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A survey of designing tools for chatbot application

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***Abstract*---**The invention of chatbot brought us to the new era of technology. As Artificial Intelligence continues to gain traction in modern customer service, chatbots are becoming an integrated part of user experience. A chatbot has the capability to study and influence user behavior by asking and answering user's questions. Chatbots help with human- computer interaction and address customers' queries instantly, without the need for a support agent. Now a days there are many tools available for designing and deploying the chatbot such as Google dialogflow, Amazon Lex, Microsoft bot, Facebook Wit.AI, RASA, IBM Watson, Botpress, Botkit, Botsify, Pandorabots, MobileMonkey, SAP Conversational AI, CoRover, Chatfuel and many more. This paper represents the different types of tools used for developing chatbot.

***Keywords*---**Artificial Intelligence, Chatbot, Tool.

Introduction

The world is moving rapidly towards digitalization which will further change how and where people associate, gather and share information. In an era of digitalization, everything is available on internet. The world becomes digital with the new technologies. One of the examples is Chatbot. A chatbot is a computer program that simulates human conversation through text chats or voice commands or both[1]. Chatbots respond to what users speak or write. Using a chatbot is similar to communicating with another person and therefore chatbots are very appealing to the users. Chatbots are different from computers that use command-line or graphical interface. When using command-line interface, syntax is required to communicate with the computer. In graphical interface, users need to click the appropriate icons to perform specific actions. In both interfaces, users are confined to a set of predefined commands. The concept has existed since the

time pople began to develop ways to interact with computers. The first chatbot introduced was Eliza, developed in 1966 by MIT Artificial Intelligence Laboratory by Joseph Weizenbaum. Eliza is used to examine the keywords obtained as input and then activate the output by a defined set of rules. The next chatbot was Parry, developed by psychiatrist Kenneth Colby in 1972 at the Stanford University. Parry tried to model the behavior of a Paranoid Schizophrenia. The next chatbot was A.L.I.C.E (Artificial Linguistic Internet Computer Entity), developed in 1995 by Richard Wallace. ALICE was designed to steer in a conversation by reacting to human input and responding immediately. After developing chatbots, there were various virtual assistants launched. The first conversational assistant was Siri by Apple. The next assistant was Google Assistant launched by Google. Microsoft launched Cortana.

After this, smart speakers were introduced which made voice conversation possible between humans and the chatbots. One of the best examples of smart speakers are Amazon Alexa and Google Home[2]. Chatbots are appearing at a rapid pace throughout the communication industry. Over time, chatbots have become more sophisticated and adopted new AI (Artificial Intelligence) features, NLP (Natural Language Processing) features, ML (Machine Learning) features. By adopting these features, chatbot improves user experience. Chatbot has the ability to communicate and understand human language through different platforms. There are three types of chatbot – Rule-based, AI-based and Hybrid.

1. Rule Based Chatbot: This type of chatbot is just like decision tree. Therefore, it is known as Decision treebots. This chatbot stored a set of predefined responses from a database for a particular question based on the keywords appeared in the question. Then, it gives a response based on the keywords.
2. AI Based Chatbot: This type of chatbot uses ML, NLP features. This chatbot is smart enough to provide responses based on previous interaction with the users.
3. Hybrid Chatbot: This type of chatbot is a combination of Rule based and AI based chatbots. Hybrid chatbot interact with users and gives a reply. In this chatbot, when the conversation between human and bot gets deeper chatbot is replaced by a human.

In chatbot, there are some steps for designing the bot. The first step is to identify scope and requirement of chatbot. The second step is to gather inputs from users by asking questions. The third step is to recognize User Interface (UI) elements. The next step is to design first interaction with the users and build a conversation. The last step is testing of the chatbot.

Figure 1. shows architecture of chatbot. Architecture of chatbot is the main part of chatbot development. Based on client requirements, we need to design it; but the basic flow of architecture remains the same. Architecture also depends on the domain of chatbot. Architecture of chatbot includes user input message, intent classification, entity recognition, intents, entities, response generator and response.

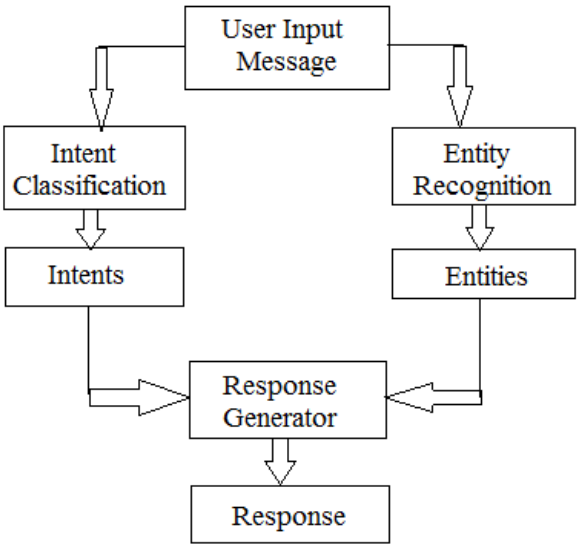

Figure 1. Architecture of Chatbot

In the above figure, input of user message is given to an entity recognition and intent classification. User input message is the text message recorded by chatbot. Intent specifies the aim of a user's input. For example- What are some good South Indian restaurants? The intent of an example would be to find a restaurant. Entity represents an object which provides a particular context for intent. Response generator uses different algorithms for processing user's request. Then the result which is calculated by response generator is the response.

This paper presents different types of tools used for designing chatbot. Here, we will discuss about many frameworks available for developing the chatbot such as Google dialogflow, Amazon Lex, Microsoft bot, Facebook Wit.AI, RASA, IBM Watson, Botpress, Botkit, Botsify, Pandorabots, MobileMonkey, SAP Conversational AI, CoRover, Chatfuel.

Related Work

It consists of many methods which have been used previously for designing chatbot. Some of the previously published research papers are:

(Rohit Tamrakar, 2021), has focused on a new learning-cum assistance tool called chatbot. First, the development history of chatbot is reviewed then architecture of chatbot is explained. After that, different types of chatbot such as knowledge domain, service provided, goal-based and response generation are presented. In this paper, various design techniques and approaches are reviewed, followed by various platforms to build chatbot (Google Dialogflow, IBM Watson, RASA NLU, Manychat, Microsoft bot, Python and Tensorflow) are presented. Advancement in chatbot technology, real life practical examples and application of chatbot are also

presented. This review paper proposed the use of the chatbot tool for Computer Aided Design (CAD) applications. Chatbot tool is also used to solve the CAD problem. [6]

(Ashutosh Vishwakarma, 2021) This paper proposed an overview on the methods that are used for designing chatbots. Taxonomy of chatbot is presented. In this paper, different design techniques such as Elizabeth bot, Microsoft LUIS (Language Understanding Information Service), Alicebot, Mitsuku, IBM Watson, Cleverbot, Chatfuel, Amazon Lex are reviewed. After that, comparison is done between different chatbots according to the technical methods involved in it. Some limitations on different types of chatbots are explained for providing successful and productive chatbot. [7]

(Sara Perez-Soler, 2021) This review paper represented chatbot development tools (Google Dialogflow, IBM Watson, Amazon Lex, Microsoft bot, Botkit, Chatfuel, Chatterbot, FlowXO, LUIS, Landbot.io, Pandorabots, Rasa, Xenioo, SmartLoop). The paper emphasizes on managerial and technical features. Basic working scheme of a chatbot with a procedural and structural diagram is also presented. For choosing a chatbot development tool, technical factors included here are input processing, dialogue, deployment, system integration, development & testing, execution and security. Managerial factors such as organizational, development-related and operational factors are also included. Finally, comparison is done on chatbot libraries, frameworks, platforms and services. [8]

(Gkikas C Dimitris, 2021), has focused on how chatbots' experts work continuously to add value to these chatbot tools by adding features, plug-ins and implementing natural language characteristics. This paper examined chatbot capabilities, features and their utility. Here, a chatbot framework comparison is also conducted to show similarities and differences of each tool to the shareholders. Chatbot tools assessment were taken. In order to fulfill this task, comparison of chatbot frameworks is done based on criteria such as pricing, location, support of human languages and conversation channels. Six dimensions are considered for chatbot assessment framework. The first dimension is "primary applications". This dimension is essential to know about dynamic concept of a chatbot framework. The second dimension is "pricing". Next, "communication channels' are integrated. It is considered to be crucial indicator. Fourth dimension refers to "location". Fifth essential dimension is "type" of chatbot framework. There are three types such as rule-based, smart and hybrid. Last useful dimension is "metrics". With the help of six dimensions, chatbot assessment framework is done. [9]

(Amit Patil, 2017), has focused on the chatbot concept and the various cloud platforms to develop chatbot. Cloud platforms used here are Kore, Chatfuel, Microsoft bot framework, Microsoft Azure bot, Heroku, AWS lambda and IBM Watson. Alll the cloud platforms discussed in this paper has many specifications and functionalities. After that, development of efficient and interactive chatbot is done with the help of these cloud platforms. This paper represented the comparison between all cloud platforms with some features such as built in AI, completion time, setup time and complexity. Finally, this paper is useful to know which cloud platform is systematic and apt for developing chatbot. After

development and comparison, table is shown for depicting features, pros and cons of Microsoft Azure, Heroku and Microsoft bot platform. [10**]**

Tool to build chatbot

Now a days, the necessity of chatbots has increased. A chatbot can communicate with a human and understand human's needs. In this section, we will present many tools which are available for designing and developing the chatbot.

1. Google Dialogflow: Dialogflow is a conversational platform used for designing and building chatbots and voice chatbots. Google has created this platform for performing better services. We can create a chatbot with less coding. It supports Natural Language Processing with more than 20 languages. Dialogflow supports messaging platforms such as Slack, Kik, Line, Twitter, Viber, Facebook Messenger, Skype, etc. REST API is provided by Google dialogflow for integrating the chatbot to our own chatbot application. This tool has two packages - the standard edition and a paid version.

2. Microsoft Bot: The Azure bot framework is used for building chatbots. This tool allows you to publish chatbots on apps, Skype, Microsoft Teams, Slack, Cortana, websites, etc. Microsoft bot easily integrates with existing Microsoft services. It has two components such as Channel connectors and Bot Builder SDK. Channel connector is used to connect the chatbot to different messaging platforms. Bot Builder SDK is used to apply the logic while creating chatbot. This SDK support Java, Python, C#, Javascript versions. Bot Builder SDK is easily connected with Natural Language Understanding Services. Microsoft's LUIS is a cloud based artificial intelligence service that uses machine learning and natural language processing technologies. This tool uses LUIS to understand conversations and bring out important information.

3. Amazon Lex: This tool is used for creating colloquial assistant using text and voice. Amazon Lex is a service offered by Amazon Web Services. This tool has incorporated many technologies such as Amazon Cognito for the user authentication process. For converting audio to text, Automatic Speech Recognition is used. For converting text to speech, Amazon Lex uses Amazon Polly services. These features help us to improve the functionality of chatbots. We can easily test, deploy, and build chatbots with Amazon Lex. It also supports messaging platforms like Facebook Messenger, Twilio SMS, Slack, Kik.

4. Facebook Wit.AI: Wit.AI is a free, open-source chatbot development tool and it is owned by Facebook. Wit.AI is the most widely used tool for Natural Language Processing (NLP) based Facebook Messenger bots because it has NLP features. HTTP API is used for connecting wit.ai to chatbot application. It also provides SDK for better purpose. Wit.ai SDK supports Node.js, Python, Ruby.

5. IBM Watson: The tool is used for building colloquial interfaces into any channel, application, device. This tool uses technologies like Watson Artificial Intelligence, Machine Learning and Natural Language Understanding. IBM Watson Assistant supports 13 languages. Watson Assistant provides SDK to create application in Java, Python, iOS. The framework allows everyone to keep

data that flows through it. IBM uses private cloud to store the information gathered by their chatbots.

6. RASA: Rasa is an open source tool used to develop conversational chatbot using text and voice. Rasa is used in large companies. RASA has two fundamental components, that is Rasa Core and Rasa NLU. Rasa Core is used for building conversational assistant. Rasa core has a feature of dialogue management. Rasa core support Facebook Messenger, Twilio, Telegram, Slack and it is written in Python. The process of classification, entity extraction and retrieving of responses is handled by Rasa NLU (Natural Language Understanding). Rasa has paid and advanced version. Rasa framework has incorporated with APIs, enterprise grade support and graphical user interface. We can deploy chatbot on our own server.

7. Botpress: Botpress is an open source chatbot development tool with dual license. For developing chatbot, we require React, NodeJS, Javascript, Typescript languages. Botpress offers an interface in which developers and non-technical people can manage the chatbot's content after implementation. Dialog Manager and Flow Builder are the two features of Bopress. These features are used for building and debugging conversational flow. We can deploy chatbot on different messaging platforms such as Slack, Facebook, Telegram, Bot, Twilio, Web. Botpress is mostly used by governments, finance companies, insurance companies.

8. Botkit: This tool is an open source chatbot development platform. Botkit is handled by Microsoft. It is used for developing custom integrations, chatbots and custom apps for messaging platforms. Botkit SDK has NodeJS language. Botkit supports messaging platforms such as Cisco, Cisco Jabber, Facebook Messenger, Microsoft Teams, Microsoft Bot, Google Hangouts, Slack, Webex. With Botkit, we can deploy the chatbot on our own server.

9. Botsify: Botsify is popular chatbot development tool. We can build the bots using drag and drops UI (User interface). Botsify is not free platform. Botsify has integrated with Google Sheet, Dialogflow, Dashbot, Shopify. The best feature of Botsify is human agent handover. We can deploy the chatbot on Website, Facebook Messenger, Slack using Botsify.

10. Pandorabots: Pandorabots is a web service used to develop and publish chatbots. This tool has an open source, free libraries. It also offers premium libraries available for an additional monthly fee. For scripting the chatbot conversation, Aritificial Intelligence Markup Language (AIML) is used by Pandorabots. Using AIML, we can build chatbot in any natural language. It also offers SDKs in Java, NodeJS, PHP, Python, Go, Ruby. This tool has plenty of free documentation, and training courses available online. We can deploy the chatbot on messaging platforms such as Facebook Messenger, WeChat and Viber.

Table 1. Pricing, Pros and Cons of various Tech-giant tool to build Chatbot

Tool	Pricing	Pros	Cons
Google Dialogflow	Standard version – free Paid version - $0.002 per text request and $0.075 per minute	Offers Software Development Kits (SDKs) for more than 14 platforms	Does not offer live customer support
Microsoft Bot	Free version – 1000 messages per month Paid version - $0.50 per 1000 messages	Supports seamless integration with existing Microsoft services Provides SDKs for various languages	Framework is complex. Need to write too much code to implement a basic function
Amazon Lex	Free version – 10000 message requests and 5000 speech requests per month Paid version - $0.004 per speech & $0.00075 per text request	Automatic scaling capabilities Supports various platforms and deployment	Framework is not multilingual. It supports English only. Data preparation process is complicated
Facebook Wit.AI	Provides custom pricing for their software	Make it easy for large developer community to create applications Well-designed developer user interface	The training of the NLP engine in Wit.AI is complicated
IBM Watson	Lite plan– free, allows 1000 users Plus plan - $14 per 100 users Enterprise plan – 50000 users	Promote data privacy It allows seamless phone integration	Framework is complex Does not allow end user to access chat history
RASA	Offers custom pricing based on the features opted by users	Develops highly customizable chatbots and run as simple http servers	Chatbots are resource-intensive on server side Does not provide integrations

Botpress	Open-source package – free Enterprise package – pricing is calculated based on chosen features	Easily customizable Documentation provided with framework is easy to use	Framework has limited features Framework uses a high learning curve
Botkit	Free version – Build simple bot Paid version – With Botkit CMS, create a bot & pay for hosting bot	Botkit is easy to use and work for different platform in isolation	Lack of options for developers who don't work in node.js
Botsify	Free trial of 14 days Personal - $40/m Professional - $124/m	Pre-built templates for building a chatbot quickly Integrates with websites	User Interface is not as intuitive as other options
Pandorabots	Free version – get unlimited messages in sandbox Developer version - $19/month Pro version - $199/month	Pandorabots AIML provides flexibility Predefined content libraries provide some shortcuts	Accuracy and reliability for business is not good Not advisable to host your chatbot
MobileMonkey	Free plan – perfect for business Pro plan - $14.25 per month Uicorn plan - $36.75 per month Team plan - $299 per month	Free account for small businesses, large number of integrations, good for Facebook marketing	Slow scalability, no built-in lead gen integration, minimal reporting, uses Facebook only
SAP Conversational AI	Free version Paid version – EUR 300 for price per block of 1000 chats/month	Entity enrichment, efficient training, totally free for individuals with high rating	User interface is not simple, bot usage analytics are bit limited
CoRover	Free version Paid version – pricing based on	Improve operational efficiency, easy to	Costly to implement

	opted features	implement and integrate	
Chatfuel	Free version - $0/m Pro version - $15/m	Automate responses Link to resources Provide a phone number	Setting it up is time consuming

11. MobileMonkey: MobileMonkey is a tool used for developing chatbot without any programming knowledge. MobileMonkey has many features which are used to build and deploy chatbots for Websites, Facebook Ads, Bulk Messaging, etc. MobileMonkey acquired ChattyPeople to extend chatbot building capabilities. MobileMonkey can be integrated with Gmail, Google Forms, Asana, Mailchimp, WordPress, Instagram.

12. SAP Conversational AI: SAP Conversational AI is an end- to-end chatbot development platform for the enterprise. It is also known as Recast.AI. Through this tool, we can build chatbots easily, in days and in full SAP integration. It is easy to use and has fastest bot building platform. This tool presents SDK for Javascript, Python, Java, Ruby, PHP. It has a limited free version available for use. SAP Conversational AI supports messaging channels such as Cisco Spark, Cortana, CoPilot, Messenger, Microsoft Teams, Slack, SAPJam Collaboration, Kik, Line, Twilio, Telegram, Twitter.

13. CoRover: CoRover is a conversational AI platform provides managed chatbot service with self onboarding support to improve customer experience and to help enterprise grade. It is one of the most widely used chatbot across banking, travel, finance, healthcare and manufacturing. CoRover has Omni channels such as Web, WhatsApp, SMS, Social Media Bots. It works with 100 foreign and 12 vernacular languages. It has robust, secure, scalable architecture. Chatbots can be deployed on public or private clouds.

14. Chatfuel: Chatfuel is a famous tool used for creating chatbots. With chatfuel, we can create and publish chatbots for Facebook Messenger. Chatfuel powers 46% of all messaging bots. Chatbot can be created from the exiting templates or using the drag and drop option. We don't need any coding knowledge to create a chatbot using chatfuel.
Table 1 shows pricing, pros and cons of various tech-giant platform to build chatbot.

Proposed Work

Here, we have opted Amazon Lex platform for implementation purpose. Amazon Lex is an AWS service used to create conversational interfaces i.e. chatbot using voice and text. Amazon Lex bot works with Automatic Speech Recognition and Natural Language Understanding capabilities. We are creating a chatbot such as ordering a pizza. We will see some terminologies for creating a bot. First one is intent. An intent is used to represent a task that user wants to perform. For our chatbot, OrderPizza is the name of intent. Sample utterences are phrases that we expect a user to speak or type to invoke the intent. For example, "I would like to

order pizza". Amazon Lex provides built-in intents to set up the chatbot. After intent, slots are created. Slots include the information that a chatbot needs to fulfill the intent. The OrderPizza intent requires slots such as pizza type, pizza crust and appetizers. In intent configuration, we add these slots. Each slot has a type. Slot type is a list of values used to capture values for a slot. For example, we use the following slot types for the OrderPizza intent: crust – thick and thin. Amazon Lex provides built-in slot types such as AMAZON.FirstName, AMAZON.Number. After creating slot types, we can build, test, and deploy our chatbot directly from the Amazon Lex console. Amazon Lex guides us through the Amazon Lex console to create our own chatbot in minutes.

Results and Conclusion

Amazon Lex is a fully controlled artificial intelligence service with advanced natural language models to design, build, test and deploy chatbot. We have created a chatbot for ordering a pizza. With Amazon Lex console, we have tested it. The final output from the console can be seen in the figure below.

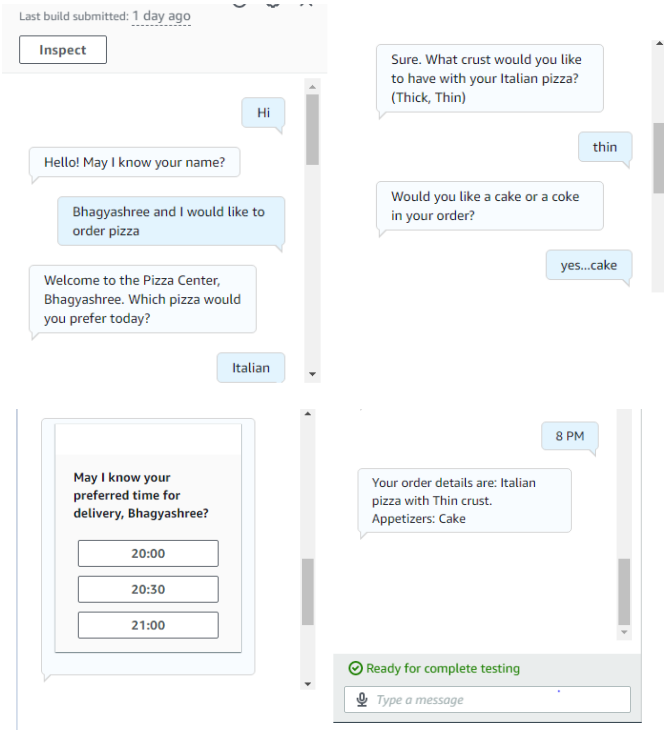

Figure 2. Output of Pizza Order Chatbot

In this paper, we have presented 14 tools that are used for designing and developing a chatbot. Among 14 tools, we have used Amazon Lex platform for creating a pizza ordering chatbot. The purpose of Amazon Lex is to provide a standard platform for developing a chatbot using text or voice. With pizza ordering chatbot, we can easily order a pizza online. Thus, we have implemented a chatbot using Amazon Lex.

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