Smart Academia - Alexa based System

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***Abstract*— SRM Academia is a web portal for the students of SRM Institute of Science and Technology. Students visit the portal to view information about their curricula like time table, attendance, and test scores. The current web portal is inconvenient to use as it is a basic website. Finding information is troublesome as the data is static and customization cannot be done. This paper aims to improve the experience of using SRM academia by extending smart capabilities to it through the use of the smart assistant Amazon Alexa. The smart assistant can leverage the full potential of SRM academia by adding voice capabilities and smart functions to get the required information. It aims to use these features to provide a richer and more intuitive experience to a student.**

I. INTRODUCTION

Amazon Alexa is a smart virtual assistant developed by Amazon which uses artificial intelligence technology to perform a variety of tasks such as voice interaction, playing music, reading news, setting alarms, making to-do-lists, and many more. Developers can make use of this technology by making their custom skills (apps) for Amazon Alexa. Amazon Alexa was first used in Amazon Echo smart speakers but now they support various types of devices including mobile platforms - Android and iOS.

SRM Academia is a web portal for the students of SRM Institute of Science and Technology. It provides updated information about students' courses. Students mainly use the portal to view their academic timetable, attendance, test scores, calendar, and other academics related information.

SRM academia is very useful for the students, but at the end of the day, it is a static website. The current SRM academia is not up to the mark of the current state of web technologies. A custom smart assistant skill can be made to leverage the full potential of SRM academia and extend smart capabilities to it.

We have devised a custom Alexa Skill which can work in conjunction with the existing system to provide ease of access to students.

II. LITERATURE SURVEY

After doing extensive research with the help of multiple scientific databases, chosen articles were reviewed to assess the state-of-art research on the use of smart virtual assistants in real-world projects.

[1] "*MohdAijaj Khan, AnubhavTripathi, Aaradhya Dixit, Manish Dixit : Correlative Analysis and Impact of Intelligent Virtual Assistants on Machine Learning"* gives information about the different smart virtual assistants that are available like Google Assistant by Google, Cortana by Microsoft, Siri by Apple, Alexa by Amazon, Bixby by Samsung, and M by Facebook.

[2] "*RuhiSarikaya : The Technology BehindPersonal Digital Assistants"*explains the working of virtual assistants and the difference in the architecture of Proactive assistance and Reactive assistance but it lacks practical implementation.

[3] "*Ochoa-Orihuel, J.; Marticorena-Sánchez, R.; Sáiz-Manzanares, M.C. Moodle LMS Integration with Amazon Alexa: A Practical Experience"* provides an implementation of Amazon Alexa with a real-world application in the education domain. It gives an idea about architecture and the working flow of an Alexa skill. It provides a methodology to securely authenticate and authorize users with the help of tokens.

[4] "*Shailesh D. Arya1, Dr. Samir Patel :Implementation of Google Assistant &Amazon Alexa on Raspberry Pi"* demonstrates the working of Google Assistant and Amazon Alexa on a Raspberry Pi.

[5]"*Assistant & Amazon Alexa on Raspberry Pi V. Këpuska and G. Bohouta, "Next-generation of virtual personal assistants (Microsoft Cortana, Apple Siri, Amazon Alexa and Google Home)"* gives us more information about next generation VPA models.

[6]"*Irene Lopatovska, Katrina Rink, Ian Knight, Kieran Raines, Talk to me: Exploring user interactions with the Amazon Alexa"* makes a comparison study of all 3 assistants.

III. MOTIVATION

SRM academia is very helpful for the students but it is not up to the mark for current web technology standards. The user interface and user experience of SRM academia are not up to the standards. It takes time to get information from SRM academia as the user has to log in each time and then search for the information. The timetable provided by SRM academia is a generic timetable.

The project aims to give smart capabilities to SRM academia through a smart virtual assistant. The user won't have to login in every time. SRM academia is most frequently used for three features - timetable/calendar, attendance, and test scores. The project provides all three capabilities via a smart assistant where the user can ask for any specific information he needs. E.g. - "Show my test results". It also gives smart capabilities to the students to get information. E.g. - "Which courses have less than 75% attendance?"

IV. ARCHITECTURE

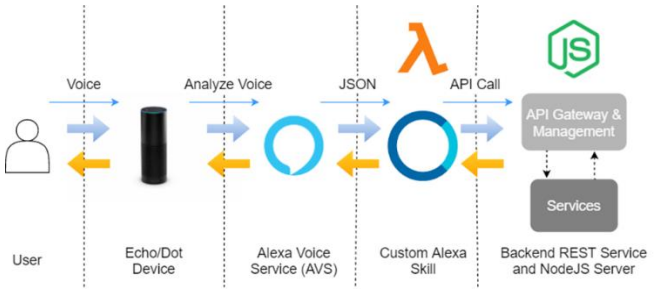

Fig. 1. Architecture of the proposed system

When the user speaks into a device powered by Alexa, the speech is sent to Alexa Voice Service (AVS) in the cloud which handles all the speech recognition and speech to text conversion. The custom Alexa skill has all the intents which the user might need. The intents are defined in a JSON format in the custom Alexa skill. The Alexa Voice Service (AVS) in the cloud analyses the user's speech and tries to match it with the most suitable intent that is defined in the custom Alexa Skill. After recognizing the intent, the action associated with that intent is called. An API call is made. A request is sent to the NodeJS server according to the intent and the response is fetched. Finally, the suitable output is displayed to the user.

V. MODULES AND METHODOLOGIES

The project can be divided into three main modules:

1. Web Scraper

   It logs on to the academia portal and fetches data from the different sections of the academia portal. Puppeteer node library is used. The program is written in JavaScript/NodeJS. Puppeteer helps to control Chrome/Chromium or any other Chrome DevTool protocol-based browser. It can perform actions like navigating web pages, clicking buttons on web pages, filling forms, etc like a real web browser. Puppeteer library can access or manipulate an element in the DOM (Document Object Model) which allows scraping data from the web easily.

   This module navigates to the SRM academia home page and fills in the user credentials in the log-in form and logs in to the portal. Then it navigates to the different pages of the portal and scrapes data by accessing the elements from the DOM.

2. Alexa Skill

   The custom Alexa skill listens for an invocation and upon hearing it, it matches the invocation to an intent. According to the intent, an API is called in the NodeJSbackend end. The API gives back a response, according to which, a suitable reply is given back to the user. The code is written in NodeJS using Javascript with the Amazon Alexa SDK running on AWS Lambda.

3. API/EndPoint

   It includes endpoints to communicate between the Alexa skill, web scraper, and database. The Alexa skill sends a request to an endpoint and it returns the required data from the database or by scraping academia. The technology used is NodeJS.
   After fetching the data from academia, it is stored in a MongoDB(NoSQL) database in JSON format. NoSQL database is used because there is no particular data structure.

VI. SETUP

The Amazon Alexa Skill is hosted on AWS (Amazon Web Services) Lambda. AWS Lambda is a serverless compute platform offered by AWS. The AWS Lambda is triggered based on events and is scalable.
The NodeJS backend is hosted on a web server with Ubuntu/Linux Operating System. NodeJS version 10 or above is installed on the server. The secrets are set as environment variables.

VII. IMPLEMENTATION

Custom Alexa skill is made by using Alexa Skill Kit (ASK). Intent refers to an action that serves the user's spoken request. Every intent has a key predefined word, phrase, or sentence that invokes that intent. An action is taken when the intent is recognized.

The user has to speak "open SRM academia" to launch the Alexa Skill. If the user is not logged in, Alexa asks for the user credentials for SRM academia. An API is called which scrapes the SRM academia portal. The puppeteer node library is used. It takes the user credentials to log in to SRM academia. After successful login, a unique token is generated with the help of the JWT(JSON Web Token) node library. It takes the user's email and a secret key to generate a unique token which has some expiry time. The token is sent as a response back by the API. This token is used to securely authorize the user for further API requests. With the help of the JWT token logging in every time is prevented.

Then the different pages of SRM academia are navigated to, and data is scraped from them. The data is present in these pages in the form of a table inside the *<table>* HTML tags. The puppeteer library accesses the DOM of the page to retrieve data from the tables. The data present as it is in the table is difficult to process as the tables are not of consistent

structure. So the data in the tables are converted into a more easily accessible JSON format which makes it easier to fetch data conveniently when required. The data is then stored in a NoSQL MongoDB database. Mongoose node package is used to interact with MongoDB database as it helps to create data models and provide data validation.

The API response sends the JWT token which is then stored locally. Now, when the user wants to ask further queries, the token is sent as a parameter along with the API request. A JWT function in the backend is used to decode the token using the same secret key which was used to encode the JWT token. The token is decoded to fetch the email of the user. The email is then used to identify or authenticate the user and process the query request by the user. The specific data is fetched from the database according to the user's query. This data is then sent as a response back to the Alexa Skill. The Alexa Skill then displays the data in a suitable format in response to the user's query.

VIII. RESULTS

The Alexa skill developed is capable of showing a student its detailed or specific academic data when asked to from Alexa. The skill is capable of showing the student its details like name and register number and also showing details about their classes, such as their attendance, course name, faculty name, etc. The Alexa skill prevents the hassle of logging in every time after the initial login.

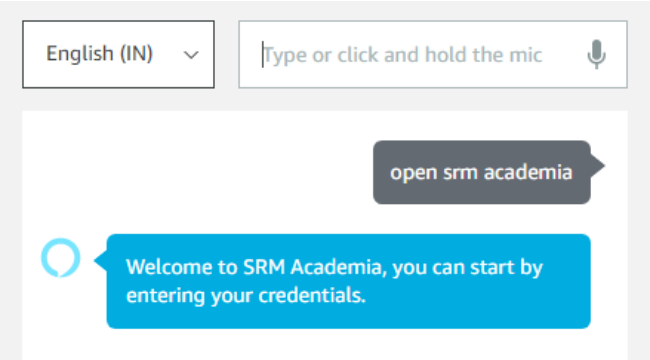

Fig. 2. Screenshot 1

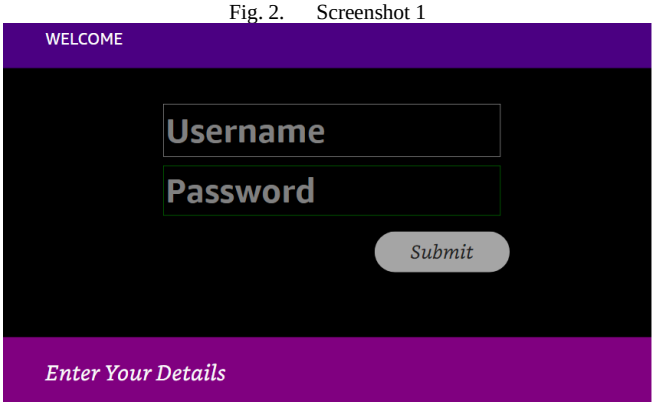

Fig. 3. Screenshot 2

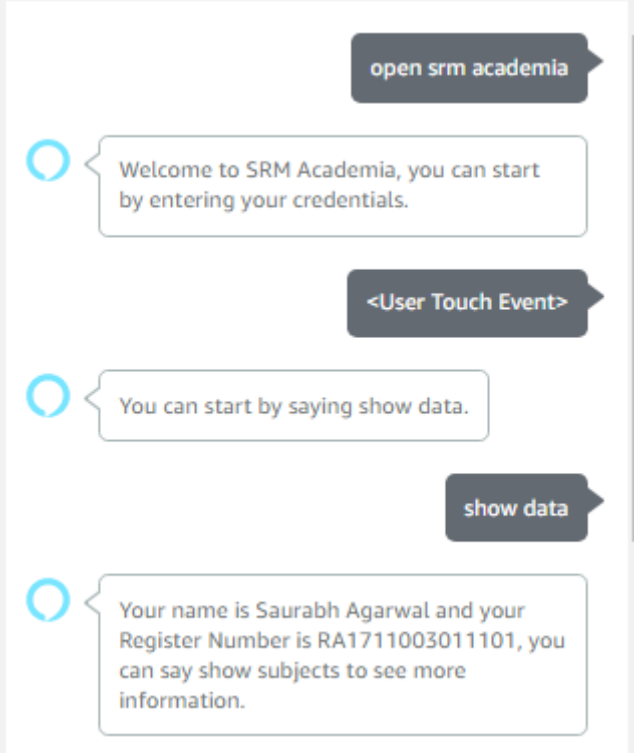

Fig. 4. Screenshot 3

The Alexa skill also extends smart capabilities like showing subjects with low attendance which are not present in the main portal.

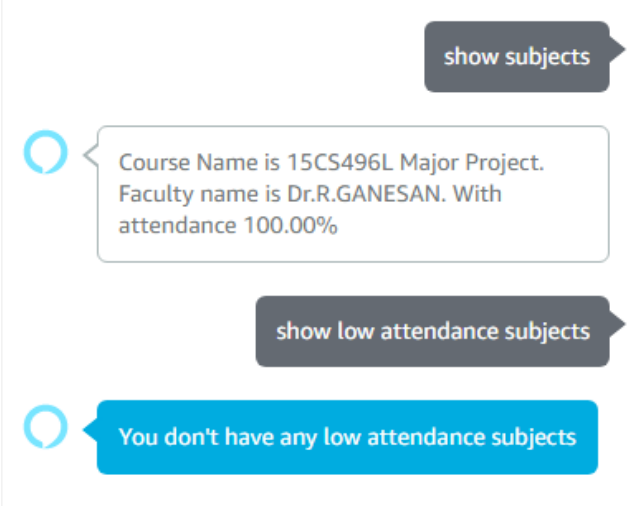

Fig. 5. Screenshot 4

The Alexa skill provides a voice assistant to get students' academic information and provides smart utilities beyond the academia portal which are helpful for the students. The Alexa interface is hands-free and intuitive and can become a viable option for students to receive their information.

IX. CONCLUSION

In conclusion, we set out to find a viable alternative to the academia of our university. The project's goal is to develop an Alexa skill, which can offer information to a student about their academic classes without the student needing to stop doing their work. The team successfully made an Alexa skill

that can respond to queries from a user and offer appropriate information about their classes.

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