Project Report

Topic: Intelligent Customer Help Desk with Smart Document Understanding (SPS_PRO_99)

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1.INTRODUCTION

1.1 Overview

The typical customer care chatbot can answer simple questions, such as store locations and hours, directions, and maybe even making appointments. In this project, there will be another option. If the customer question is about the operation of a device, the application shall pass the question onto Watson Discovery Service, which has been pre-loaded with the device's owners manual. To take it a step further, the project shall use the Smart Document Understanding feature of Watson Discovery to train it on what text in the owners manual is important and what is not. This will improve the answers returned from the queries.

1.2 Purpose

- To create a Customer Help Desk using IBM assistant along with the Smart Document Understanding feature provided by IBM Discovery Service.
- To create a customer care dialog skill in Watson Assistant
- To use Smart Document Understanding to build an enhanced Watson Discovery collection
- To create an IBM Cloud Functions web action that allows Watson Assistant to post queries to Watson Discovery
- To build a web application with integration to all these services & deploy the same on IBM Cloud Platform

2. LITERATURE SURVEY

2.1. Existing Problem

Chatbots are tiny programs that help simulate interactions with customers automatically based on a set of predefined conditions, triggers, and/or events. Customer satisfaction with a company's services is often seen as the key to success and long-term competitiveness for a company. If the customer query were to be something outside of the standard question the chatbot would direct the call to a human customer service representative. These chatbots are inflexible and are incapable of finding the meaning and relationships of queries asked and data provided. Chatbots are not-so-popular due to their inability to understand perplexed human behavior. Also, they may not be able to handle all the queries and hence come across as a challenge while interacting. They are incapable of realistically mimicing a human-human communication

2.2. Proposed Solution

If Artificial Intelligence is incorporated with the chatbots they can answer all these queries on their own without connecting to a customer care executive. Here we make use of IBM services like IBM Watson Discovery, IBM Watson Assistant and IBM Cloud Functions.

AI chatbots are smarter versions of these traditional chatbots. They use machine learning and natural language processing to understand human intent better.AI chatbots provide more natural communication with humans. AI chatbots are trainable and, over time, learn and improve communication with your target audience.For every interaction they have with the audience, they become smarter. The bots also become better and more efficient at task completion.

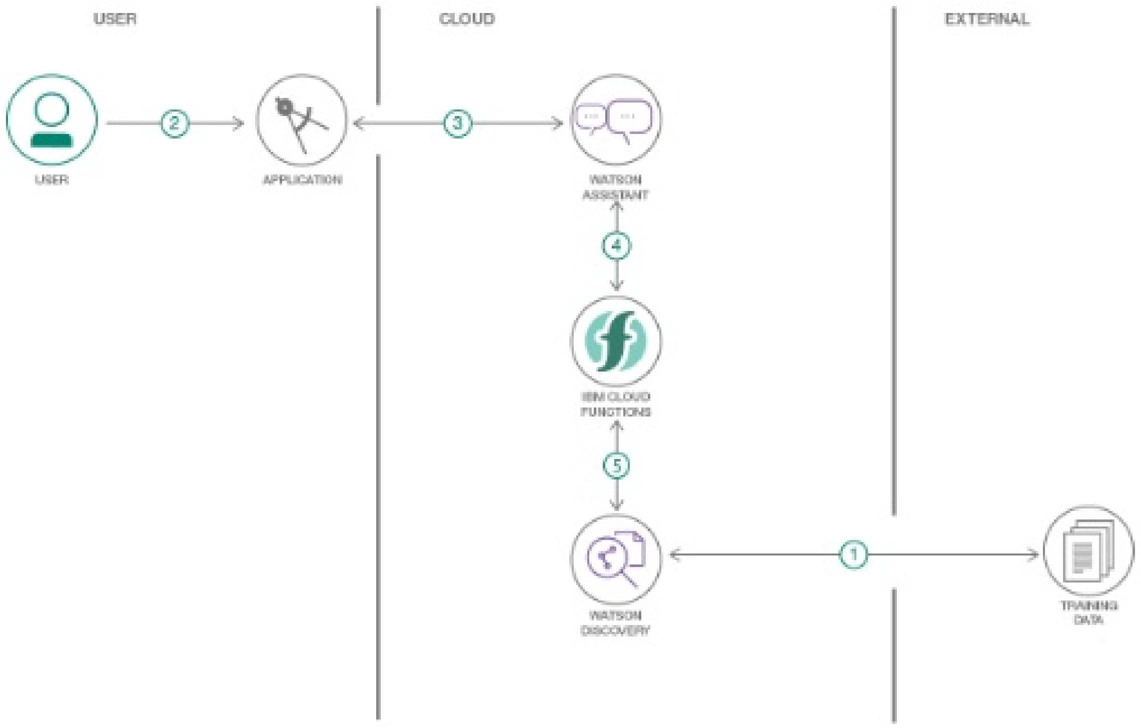
With IBM Watson Discovery, you can ingest, normalize, enrich, and search your unstructured data (JSON, HTML, PDF, Word, and more) with speed and accuracy. It packages core Watson APIs such as Natural Language Understanding and Document Conversion along with UI tools that enable you to easily upload, enrich, and index large collections of private or public data.

Watson Assistant is a conversation AI platform that helps you provide customers fast, straightforward and accurate answers to their questions, across any application, device or channel. By addressing common customer inquiries, Watson Assistant reduces the cost of customer interactions, helping your agents focus on complex use cases – not repetitive responses.

IBM Cloud Functions is a distributed compute service that executes application logic in response to requests from web or mobile apps. We can set up specific actions to occur based on HTTP-based API requests from web apps or mobile apps, and from event-based requests from services like Cloudant.

3. Theoretical Analysis

3.1. Block Diagram



1. The document is annotated using Watson Discovery SDU
2. The user interacts with the backend server via the app UI created using Node-Red. The frontend app UI is a chatbot that engages the user in a conversation.
3. Dialog between the user and backend server is coordinated using a Watson Assistant dialog skill.
4. If the user asks a product operation question, a search query is passed to a predefined IBM Cloud Functions action.
5. The Cloud Functions action will query the Watson Discovery service and return the results.
6. Integrate all services in Node-RED and create a UI for the same.

3.2. Software Designing

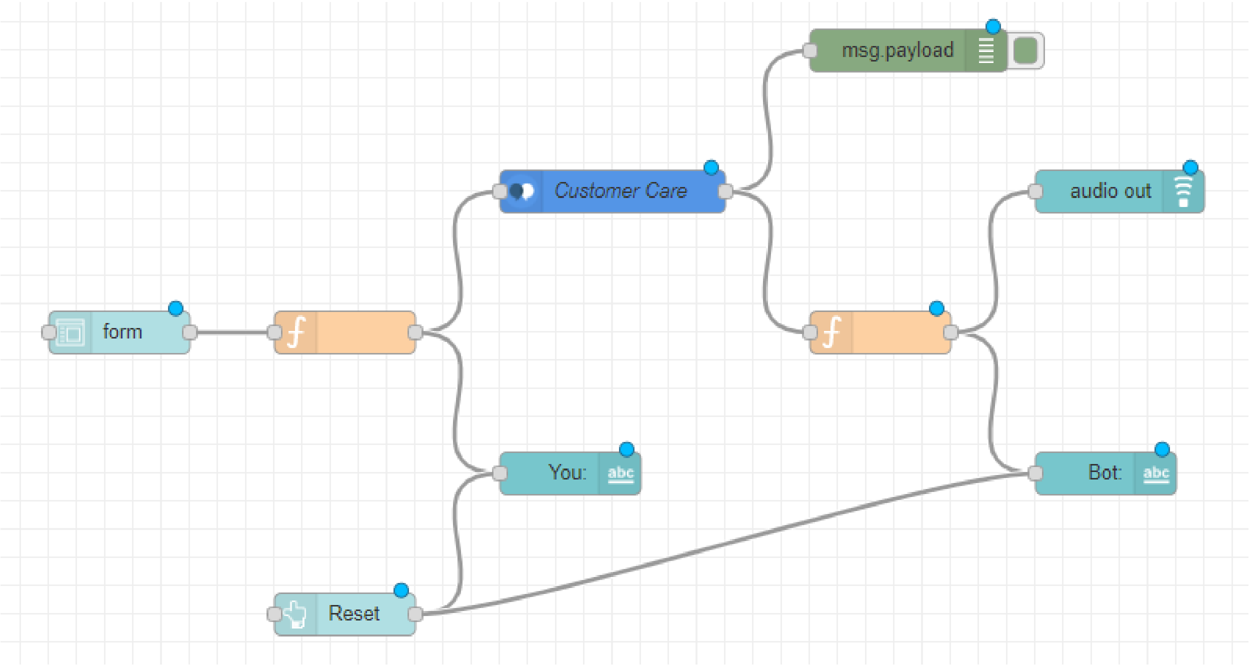
1. Create Necessary IBM Cloud Services

2. Configure Watson Discovery Service
3. Create Cloud Functions Action
4. Configure Watson Assistant
5. Build Node-RED Flow To Integrate All Services
6. Deploy the Node-Red flow

4. Experimental Investigation

1. Create required IBM Cloud Services
    a. IBM Watson Assistant
    b. IBM Watson Discovery
    c. Node-RED
2. Configure IBM Watson Discovery
    a. Launch Watson Discovery service
    b. Upload documents for Smart Document Understanding (I have used the Ecobee3 Smart Thermostat User Manual).
    c. Annotate data for Smart Document Understanding.
    d. Select the fields to be indexed and split document for improved results (I have selected only subtitles and text for indexing and split the document using subtitles).
    e. Run a query to check accuracy of discovery, store Discovery credentials and also the API key and URL
3. Create a webhook using IBM Cloud Functions Action
    a. This is used to integrate IBM Discovery Service with IBM Watson Assistant using a webhook.
    b. Create an IBM Cloud Functions Action (Source code is given in appendix).
    c. Click on parameters, create required parameters and use the Discovery credentials for parameter values.
    d. Go to Endpoints tab and click on the Enable as web action checkbox and store the URL.
4. Configure IBM Watson Assistant
    a. Launch IBM Watson Assistant and use the Customer Care Sample Skill to create an assistant with pre-loaded queries related to customer support.
    b. Create an intent for product related queries (I have created the Product Info intent) and add to dialog
    c. Go to options tab and under webhooks, paste the URL we stored in step 3(d).
    d. In dialog tab enable webhooks.
5. Create a Node-RED flow
    a. Open Node Red app from the Cloud foundry apps.
    b. Use Node-RED to create a UI and to link all the services.

5. Flowchart

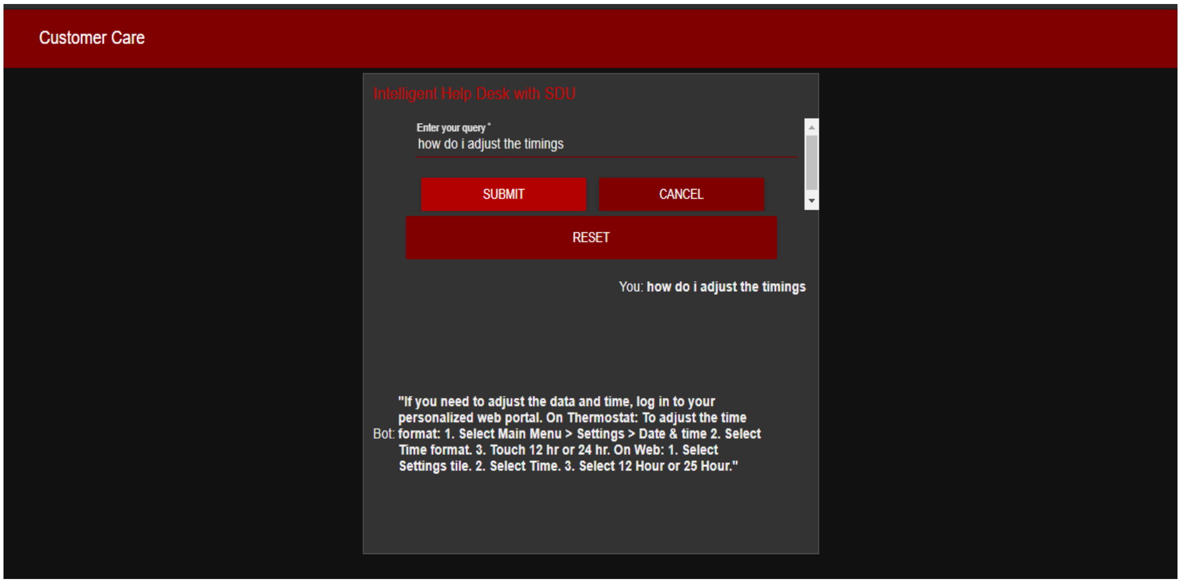

msg.payload
Customer Care
audio out
form
ƒ
ƒ
You:
abc
Bot:
abc
Reset

6. Result

The chatbot created can be found in the link:
https://node-red-dktrz.eu-gb.mybluemix.net/ui

This link provides the front-end of the chatbot created using Node-Red services where in we have integrated the IBM Watson Assistant, IBM Watson Discovery and IBM Cloud Functions.

The screenshot of this result is :



Enter your query *
how do i adjust the timings

You: how do i adjust the timings

Bot: "If you need to adjust the data and time, log in to your personalized web portal. On Thermostat: To adjust the time format: 1. Select Main Menu > Settings > Date & time 2. Select Time format. 3. Touch 12 hr or 24 hr. On Web: 1. Select Settings tile. 2. Select Time. 3. Select 12 Hour or 25 Hour."

7.Advantages and Disadvantages

Advantages:

- Reduced costs
- 24-7 availability
- Learning and updating
- Onboarding and educating customers
- Low interaction with Customer Care executive
- Low workload on employees

Disadvantages:

- Inability to understand if an unsaved query is asked.
- Zero decision-making
- The context and meaning of a question is not understood properly. So may give same answer for multiple sentiments
- May mislead customers
- May give wrong results if not properly configured

8. Applications

- It can be integrated with websites and apps to solve user queries.
- It can be deployed in various social media apllications because of preexisting integrations with IBM Cloud Services.

9. Conclusion

The combination of a new wave of thinking and newly developed artificial intelligence technology has the potential to completely change the customer experience to provide great service in a way that resonates with modern customers. With the help of IBM Cloud servicesd, a chatbot that can answer queries regarding the product and location/ timing of the office was created successfully.

10. Future Scope

We can import the pre-built node-red flow and can improve our UI, moreover we can make a data base and use it to show the recent chats to the customer. We can also improve the results of discovery by enriching it with more fields and doing the Smart Data Annotation more accurately. Because it can process text mining and complex analytics on huge volumes of unstructured data and handle enormous quantities of data. As the application gains experience with more input, it can find enough patterns to make accurate predictions. .We can get the premium version to increase the scope of our chatbot in terms of the calla and requests. We can also include Watson text to audio and Speech to text services to access the chatbot hands free. These are few of the future scopes which are possible.

11. Bibliography

1. Watson Services:
   https://www.ibm.com/watson/products-services
2. Watson Assistant
   https://developer.ibm.com/components/watson-assistant/series/learning-path-watson-assistant
3. Watson Discovery
   https://developer.ibm.com/articles/introduction-watson-discovery/
4. Watson Cloud Functions
   https://cloud.ibm.com/docs/openwhisk?topic=cloud-functions-getting-started

12. Appendix

12.1. Source Code

a. Node-Red Flow:

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```

b. Watson Cloud Function Action:

```
 /**
          *
          * @param {object} params
          * @param {string} params.iam_apikey
          * @param {string} params.url
          * @param {string} params.username
          * @param {string} params.password
          * @param {string} params.environment_id
          * @param {string} params.collection_id
          * @param {string} params.configuration_id
          * @param {string} params.input
```

```
  *
  * @return {object}
  *
  */

const assert = require('assert');
const DiscoveryV1 = require('watson-developer-cloud/discovery/v1');

/**
  *
  * main() will be run when you invoke this action
  *
  * @param Cloud Functions actions accept a single parameter, which must be a JSON object.
  *
  * @return The output of this action, which must be a JSON object.
  *
  */
function main(params) {
  return new Promise(function (resolve, reject) {

    let discovery;

    if (params.iam_apikey){
      discovery = new DiscoveryV1({
        'iam_apikey': params.iam_apikey,
        'url': params.url,
        'version': '2019-03-25'
      });
    }
    else {
      discovery = new DiscoveryV1({
        'username': params.username,
        'password': params.password,
        'url': params.url,
        'version': '2019-03-25'
      });
    }
    discovery.query({
      'environment_id': params.environment_id,
      'collection_id': params.collection_id,
      'natural_language_query': params.input,
      'passages': true,
      'count': 3,
      'passages_count': 3
    }, function(err, data) {
      if (err) {
        return reject(err);
      }
      return resolve(data);
    });
  });
}
```