speed of 600 MHz minimum. The proposed multilingual service will deal with the limitation of the existing system by developing a system that will allow multiple languages on chatbot agents. The system will allow the users to converse in their languages, which will make communication easy between the system and the users. The proposed system will include a user-friendly interface that will assist in guiding each user on how to utilize it effectively without any specialized training.

Keywords: Augmented Intelligence · Chatbot · Conversational agent · Rule base · Software development

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O. Gervasi et al. (Eds.): ICCSA 2022 Workshops, LNCS 13381, pp. 476–488, 2022.
https://doi.org/10.1007/978-3-031-10548-7_35

1 Introduction

An Augmented intelligence entails humans and robots collaborating to maximize company value by appealing to their respective strengths. This is an alternate paradigm of artificial intelligence that emphasizes AI's assisting role in developing human skills, reflecting AI's continual effect on enhancing human creativity. Artificial intelligence is being used in a wide range of everyday tasks [1, 2]. Among the most commonly used applications include navigation, which can forecast road congestion; real-time language transcription using cameras; online platforms, which help individuals explore different information of personal value or involvement; movie proposals; email spam and ransomware filtering; online customer assistance; Chabot, among others.

Multilingual Conversations or Chatbots are software applications that use natural language to connect with individuals. This technology began almost six decades ago to see if chatbot software might deceive consumers into thinking they were actual humans [3]. Chatbot systems, on the other hand, are not just designed to replicate human communication; they are also beneficial in a variety of industries like education, knowledge discovery, industry, and e-commerce. Chatbot apps improve customer experience by streamlining communication between humans and enterprises [4]. Chatbots have become increasingly important in a variety of businesses [5]. Chatbots such as Apple's Siri, Microsoft's Cortana and XiaoIce, Google Assistant, Facebook Messenger bots, IBM's Watson Assistant, and Amazon's Alexa have all received significant interest [6]. Nevertheless, developing bots with simulated cognitive capacities is still in the works. Studying complicated user behavior under numerous settings and circumstances can be essential to improving a system's user experience [7]. Chatbots ought to be able to do more than only comprehend things offered in message queries to better replicate human emotional skills, such as reading the mood of text/voice and assessing facial gestures [8]. This is where augmented intelligence of Things comes into implementing an intelligence chatbot for a smart enterprise management system.

The physical world is transformed into being digitized and makes everything connected [9]. The development of mobile and network devices, along with modernization, has changed the way people interact with each other and engage with organizations [10]. The proliferation of wireless networks and mobile devices has resulted in the expansion of electronic business [11, 12]. Which presents several benefits for entrepreneurs by facilitating the growth of commercial activity and enabling operations that were previously impossible [13]. As a result, various firms, including airlines, fashion labels, and insurance organizations, have begun to provide services to their clients using chat applications. Airlines now allow passengers to check-in, make suggestions, and receive the latest information via Facebook messaging. Fashion firms provide clients with stylistic tips based on prior purchasing or personal tastes, and insurance companies manage claims using chat applications. Customers and businesses may engage via text messaging, a generally known form of communication, and a basic interface when using mobile messenger software [14]. Customers may quickly reach out to firms by messaging, rather than phoning, e-mailing, or launching an app, at a time that is convenient for them.

Augmented intelligent multilingual conversational services can be used to facilitate interactions between a business and its customers to enable a smart enterprise management system [15]. The conversation service achieves this by creating natural language

as output [16]. The use of chatbots by corporations is not a new concept. Chatbots have been around for quite a long period in electronic web-based applications and are often employed to ease customer care. Chatbots, on the other hand, are now migrating to the mobile messaging platform. The use of mobile messenger chatbots for business reasons is at the start of a trend known as 'conversational commerce.' Chatbots can answer via the messengers interface with comments, suggestions, changes, links, or call-to-action buttons, and users can browse for items by scrolling through a product carousel [17, 18]. A chatbot can identify the buyer's purpose and adjust products depending on the buyer's preferences and tastes. It can then help with the purchase, ordering, and delivery processes [19].

The focus of this study is to enhance the chatbot agent with the augmented intelligence of things for multiple language interactions among the users with rule base approach to achieve a smart enterprise management software. This study switched between English and French during the conversation with the client. This will cause the conversational agents to find it enticing since it can consolidate and reduce the steps of the purchasing process to become a "one-stop shopping" platform.

The remaining part of this research is structured into various sections: Sect. 2 describes the review of related works, and Sect. 3 described the material and methods. Section 4 presented the result and discussion while Sect. 5 presented the concluding part of the research.

2 Related Works

Ralston *et al.* [2] investigated the chatbot-related API packages provided by Google, Amazon, and IBM, and suggests a chatbot system for student support. The study used Watson Tone Analyzer to analyze the student mood and Watson Language Translator API to provide the standard chatbot base. The study's comparative analysis indicated that IBM Watson provided the most effective alternatives for assessing textual tone information in terms of attitude. However, the question-answer bank for all possible questions needs to be inputted manually and Assign them to intentions in the chatbot's expertise specification to respond correctly to user interaction requests.

Kasinathan, Mustapha, and Bin [20] the study presented a multilingual chatbot system that will enable businesses and organizations to build and launch their customized multilingual chatbot solution with enhanced capabilities The research implemented Type-Script for frontend web application development and Go for backend development while Dart was used for the mobile application. The constructed prototypes are then tested using a research instrument, with the results indicating that the suggested scheme might help local firms and enterprises establish their chatbot system as a substitute for conventional customer support. However, the limitation to the study was that of adding support for more languages and improving language models for better matching accuracy.

Vanjani, Aiken, and Park [21] the study surveyed chatbots for multilingual conversations. The study established that chatbots may be used to deliver multilingual supportive services to customers Conversely, while several chatbots have been built in other languages, the majority now talk solely in English, with only a handful able to interact

in many languages. Multilingual chatbots, when properly constructed, can provide an online communications alternative that crosses language borders. A team of undergraduates assessed the English translations of the chatbot's responses in this investigation. The results suggest that German and Spanish comments were clear and natural, whereas Korean ones were less so. The study indicates encouraging findings in the future usage of multilingual chatbots to enable global communication, with business potential in the employment of such chatbots to provide customer support and online live connection with clients worldwide.

Zheng *et al.* [22] surveyed hybrid-augmented intelligence, collaboration, and, cognition. The study outlines a basic framework for human-computer cooperative hybrid-augmented knowledge, as well as the fundamental features of cognitive-based hybrid-augmented intellectual capacity. Common implementations of hybrid-augmented intellectual ability are explored, including controlling manufacturing intricacies and threats, participatory decision-making in organizations, online smart learning, medical and universal health care, public safety and security, human-computer interactive driving, and cloud robotics. The study encourages both business and academics to research and improve hybrid-augmented intelligence, both theoretically and practically.

Li *et al.* [23] The IBM Watson Language Translator API was used to establish an efficient billing transaction processing for a global corporation that provides safe language translation across many dialects. The system also contains a review method that enables users to rate how well their lexical items are converted on a routine basis, which helps to improve the learning algorithm.

Marbouti *et al.* [24] IBM Tone Analyzer was used to scan online tweets to uncover pertinent information that may be useful in an emergency case. The Tone Analyzer was included in this application to assess the emotional resonance of a given tweet. Using this information, as well as an assessment may be done to classify and categorize twitter posts in process of extracting vital information in the event of an emergency based on information about the operator and the receiver(s) of the message. This is an appropriate use case that suggests combining IBM Tone Analyzer with our proposed chatbot.

Mlakar *et al.* [25] work on an execute-related investigation that links artificial intelligence (expressed speech methods, conversational intellect) and natural sciences (encapsulated interactive bots) to create a system that permits symmetrical computer-mediated communication. Its task is to gather client data and integrate it into medical workflows as electronic health materials (the Fast Healthcare Interoperability Resources). The research utilizes the system's core elements, including the mHealth software, the Open Health Connect framework, and techniques to provide voice voice-enabled conversational agents to cancer survivors in five distinct languages. The system suggested a way to incorporate potential advantages and distribute them to people.

Nuruzzaman and Hussain [26] the article give an overview of contemporary chatbots and the methods used to construct them. It examines and evaluates the connections, variances, and limitations of existing chatbots. The research looked at the functionality and technological attributes of the top 11 chatbot technology platforms. According to studies, around 75% of customers have experienced poor customer service, and delivering relevant, comprehensive, and insightful responses remains a challenging task. Earlier, methods for developing chatbots relied on hand-written guidelines and patterns. When

deep learning become prominent, end-to-end neural networks quickly surpassed them. Deep Neural Networks, in particular, is a powerful generative-based methodology for overcoming conversational response generating challenges. This paper conducted an in-depth review of recent literature by examining over 70 articles relevant to chatbots published in the last 5 years. This study examined selected studies depending on the approach adopted, based on a review of the literature. This study also examined why previous chatbot models fail to consider when creating responses and how this affects dialogue effectiveness.

Hussain, Ameri, and Ababneh [27] focus on chatbot categorization and chatbot creation strategies, in which the authors investigated chatbot categories of task-oriented and non-task-oriented chatbots. These categories were discussed during a discussion on how chatbots utilize conversational context. The authors investigated a variety of machine learning methodologies, including Recurrent Neural Networks, Sequence to Sequence neural concepts, and Long Short-Term Memory networks.

Bavaresco *et al.* [28] the paper provide a thorough review of the literature on the usage of conversational agents in commercial domains. The study addressed three basics, three specific, and two statistical research issues using a selected literature corpus. The corpus was created by scanning information sources for publications, using inclusion and exclusion criteria, and then filtering them. The study questions addressed the business areas studied, as well as the fundamental aims and future difficulties. This review's contributions demonstrate that the study area of conversational agents in business lacks this method of enriching the agents. The findings and outcomes of this review may influence future research possibilities in conversational agents in business domains.

Kaghyan *et al.* [29] outline the reasons for the increased utility of chatbots and their future in the corporate context. They also advocated a dialogue on platform development by comparing skills, strengths, and constraints. Meyer et al. [30] carried out the investigation that most closely resembles this work. The authors organized a literature analysis of chatbots in digital workplaces, analyzing employee support in their regular job. They propose a system of searching and filtering using scientific databases as a source of papers in the study. The primary goals of the research were to categorize the chatbot application fields and to assess the potential and objectives of the articles In addition to business uses.

From the list of works of literature, it can be concluded that chatbot is an important aspect of enterprise management software development and many other related fields. In recent times, corporations have discovered uses for chatbots that go beyond service delivery. Chatbots are playing important roles in advertising and promotion. They're quickly gaining popularity among firms trying to automate customer care, marketing, or sales. People are eager to interact with chatbots, and some even prefer this mode of contact to human representatives. Therefore, this study contributes to the body of knowledge by engaging the use of augmented intelligence to develop a multi-language conversation software for various organizations to achieve smart enterprise management software.

3 Material and Methods

This section presents the methodology used to conduct the study. The system is designed using a rule-based method that makes it entitled Conversation Training Data. The training is categorized into three major subsystems which are; Facts, insights, and guidelines from NLU Utilizing top tier keys, the training sample parser identifies the training data type. The area utilizes the same YAML structure as the learning algorithm and can be divided into numerous files or concatenated into a single file. The domain covers reaction and form specifications. Each of the subsystems described above serves a unique purpose for the platform.

A. Stories

Stories are made up of:

Narrative: The title of the story. The name is generic and is not utilized in coaching; nevertheless, it can be used as a human-readable description for the tale.

Metadata: random and unnecessary; not used in training; can be used to hold necessary details about the tale, such as the author's name.

A step-by-step guide: The tale is made up of respondents and activities.

Each of the subsequent steps can be taken:

- A user statement comprised of purpose and entities.
- An Or Expression that contains two or more user messages.
- A bot operation.
- A form.
- A time slot was assigned to the event.
- A checkpoint that links one tale to another (Figs. 1 and 2).

```
stories:
- story: story with a form
  steps:
  - intent: find_restaurant
  - action: restaurant_form              # Activate the form
  - active_loop: restaurant_form         # This form is currentl
  - active_loop: null                    # Form complete, no for
  - action: utter_restaurant_found
```

Fig. 1. Structure of a form. A form is a type of customized activity that provides the logic to cycle over a list of needed slots and ask the user for this knowledge.

B. Checkpoints

Checkpoints are indicated using the guard post: key, either at the start or conclusion of a tale. Checkpoints are used to link storylines. They might be the first or last stage in a tale (Fig. 3).

```
stories:
- story: story with a slot
  steps:
  - intent: celebrate_bot
  - slot_was_set:
    - feedback_value: positive
  - action: utter_yay
```

Fig. 2. Structure of a slot. A slot activity is defined by the key slot was set: with the space title and, possibly, the space values.

```
stories:
- story: story_with_a_checkpoint_1
  steps:
  - intent: greet
  - action: utter_greet
  - checkpoint: greet_checkpoint

- story: story_with_a_checkpoint_2
  steps:
  - checkpoint: greet_checkpoint
  - intent: book_flight
  - action: action_book_flight
```

Fig. 3. Structure of a checkpoint. Checkpoints can assist to clarify training sets and eliminate duplication, but they should not be used excessively.

C. Rules

The guidelines are given under the principles area and resemble tales. A rule also includes a steps key, which holds the same set of steps that tales do. Rules might also include the discussion beginning and criteria keys. These are used to define the parameters under which the policy must be applied.

Regulation with a prerequisite that appears just like (Fig. 4):

```
rules:
- rule: Only say `hey` when the user provided a name
  condition:
  - slot_was_set:
    - user_provided_name: true
  steps:
  - intent: greet
  - action: utter_greet
```

Fig. 4. Structure of a rule

D. Test Stories.

Test tales determine if a statement is appropriately categorized as well as the response forecasts.

Test scenarios have the same syntax as narratives, with the exception that user communication steps might include a user defining the user message's actual content and object descriptions. Here's an illustration of a test narrative (Figs. 5, 6, 7 and 8):

```
stories:
- story: A basic end-to-end test
  steps:
  - user: |
      hey
    intent: greet
  - action: utter_ask_howcanhelp
  - user: |
      show me [chinese]{"entity": "cuisine"} restaurants
    intent: inform
  - action: utter_ask_location
  - user: |
      in [Paris]{"entity": "location"}
    intent: inform
  - action: utter_ask_price
```

Fig. 5. Structure of aest stories.

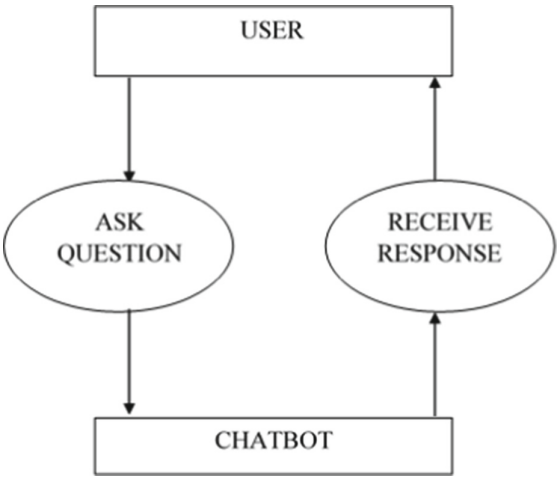

Fig. 6. Flow diagram of chatbot design

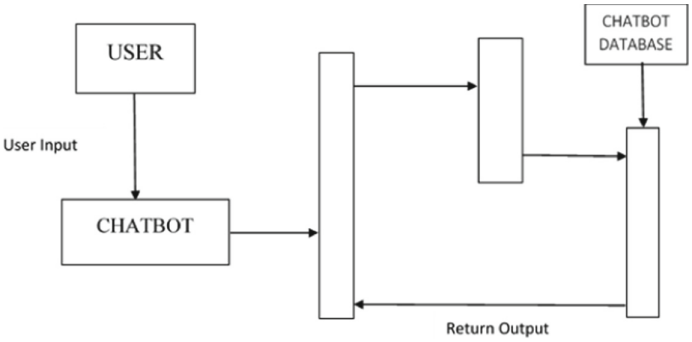

Fig. 7. Sequence diagram representing design of the proposed chatbot.

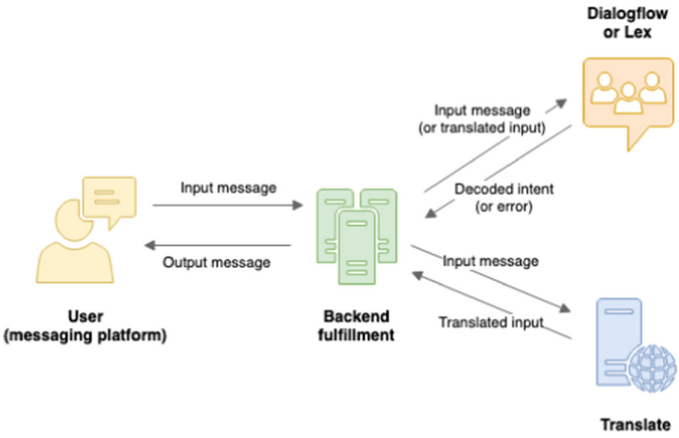

Fig. 8. Diagram representing the proposed multilingual Chatbot.

4 Results and Discussion

This program is designed to enable users to interact with chatbots in multiple Languages, as well as get the replies in their choice of language. Figure 9 Shows the NLU simple chatbot system, this is where the interaction with the chatbot takes place. As it is using a rule-based approach, the system is designed to offer support for adverse drug reactions, Blood Pressure, Hospitals, and Pharmacies (Fig. 10).



Fig. 9. NLU Multilingual chatbot interface.



Fig. 10. Interaction with the chatbot in English.

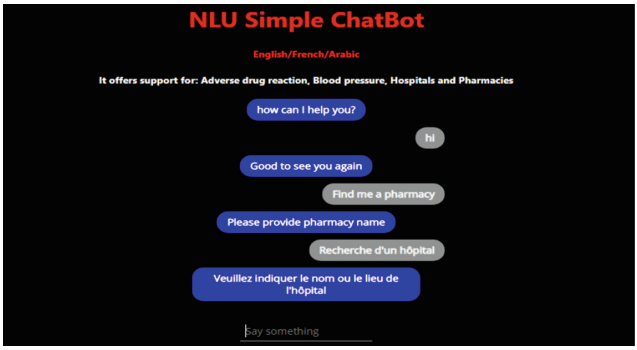

Fig. 11. Interaction with the chatbot in both English and French.

Figure 10 Shows the interaction with the system in English, the User starts the conversation with greetings like “Hi there”, “How are you”, “Is anyone there?”, “Hey”, “Hola”, “Hello”, “Good day”. Figure 11 Shows the interaction with the Chatbot in French language, User start the conversation with greetings like “Bonjour”, “Comment allez-vous”, “Quelqu’un est-il là?”, “Hé”, “Hola”, “Bonjour”, “Bonjour” Or it can also start by asking questions related to the support the chatbot offers like asking “Recherche d’un hôpital”. And the system replies to the conversation with the same language French.

5 Conclusion and Recommendation

Augmented Intelligence Multilingual Conversational service is a way to increase organizational functional efficiency and minimize expenses while offering clients comfort and significant operations. They enable firms to respond swiftly to a wide range of consumer inquiries and concerns while reducing the need for human intervention. This research developed a multilingual conversational bot software development to converse with clients speaking languages enhancing engagement and conversations. Modern chatbots were designed with the incapacity to communicate in many languages at the same time; however, switching language preferences requires the development of a distinct chatbot, which adds time complexity and costs [31]. Our proposed system is flexible in terms of time complexity as a single chatbot converses both in English and French language without the need to build a new separate chatbot. As displayed in Fig. 11, our proposed system can converse in multiple languages simultaneously.

Chatbots are a smarter method to ensure that clients get the fast response they need without having to wait in line. Conversational multilingual bots are constantly accessible to engage clients and provide them with rapid responses to frequently requested questions. Therefore this proposed system will help to engage customers which is perhaps the most effective approach to reduce bounce rates and, as a result, increase conversions in multilingual mode simultaneously.

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