|| Volume 6 || Issue 5 || May 2021 || ISSN (Online) 2456-0774
INTERNATIONAL JOURNAL OF ADVANCE SCIENTIFIC RESEARCH
AND ENGINEERING TRENDS

AMAZON LEX BASED PERSONALIZED CHATBOT FOR IoT LAB@CIT

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Abstract: - In general, there arise lots of queries among students regarding laboratory procedures, projects, previous patents, paper publications and other concerns. One competent solution to the above inquiries and to make students feel comfortable is a chatbot. A chatbot (Chatter Robot) is a software program used to automate human interplay and is successful in open framework between human and machines. Educational chatbots provides streamline support, and automate processes, without any human intervention. Our project aims to develop an automated, conversational, personalized chatbot based on Amazon Lex, an Amazon Web Service (AWS). It allows users to raise questions or concerns about the project team, completed and on-going projects, publications and components available in IoT LAB@CIT website. IoT LAB@CIT is an innovation center which was established in the year 2018, wherein students/faculties/researches of CIT and from other institutions do projects and undergo intern exclusively on IoT domain. The advantages of AWS chatbot over other chat bots include notification in real time, faster response, quick setup, and auto scaling i.e it can be tailored according to the institution's need and requirement. Prepared questionnaire allied to IoT LAB@CIT website and they are fed to the Amazon lex chatbot. It is then trained to respond the queries. Several trials were conducted to test the chatbot and verified that it responds accurately by answering the appropriate queries. The chatbot is then integrated into the IoT LAB@CIT website using Kommunicate- a customer support solution enterprise.

Keywords: *Chatbot, Amazon Lex, Amazon Web Service, IoT LAB@CIT.*

I INTRODUCTION

Chatbots – also known as "conversational agents" – are software applications that mimic written or spoken human speech for the purposes of simulating a conversation or interaction with a real person. There are two primary ways chatbots are offered to visitors: via web-based applications or standalone apps. Having a Chatbot today has numerous benefits for businesses – they make life easier for customers, are available 24/7, save time (no more long waits to talk to a service rep) and they are easy to use. These benefits have led to increased adoption of Chatbots by businesses, consumers, and educational institutions. Educational chatbots provides streamline support, without any human intervention, by leveraging conversational bots for university. Conversational Chatbots are used by over 150 Institutes across the globe.

Amazon Web Services (AWS) is the world's most comprehensive and broadly adopted cloud platform, offering 200 fully featured services from data centers globally. It provides highly reliable, scalable, low-cost infrastructure platform in the cloud. Amazon Lex is an AWS service used for building conversational interfaces for applications using voice and text. Amazon Lex provides the advanced deep learning functionalities of automatic speech recognition for converting speech to text, and natural language understanding (NLU) to recognize the intent of the text, and enable one to build applications with highly engaging user experiences and lifelike conversational interactions. Amazon Alexa is one of the applications that evolve from LEX. Using LEX, a chatbot can be developed for Internet of Things. A chatbot is a computer program that simulates human conversation through voice commands or text chats or both. It is an Artificial Intelligence (AI) feature that can be embedded and used for any major messaging applications. AWS Chatbot is an interactive agent that makes it easy to monitor and interact with AWS resources in Slack channels and Amazon Chime chat rooms. With AWS Chatbot one can receive alerts, run commands to return diagnostic information, invoke AWS Lambda functions, and create AWS support cases. The benefits of AWS Chatbot include, Notification in real time, faster response, Quick setup, easily defines permissions. Building a chatbot is easy with Amazon Lex and AWS Lambda. Fig 1 shows a simple depiction on how a chatbot works with Amazon lex and AWS Lamba.

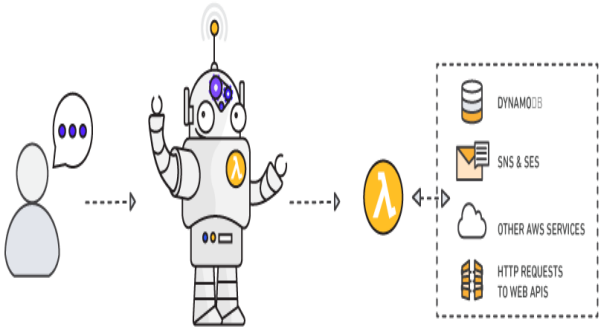

Fig 1 Simple depiction on how AWS chatbot works

AWS also provides its customers with pay as you go pricing model. It is one of the most efficient pricing models in recent days i.e. the customers pay for only what they use which means no upfront costs involved. It is the most attractive feature when considering AWS. Three important aspects of AWS pricing: Pay as you go, save when you reserve, Pay less by using more.

Considering the above mentioned benefits and AWS being one of the trending technologies nowadays Amazon lex has been chosen to build a bot.

Kommunicate is a Customer support solution enterprise. It provides the customers with SaaS (Software as a service) platform. It works for the maintenance of websites, chatbots, mobile applications etc. The integration of our chatbot to IoT LAB@CIT website has been done by this third party and maintenance of the website will be handled by them on pricing.

The proposed work focuses on developing a chatbot for IoT LAB@CIT (website). The proposed work arises from the need to have new tools or communication channels that allow users to;

1. Answer questions or concerns about different fields at the university level.
2. Assist the students of final year and pre-final year to select projects based on their interest and domain.
3. Resolve queries related to IoT based projects and ease access of available components.
4. The chatbot is integrated with our college's IoT lab website and queries like projects, available components, papers presented related to IoT Lab will be answered.

The rest of the paper covers the related works, the proposed system model/architecture, Results & discussion, Conclusion and the future scope.

II RELATED WORKS

" Kumari, Sangeeta, Zaid Naikwadi, Akshay Akole, and Purushottam Darshankar(2020)". The aim of this paper is to provide a platform for student and parents to ask queries and clear doubts through simple English language text messages or audio commands using Natural language processing. This Chat bot is integrated with Vishwakarma Institution website to aid stakeholders to ask their queries anytime. This Chat bot simplifies the admission process, provides college information and also answers queries related to state wise cut off, Categories wise off, gender specific cut offs and shift wise cut offs. The merits of this paper is that it understands voice based queries and the demerit is that it voilates glitches.

"Sadavarte, Sanket Sanjay, and Eliane Bodanese(2019)". The paper describes a pregnancy companion chatbot to help pregnant women during pregnancy. A questionnaire was designed for the expectant mothers and healthcare professionals who treat them, to design the chatbot. The pregnancy companion chatbot was tested on Amazon Echo dot, a smart speaker device supported by Amazon voice assistant Alexa. The design has used AWS Lambda as a triggering function, Simple Notification Service for sending message notifications, Simple Email Service for sending emails and DynamoDB as a database.

"Patel, Neelkumar P., Devangi R. Parikh, Darshan A. Patel, and Ronak R. Patel (2019)". The aim of this paper is interaction between users and chatbot which can be accessed from anywhere anytime. The chatbot can be easily attached with any university or college website with few simple language conversions. Chatbot provides various information related to university or college and also students-related information. The chatbot can be used by anyone who can access the university's website. This paper uses the concept of Artificial Intelligence and Machine Learning. PHP Language is utilized for the development of Chatbot. User can ask university-related questions, and then the query is applied as an input to algorithm, which processes the message and displays the corresponding response to the user.

"Lee, Lap-Kei, Yin-Chun Fung, Yau-Wai Pun, Ka-Kin Wong, Maverick Tai-Yin Yu, and Nga-In Wu(2020)". This paper presents the design of a chatbot for instantly answering students' questions on multiple common social platforms including Telegram, Facebook Messenger and Line. The chatbot can answer questions in natural language and commands. Once the teachers upload the necessary course-related information to an online database, the chatbot can answer questions on the course materials and course logistics (e.g., class schedule). The chatbot also supports a login system so as to provide answers according to different student profiles (e.g., schedule of their enrolled class and score dissemination). A survey on ten undergraduate computer science students showed that this chatbot can effectively act as an online tutor to reduce teachers' workload and it is a useful tool to be integrated into other e-learning platforms. The demerit of this paper is that the Chatbot will not understand Voice based queries.

III.IOT LAB@CIT CENTER

IoT LAB@CIT is a new creative laboratory which aims to transform CIT to Smart Campus through Internet of Things and make environment safe, private and secure. The mission of IoT lab is make department laboratories smarter using convergence of technologies, markets, applications, and the Internet for campus management.

The objective of this center is to;

Create an environment for research, design, development and testing of IoT solutions, in the field of energy management, communication systems, distributed sensor devices and advanced user interfaces, provide a large-scale IoT system for the collection of information from the environment and its transfer to a server, as well as the skills necessary for the development of control logics, processing and display of data.

The Laboratory is equipped with devices for the monitoring of energy consumption of electrical appliances, sensors for the monitoring of environmental parameters such as temperature and humidity and the communication infrastructure necessary to deliver the acquired information to a server.

This lab is used as a platform for conducting consultancy work required by government/Private organizations in around Coimbatore, enable faculty learning, research and hands-on experimentation to discover and demonstrate the promise of the Internet of Things, provide students unique interdisciplinary learning and innovation experiences with IoT technologies.

Several IoT related real time projects have been done and hardware with recent technologies are available. Chatbot is developed to answer queries related to projects, components that are currently available, its specifications, assistance in undertaking new innovative projects, etc. Chatbot consists of questions related to the previous projects done at IoT Lab. It answers about the domain, hardware, software and the outcome of the projects. This helps the pre-final year and final year students to work with their projects in the domain of IoT, to improve the older projects and to take up new projects. Also queries based on the components like Raspberry pi, sensors, etc., that are available in IoT Lab will be answered. Queries related to the number of components and the due date to return and suggestions regarding the usage of components will also be provided.

IV.SYSTEM MODEL OF PROPOSED SYSTEM

The proposed system model for the Amazon LEX based personalized chatbot for IoT LAB@CIT is shown in Fig 2. It comprises of a user and a PC/mobile, Amazon EC2, Amazon LEX, AWS Lambda, Amazon Cognito and Amazon clock watch. The user interacts with the bot through PC or mobile. The user's request will be handled by the Amazon lex and it will internally communicate with Amazon EC2 (a virtual machine) and AWS Lambda (serverless compute) for processing the request. Once the request is processed the response will be returned to the user by AWS lambda. Amazon Cloud watch monitors and collect data in the form of metrics and logs for future analysis. Amazon Cognito is used for authentication and scalability of users. The chatbot is integrated into the IoT LAB@CIT website using Kommunicate-a customer support solution enterprise.

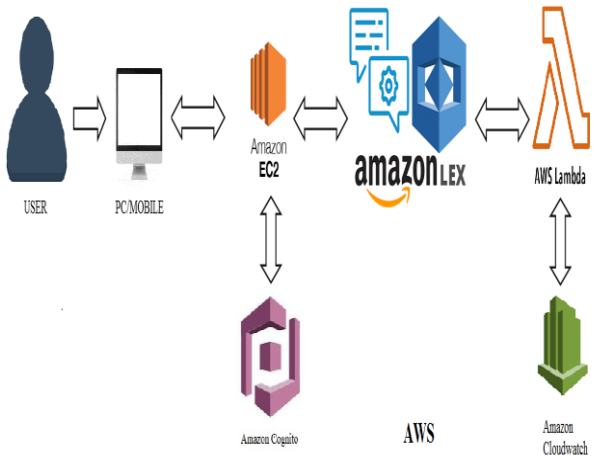

Fig 2 Proposed system model

AMAZON EC2: Amazon Elastic Compute Cloud (EC2) is a component of Amazon's cloud-computing platform, Amazon Web Services (AWS) that allows users to rent virtual computers on which one can run own computer applications.

AMAZON LEX: Amazon Lex is a service for integrating voice and text-based conversational interfaces into any application. It powers the Amazon Alexa virtual assistant. Amazon has already released Alexa Voice Services, which developers can use to embed Alexa into their own products, such as smart speakers and alarm clocks, but Lex would not enable end users to communicate with the Alexa assistant, but rather some kind of assistant or interface.

AWS LAMBDA: AWS Lambda is Amazon's event-driven, server less computing platform, and is a part of Amazon Web Services. It's a computing service that runs code in response to events and handles the computing resources used for that code automatically. AWS Lambda can also be used to automatically provision back-end services in response to custom HTTP requests, as well as spin down those services while they are not in operation to save resources. AWS Lambda is metered by rounding up to the nearest millisecond with no minimum execution time, unlike Amazon EC2, which is charged by the hour but metered by the second.

AMAZON CLOUDWATCH: Amazon CloudWatch is a monitoring and observability service that provides the users with data and actionable insights to monitor the applications, respond to system-wide performance changes, optimize resource utilization, and get a unified view of operational health. CloudWatch collects monitoring and operational data in the form of logs, metrics, and events, providing the users with a unified view of AWS resources, applications, and services that run on AWS and on-premises servers. CloudWatch can be used to monitor unusual behaviour in your system, set alerts, compare logs and metrics, automate tasks, troubleshoot

problems, and discover insights to keep the applications running smoothly.

AMAZON COGNITO: Amazon Cognito makes it easy to incorporate account sign-up, sign-in, and access control to web and smartphone applications. Amazon Cognito supports sign-in with social identity services such as Apple, Facebook, Google, which Amazon, and scales to millions of people.

V. REUSLTS AND DISCUSSION

This chapter presents the results obtained from the designed chatbot for IoT LAB@CIT. Component based queries and project based queries are effectively answered by the chatbot. Fig 3 shows the response of the bot for the user's input. IoT is the keyword (there can be more than one keywords but it needs to be specified). Once the user request and the keyword are matched the chatbot responds by displaying the appropriate question. Here, the chatbot responds the user with the possible areas in which queries can be invoked i.e. the queries can be based on any of the five domains like projects, components, faculty, achievements and contact.

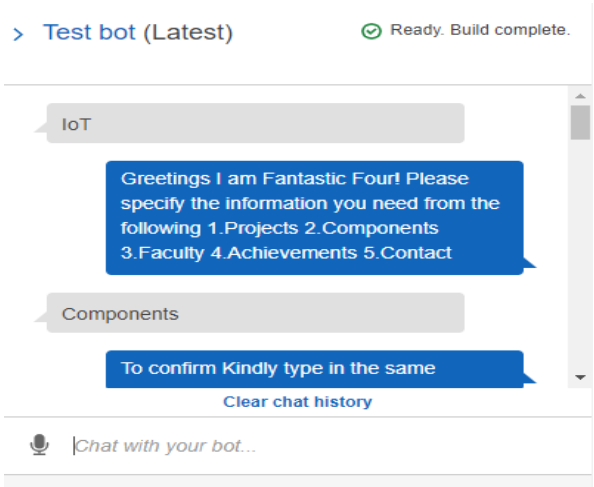

Fig 3 Available information

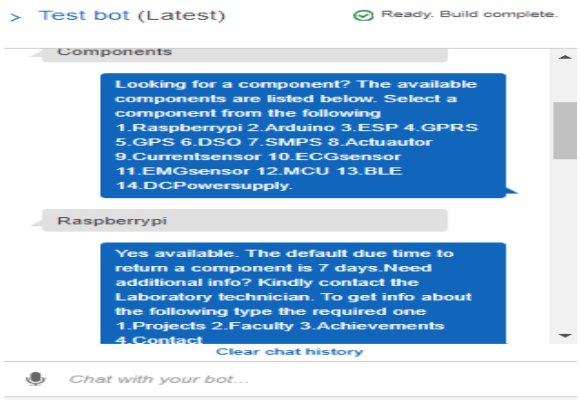

Fig 4 Component based query

Fig 4 shows the response of the bot for the query related to the components available in the laboratory. A component is the keyword. Once the user request and the keyword matches the chatbot displays the available list of components. As a next step, the user needs to specify the component needed. All the components available in the laboratory have been fed as a keyword to the bot. Once the user specified component and the keyword matches the chatbot responds with next question. Similarly, the process continues once the keyword matches with the request.

Fig 5 shows the bot's reply to the questions about completed projects. A project is the keyword. Once the matching is done the chatbot responds with available projects in the laboratory. The user needs to specify the title of the project whose information is needed. Once the title of the project is specified by the user the chatbot asks for the type of information needed by the user eg: project domain, project hardware, project software, project outcome etc., once it is specified by the user, the chatbot replies the user with appropriate information and asks for any additional information.

Fig 6 demonstrates the response of the bot to the queries regarding the achievements accomplished by IoT laboratory. Fig 7 illustrates the reply of the bot to the queries in accordance with faculties responsible for IoT laboratory.

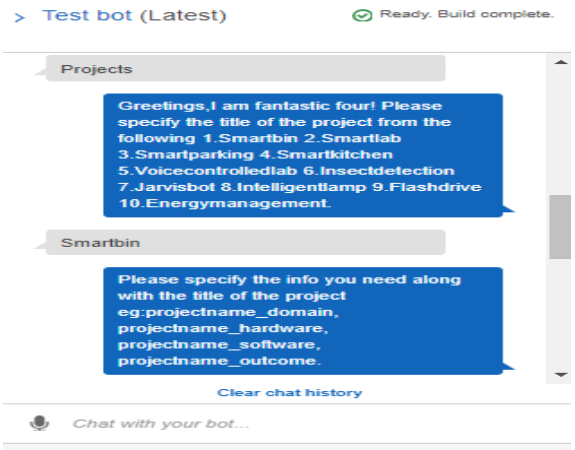

Fig 5 Query-Project

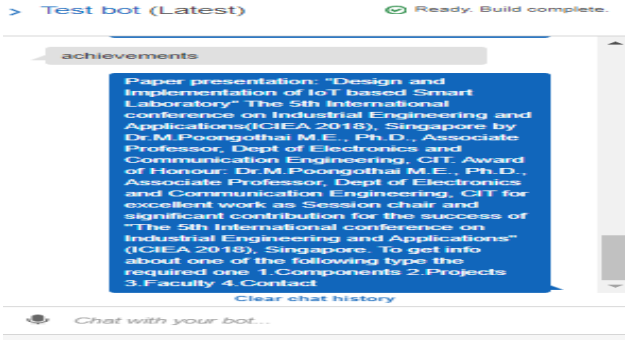

Fig 6 Query-Achievements

Fig 8 reveals the bot's response when the bot is provided with inappropriate requests. If the user's request does not match with

any of the keywords then the bot responds as shown in the figure.

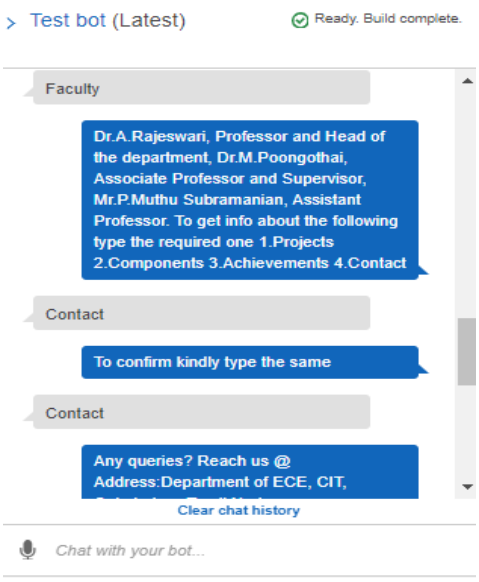

Fig 7 Query-Faculty

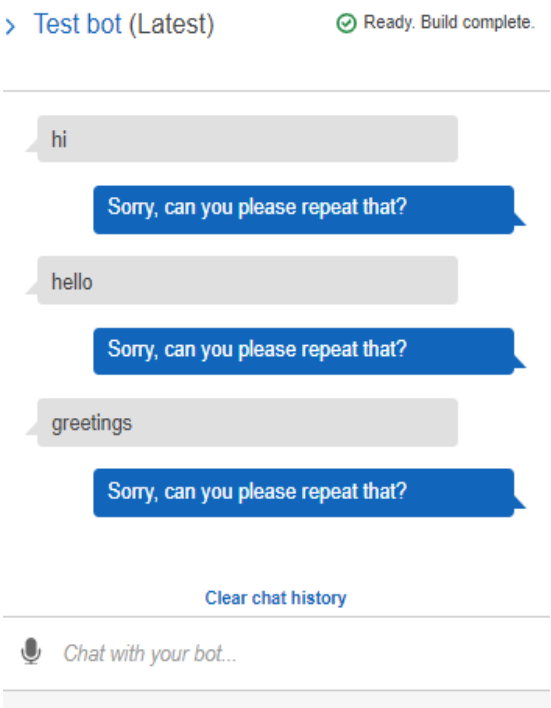

Fig 8 Inappropriate query

Thus the chatbot responds correctly only when the user's request matches with the corresponding keyword. Therefore, the chatbot responds appropriately to the users queries.

Fig 8 and 9 showcases the response of the chatbot after being integrated into IoT LAB@CIT website. The chatbot is live now and can respond to any queries related to IoT lab thus increasing enthusiastic and interest among students to take up projects related to IoT.

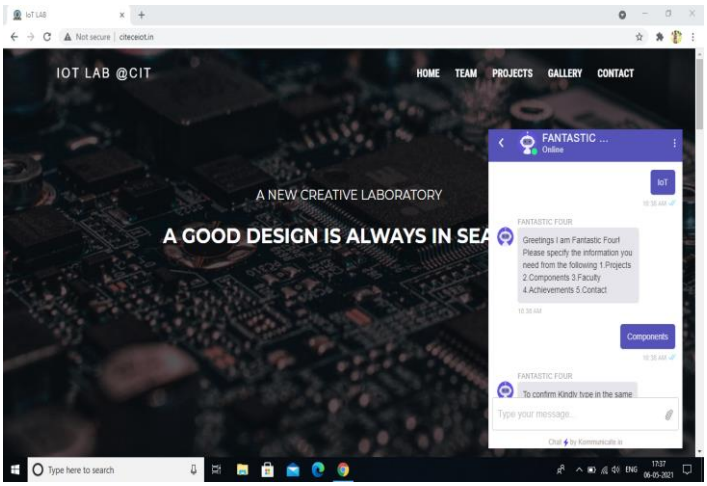

Fig 9 Response of the bot in the website

VI.CONCLUSION AND FUTURE SCOPE

The chatbot for IoT LAB@CIT website has been created using Amazon Web Services (AWS-Amazon lex) and it has been successfully integrated into website using kommunicate platform. Updating the chatbot with more queries related to various domains like admission procedures, hostel procedures, faculty directory etc., to be made and to be integrated into the college's primary website (www.cit.edu.in).

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