Chatbot for Business Environment Using Botpress Conversational AI Platform

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Abstract - *In this paper a proposition is carried on how the AI Chatbot can benefit the corporate Business management. Over the last decade, a several studies have been made on how Chatbot impact business by improving customer service. Chatbot can not only be used for enriching customer experience but can also help in the internal business task management by assisting developers and managers to ease their work. In huge organization business process management and project management software plays a major role as the management is a challenging task and even the smallest mistake can cost major loss to the company. These management software has various subdivisions and segments, when there is some conflict or issue at some phase it has to be resolved immediately to keep up productivity, but all the phase does not have reporting features, this requires navigating to a particular page and have to give details about the issue which slowdowns the workflow. This is where Chatbot contributes to the business environment. The proposed chatbot is designed and implemented using Botpress framework and uses Natural Language Processing and Natural Language Understanding for query processing and analysis, this Chatbot can be easily integrated into the management software and provides 24/7 assistance to resolve issues.*

*Key Words***:** Chatbot, Botpress, Business process management, Project management, Natural Language Processing, Natural Language Understanding.

1. INTRODUCTION

In Business environment, developers demand excellent service from business models, so that developers can accelerate their development by accessing the different knowledge source, links between software and platforms allows developers to speak to each other to collaborate and integrate their thought process. Currently, many businesses provide this type of service via phone service, live chat, email support, but it takes time to answer queries for all such support services that are provided by human to human. Waiting time increases with increasing number of users, resulting in poor user satisfaction and certainly costs lots of money [1], [2], and [4].

The Proposed solution is to build Chatbot system which provides one common platform where all the queries and issues can be addressed and resolved [3]. Chatbot is an assisting tool that conducts a conversation via text or auditory methods, and it is a virtual assistant that integrates into apps or software or websites and makes the job easy.

Unlike typical method, which are one-way and provides delayed response, Chatbot provides interactive communication using ML and NLP to understand the user's language and are intelligent enough to learn from the conversation [5]. Chatbot is becoming more popular in business environment right now as they can handle multiple users at a time and reduce the cost of customer service [1], [7]. Bots are programmed to give automated answers to repetitive questions immediately, bot provides 24/7 service regarding any issue, any time of the day, which improves customer experience and bot always treat the customer in the perfect way, no matter how rough the person is or how foul the person's language is[6], [7].

Botpress open-source conversational AI bot creation platform is used to design, build, debug and deploy AI-based conversational assistants. It is written in JavaScript and driven by a rich collection of open source modules that the community has built up. Botpress has advantages over other the platforms, it runs completely On-premise, so that one has full control over the data that that goes in and out. It is simple and intuitive but provides flexible easy-to-use graphics.

2. LITERATURE SURVEY

In Paper [1] proposes University FAQs Chatbot, designed using Latent Semantic Analysis (LSA) and Artificial Intelligence Mark-up Language (AIML). AIML does not provide intelligence, thus adding sentimental analysis gives right reactions to random questions. AIML responds general and Template based questions and LSA is used to provide responses for other service-based questions that will satisfaction user. In [2], Godson Michael proposes a system architecture to analyse social messages from huge volumes of users and take appropriate action to respond to user queries using cognitive services and LUIS and this system is deployed on the AWS cloud platform. In [4] the Automated FAQ Chatbot developed using Recurrent Neural Network - Long Short-Term Memory (RNN-LSTM) automatically responds to customers using a RNN for text classification in the form of LSTM. In this paper [5] proposition is carried on implementing college chatbot using both AIML and NLP to enhance college website's user experience. AIML files are used to create knowledge base for normal conversation and to stores the question and answers pair. Information extraction from the input text is done using "nltk" package.

In [7] Belfin R V proposes AI and NLP based Cancer Patients assisting chatbot, it is designed using Sentiment analysis to identify the mood of the patients. The NLTK package is used for pre-processing, the Web Scraping is used for data processing and analysis, and graph database- Neo4j is used to convert data into a graph model. This method helps to efficiently process and easily identify the relationship between highly connected data.

3. METHODOLOGY

The methodology focuses on two phases: Knowledge abstraction and modelling, and Conversation Flow. Knowledge abstraction and modeling: This phase processes user queries, extracts knowledge and determines how knowledge is represented and stored. Conversation flow: Based on the data extracted system determines the DialogFlow and response to the user query. Fig 1.1 gives the general workflow of Chatbot system.
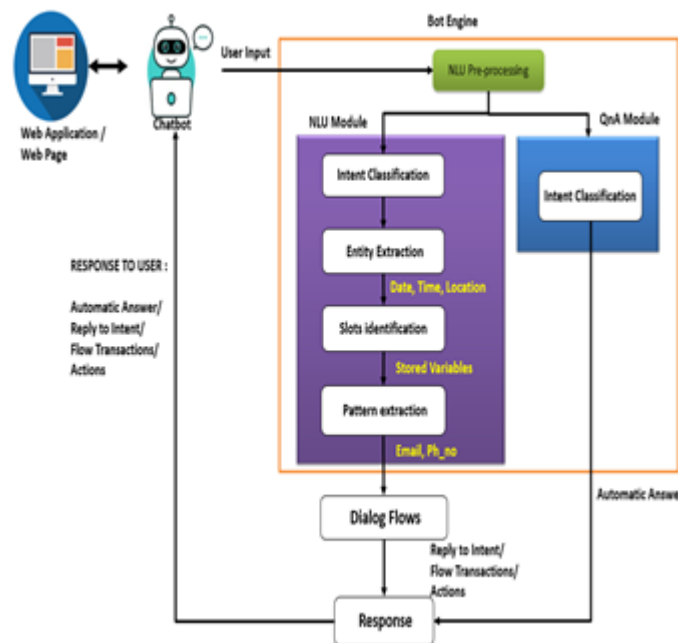

Fig -1 Chatbot Workflow Diagram

3.1. User Authentication
Chatbot on receiving a user request first performs user authentication, based on the authentication result, if the user validation is successful, Chatbot gives an introduction and waits for the next request.

3.2. Data Extraction, processing and Analysis
Raw data received from the user are sent to the NLP (Natural Language Processing) model to perform data pre-processing and abstract knowledge. NLP module will process every incoming query and then sends the processed data to the NLU and QnA modules to perform query analysis and provides the appropriate result.

A. NLP text pre-processing
Natural language processing is a subfield of computer science and artificial intelligence, concerned with interaction between human and computers. NLP provides the ability for the computer to analyze and derive meaning from human (natural) language. Here NLP is used to perform query preprocessing and analysis.

- **Tokenization** – Tokenization is a problem of splitting/dividing a text or string into a list of tokens. Tokens are the smallest entity such as a sentence is a token in a paragraph and word is a token in a sentence.
- **Text Lemmatization and Stemming** – Lemmatization and Stemming are text normalization techniques that converts the inflected words to their root forms
- **Stop Words** – Stop word refers to the most common words such as 'the', 'a', 'and', etc. Stop words are removed because they can add noise. For Ex: "I'm facing login issue, when I login, page just logs me out. How to resolve this?", the entire query does not contributes to identity the issue, the main text required is 'login', 'issue', 'logs', 'out', thus the query will be processed to remove stop words.
- **Regex** – Sequence of characters (non-words) defined as search patterns such as emails, newlines and extra spaces are filtered using the regex package.
- **Bag-of-Words** – It is a simple and popular feature extraction technique. It is used to processed text and represent as bag-of-words that describes occurrence of words within a document.
- **TF-IDF** - It is a statistical method used to determine the relevance of a word to a document in a corpus or a collection. It penalizes words that are common across all the documents. The value of the TF-IDF score increases in proportion to the number of times the word appears in the corpus.

B. NLU and QnA module
The Botpress engine provides NLU and QnA modules to perform Language Identification. The NLU module will processes all the queries from the user and performs Slot Tagging, Entity Extraction, and Intent Classification while the QnA module performs Intent Classification and returns the associated solution. The structured data provided by above tasks are stored directly in the message metadata (under *event.nlu*) that are used by the other components and modules.

- **Intent Classification**

The Intent classification detects the user Intents. It is better and more accurate way to understand the intention/statement of the user than to use keywords. Intents are detected and stored in metadata and when a particular Intent is recognized within a specific flow, the flow metadata is used to create transaction. The event.nlu.intent.name variable in flow transactions or actions or hooks is used to reply to the intents. For Example Intents can be like "Help", "Access Issue "and, "Provide document" and so on.

- **Entity Extraction**

The Entity Extraction extracts known entities from phrases and performs normalization on it. It is added to NLU module, it can be either System or Custom entities. These entities are available in the *event.nlu.entities* variable in flow transactions or actions or hooks, which can be used to access and use data.

System Entities - For known entity extraction Botpress NLU engine uses Facebook/Duckling to provides a handful of system entity extraction such as Date, Time, location, etc. and also ships a system entity of the type any which is essentially a placeholder.

Custom Entities – Custom entities provided by Botpress are of two types: List entity and Pattern entity.

- **Slot Identification**

Slots are another key concept in Botpress NLU, to perform the transaction and actions associated with the Intent these parameters are necessary. For Ex: "Username", "Order number", "Email ID", etc.

   Slot Tagging – each words in the user input is tagged by Bot engine, the slot will be added to the NLU extraction event when correctly identified as an intent, and by using the name as key, slot can be accessed in the *event.nlu.slots* map.

   Slot Filling - Intent slots are considered as optional, if they are required for the desired task, they must be handled manually in conversational flow design using the Flow Builder.

- **Pattern extraction**

For each incoming message, NLU will perform a regex extraction and adds it to *event.nlu.entities*.

- **Sensitive Information**

The communication between the bots and users are stored in the database, often there may be personal information such as passwords or bank details in the query. In order to make sure this problem does not happen, Botpress can be told that the pattern and the list should not be persisted by certain entities.

3.3. Response

On Successful Intent detection, Intent related Actions and Transactions are performed. In case of the transactions, the dialog flows into sub-flows and the bot will ask further details about the query to provide valid solution. In order to collect further details, the bot will provide options for users to select or fields to describe the issue in detail. For Example: In Access Issue, bot asks, "In which platform are you facing access issue?" and provides the name of the platform as options to choose from, based on the option selected further transactions will be mode. Finally provides the appropriate solution for the query requested.

3.4. Feedback

At the end of the flow, Bot asks the user "whether the issue has been resolved?" if the user says 'YES', then the bot asks for feedback on Chatbot performance, if the user says 'NO', then bot asks "Would you like to Raise Ticket for further details?", on 'YES' bot collects information of the issue and raise ticket, a copy of the ticket will be mailed to user. If the user says 'NO', then the ticket will be raised, and the conversation will end.

4. RESULT ANALYSIS

The Previous section described how the data will be extracted, analyzed and classified by bot engine. This section explains the efficiency of the model. Chatbot successfully answers business related issues using the NLU and the QnA module for query processing and understanding, these are the two main modules used in the bot engine.

QnA module handles direct questions that do not require much processing, i.e. it will be always 1 step query, one question and one answer which does not involve any further steps. Ex: "How can you help me?", "What is a Chatbot?" or "Who are you?" Thus the QnA module performs only Intent classification and always delivers 100 % accuracy.

NLU module handles queries that require more than 1 step to answer the query. Ex: "Access Issue", when the user says "Access issue", certain information is required to provide an appropriate solution. Required details might be like, "In which platform you are facing the issue?" or "In which web page?" and "What is their Username?" to identify the problem, this can't be done in one step. In this example, the NLU module uses Intent classification to identify the platform and slot identification and Entity extraction to

extract Username and provides the appropriate result to the user query. NLU module provides better performance and accurate results with increased number of input examples for each Intent, with 70 input examples for each Intent, the NLU module gives 95% accuracy.
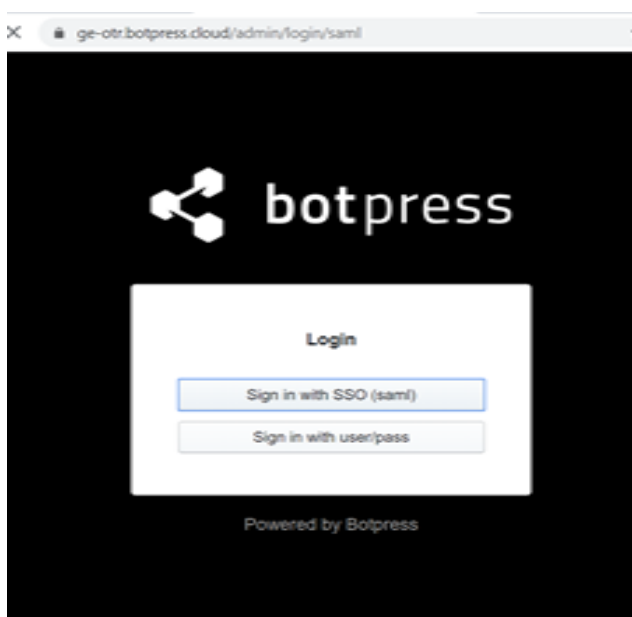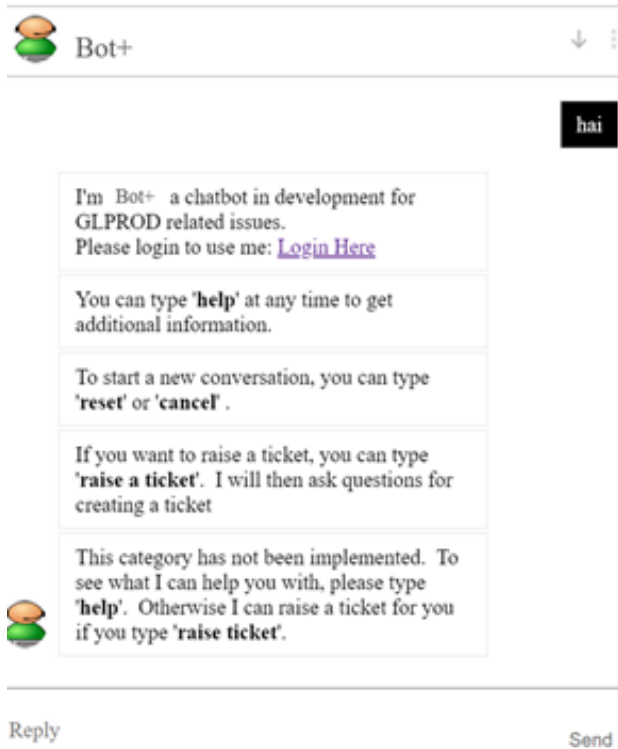
Screenshot of Chatbot:

Fig - 2. a) Login Request, on successful authentication gives Introduction b) Botpress Login page
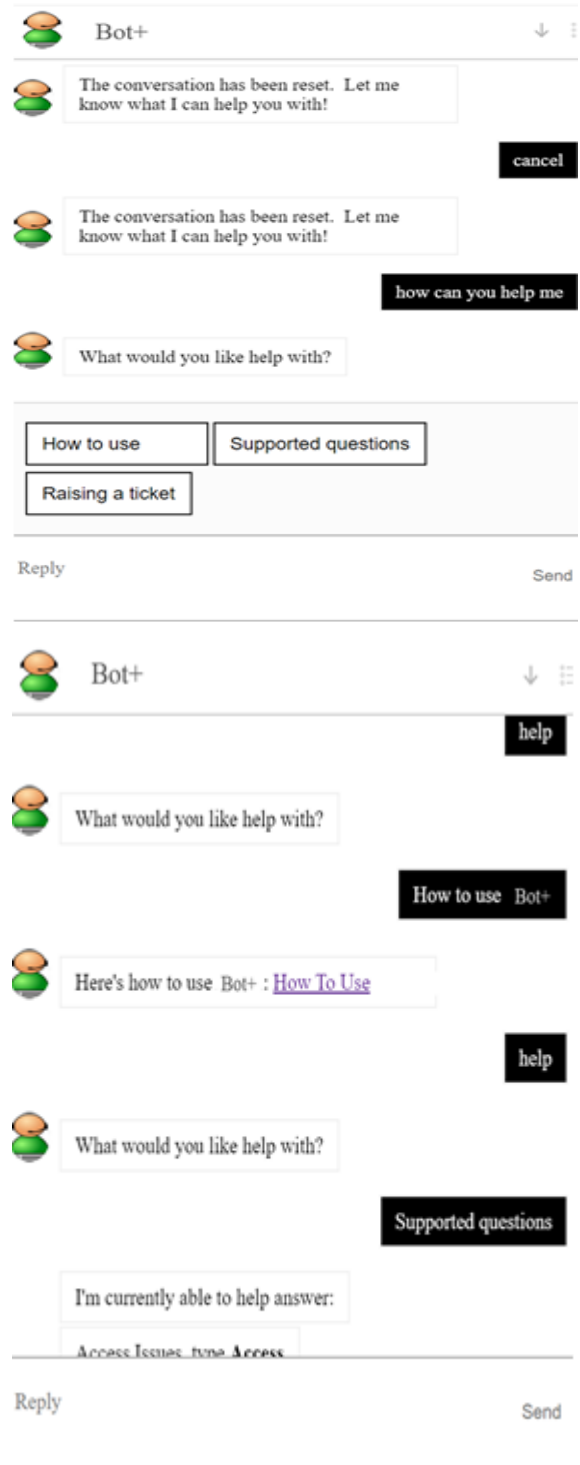

Fig - 3. User Conversation with Bot

5. CONCLUSIONS

This paper explained the management chatbots that provides 24/7 support for developers and how chatbot is designed and developed using Botpress AI conversational bot platform. This paper also explains the working of the Botpress SaaS NLU and QnA module and the features that are provided. It shows that the AI based chatbot delivers

high level performance to provide a consistent response compared to the conventional chatbots. To the people who are overwhelmed with their work schedules this is the perfect option. They don't have to halt their work to get solution. This conversational user interface provides User guide on Chatbot and business modules, provides business process management Assistance, and also provides second line support that helps to raise tickets for complex user issues. This can be easily integrated into business process management software such as Oracle BMP Suite, SAP NetWeaver BPM, etc. and agile software development process tools such as JIRA, Pivotal tracker etc.

6. FUTURE ENHANCEMENTS

The proposed Chatbot system is integrated into management software and assists developers by providing reference document and by providing immediate response to queries. In future the Chatbot support can be extended by integrating bot in Microsoft Teams and Skype for Business applications, which are mainly used in a business environment. Also, a voice-based input query processing feature can be added to the existing bot that enhances user experience.

ACKNOWLEDGEMENT

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