

## INTELLIGENT VIRTUAL ASSISTANT USING IBM BLUEMIX AND WATSON SERVICES

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### ABSTRACT

A busy person's schedule puts him in situations where the person forgets his personal commitments and finds difficulty in performing tasks. The busy person needs an assistant to do many of the inevitable tasks for him that could relieve him of the routine tasks and motivate himself to the critical work which require human problem solving skills. The purpose of this project is to aid a busy person in managing time commitments and tasks such as scheduling an event in the calendar, telling a joke, navigating in an unknown area, performing arithmetic calculation, making a call, sending an email. We propose a website/mobile application that understands commands given either by text or speech from the user and perform the required action. We made use of emerging platforms such as IBM Bluemix and Watson Services. IBM Bluemix is IBM's innovative cloud computing platform that combines platform as a service (PaaS) with infrastructure as a service (IaaS). Additionally, Bluemix has a rich catalog of cloud services that can be easily integrated with PaaS and IaaS to build business applications rapidly. IBM Watson Services supports in Dynamic learning by helping to improve learning based on outcomes to get smarter with each iteration and interaction.

### 1. INTRODUCTION

A Person must juggle a broad range of tasks and responsibilities. While doing so, worker must maintain awareness of deadlines and resources, as well as tracking current activities and new information that could affect his or her objectives and productivity. Much of his/her work will require coordination and collaboration with a broad range of people, both within and outside of his/her immediate organization. As organizations seek to improve cost effectiveness and efficiency, workloads for many people are increasing. Furthermore, people are being inundated with vastly increased volumes of information that must be filtered and absorbed. The net result is high

levels of cognitive overload in the workplace. Different styles of assistive technology suit different applications, depending on the types of problem to be addressed and the balance of expertise and knowledge between the user and the system. In situations where human problem-solving skills are weak or compromised in some way, an assistant can provide value by watching over the user's shoulder and intervening to provide guidance when the user reaches impasses or makes mistake.

With the breakthrough of speech recognition, natural language processing, semantic web and machine learning we can safely say that the age of Intelligent Virtual Assistant is upon us. A software agent that can do various tasks or service for a person is called "Intelligent Virtual Assistant". It depends on user input, location information about weather, traffic conditions, news etc. According to IBM, more than 100 different techniques are used to analyze natural language. IBM Watson represents a first step into cognitive systems, which can transform how organizations think, act, and operate in the future. Watson combines natural language processing, dynamic learning, and hypothesis generation and evaluation to give direct, confidence-based responses.

### 1.1 Existing system

There are many Intelligent Virtual Assistant present in the market at present: -

**1. SIRI:** Siri was released as an iOS application by Siri Inc. It was integrated with service such as Google Maps, OpenTable, MovieTickets and TaxiMagic. Siri works like a real personal assistant, it has its own personality and we can carry on a short conversation with it. We can ask to show pictures or videos present in the phone.

**2. GOOGLE NOW:** Google Now is an intelligent assistant available on Android, iOS and Google Chrome browser. Google Now track varies information and notify or show them in their dedicated application before you may need them. It does this by tracking user's use pattern and searched information as well as frequently visited web sites.

**3. CORTANA:** Cortana is a voice controlled intelligent personal assistant created by Microsoft. It is a personal assistant where a female virtual assistant will give suggestion for tasks the user might need to perform based on user location and past behavior. Users can instruct Cortana to find information, find things on PC, schedule appointments, manage calendar etc. Cortana collects information using the Bing search engine.

### 1.2 Problem Statement

It is very difficult for a busy person to cope up with all the works apart from doing the critical work which requires the worker's complete assistant. The worker needs a personal assistant which can aid him and relieve him off few works. We propose

a website/mobile application which would understand the command given by the user either in text or speech and perform the required action.

### **1.3 Proposed System**

We propose a website and mobile application that tries to overcome the above drawbacks using IBM Watson and its services. Our proposed intelligent personal assistant tries to understand the human language to identify inferences between text passages with human-like accuracy using IBM Watson, and at speeds faster than the existing intelligent personal assistants. It uses the Watson Natural Language Classifier service which understands the intent behind text and returns a corresponding classification and Watson dialog service which supports building conversations between a user and an application. The Dialog service will track and store information obtained during the conversation until we have all the information required to complete the task.

### **1.4 Objectives**

- To create website/mobile application using nodeJS.
- To make a phone call that connects the Requested user.
- To send an email by giving commands.
- To ask to perform a numeric calculation that solves the required sums asked by the User.
- To request a joke with the user when he Commands for a joke.
- To help in navigation by giving directions to a particular location requested by the user, or give directions to the house.

### **1.5 Methodology**

**1. Create an application:** This is the initial stage where we create a website/mobile application using Angular1, nodeJS, HTML, IBM Bluemix and Watson services.

**2. Setting up of Watson services:** This stage involves the setting up of the Watson services namely the Watson Natural Language Classifier service which understands the intent behind text and returns a corresponding classification and Watson dialog service which supports building conversations between a user and an application. The Dialog service will track and store information obtained during the conversation until we have all the information required to complete the task.

**3. Training the Natural Language Classifier service:**

In this phase, we train the Natural Language Classifier using various text examples of users making the requests and expecting a proper reply.

**4. Testing the IPA using real time examples:**

In this phase, we are developing an Intelligent Personal Assistant by combining the services configured in the above phases. The IPA is tested with real time queries by the users.

## 2. LITERATURE SURVEY

The concept of virtual assistant was first developed by Joseph Weizenbaum of MIT in the late 60s [2]. ELIZA is an early natural language processing computer program created during

1964 to 1966[1]. It was initially created to demonstrate the superficiality of communication between man and machine. It provided a lot of insight into human reactions to computer systems. JULIA is an example of the second- generation chatterbot developed by Michael Mauldin in 1994. The third-generation chatterbots were developed in 2000 by Richard Wallace called ALICE (Artificial Linguistic Internet Computer Entity). The chatterbot Prelude is an intelligent virtual character that learns about and attempts to interact with the user. Currently there are many such agents for everyday use like Google Now by Google, Siri by Apple, Amazon Echo, Microsoft Cortana and many more.

The first fully functional Intelligent Personal Assistant (IPA) is Denise developed by NextOS formerly known as Guile3D [8]. Denise is an advanced virtual assistant software for PC Desktops and MAC OS computers running Parallels. She assists the users in human - computer interaction like searching the web, checking and speaking aloud e-mails, scheduling appointments, getting latest news etc. using natural language. The age of mobile IPA start with the acquisition of Siri by Apple in April 2010 [8]. It was integrated with the services such as Google Maps, Open Table, Movie Tickets and Taxi Magic. Siri works like a real personal assistant, has its own personality and can carry on a short conversation. After a year and a half of their acquisition, Apple released Siri integrated with iOS[6].

In 2011, EasilyDo was developed by Mikael Berner and Hetal Pandya, which is a virtual personal assistant for iOS and Android. It allows the user to keep track of e-mail, schedule and social obligations. In January 2012, Evi was released which has the ability to deal with natural language. It was developed by Per Kvalvaag. It was made available as an application for both iPhone and Android. Google Now is the answer of Google for IPA [8]. In July 2012, it makes its first appearance on Android 4.1 powered by Nexus smartphone. Later by 2013 it begun to support iOS with limited functionality. It provides most of the information that the user needs at any time. This includes reminder to walkout summary. It can keep track of the user's browsing history [3] and show relative information when new content is being added to the site.

In April 2014, Cortana was created by Microsoft as a voice controlled IPA. Cortana is named after a gaming character in Microsoft's Halo video game [8]. It is only available on phones with Windows Phone 8.1, PC with Windows 10 [7] and in some countries/regions. It uses the Bing search engine and data stored on the user's

smartphone and computer. It is placed as a personal digital assistant that helps the users organize and manage their day-to-day activities.

In November 2014, an IPA named as Alexa was developed by Amazon Lab126. It is made available for iOS 8.0 and later versions, Android 4.4 and later versions. It is capable of voice instruction, music playback, setting alarms and other real time information [8]. Most devices with Alexa allow users to activate the device using a wake-word (such as Echo).

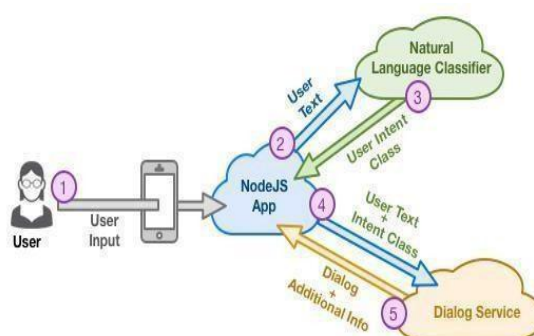
In 2015, one more IPA for Microsoft Windows was developed by Brainasoft named Braina. It uses the natural language interface and speech recognition to interact with the users. It allows users to use English language sentences to perform various tasks on their computer [4]. In March 2015, an open source IPA named as Lucida was developed by Clarity Lab at the University of Michigan [5]. It is a natural language IPA notable for being open source in a field of competing proprietary IPA services. It operates on Ubuntu OS. Google has taken on Amazon Alexa, Apple Siri and Microsoft Cortana with its own voice assistant i.e., Google Assistant.

Google Assistant is Google's latest iteration of an assistant. It is considered as an upgrade or an extension of Google now. It is designed as conversational application for the users.

### 3. SYSTEM DESIGN

The design phase begins when the requirement specification for the software to be developed is available. The design of the system is essentially a blueprint or a plan for the solution to the system. The system comprises of different components with clearly defined behavior or services to its environment. System design is a modeling process, which allows user to create a new system it is a transition from user's view to programmers' or database person's view. It acts as a bridge between the required specification and implementation.

#### 3.1 ARCHITECTURE DIAGRAM



**Fig 3.1: Proposed framework for Intelligent Virtual Assistant**

The above diagram represents the architectural diagram. Here the user sends a request to the nodeJS server. The server sends the request to the Natural Language Classifier. The Natural Language Classifier recognizes the request and selects the class and sends it back to the server. The server then sends the text plus the intent class to the Conversation services. The dialog class sends the response back to the user.

#### 4. IMPLEMENTATION

The goal of the implementation phase is to translate the design of system produced during the design phase in to a source code through a programming language which can be executed by a computer which performs a computation specified for a given design, the aim is to implement design in the best possible manner.

##### 4.1: PSEUDOCODE

```

/* the cloud foundry environment */ var cfenv require('cfenv')
var express require('express'), app express(), env process.env.NODE_ENV
process.env.NODE_ENV OR 'development', config
require('./server/config/config.js')[env]; require('./server/config/express.js')(app, config);
app.use('/static', express.static(__dirname + '/public'))
app.use('/vendor', express.static(__dirname + '/public/vendor'))
/* the Watson Developer Cloud */
var Watson require('watson-developer-cloud')
var conversation watson.conversation
/* enclosing the parameters for watson.conversation */ username: <username>, password:
<password>, version: 'v1',
version_date: <version date> /* response to the user */
app.post('/chatResponse', function (req, res)
{ /* processing input in the form of text */ var text req.body.text; conversation.message({
workspace_id: <workspace id?>, input: {
'text': text }, context: {} context: {}
}, function (err, response) { if (err) console.log('error:', err); endif else{
console.log(response);
/* declaring the response data */ text:response.output.text,
confidence:response.intents[0].confidence, intent:response.intents[0].intent
};
res.json(responseData); } } );
})

```

```
app.get('/', function (req, res) { res.render('./../public/clientApp/index'); })
app.get('/test', function (req, res) { res.json({ "test": "success" /* checking the result */ })
});
app.get("*", function (req, res) { res.redirect(400, '/');
})
```

### Configuring the Services:

Our application has been developed using the Watson Services of IBM Bluemix. Watson

Developer Cloud is the platform for the Watson Services. Initially we made an account in the cloud giving the username and password to develop the basic web page of the application and to make as an interface to fetch the services.

The Watson Services we have made use are Natural Language Classifier (NLC) and

Conversation Services. IBM gives unique credential to each of the services which should be included in order to use the application on localhost. The user when opens the application in desktop or mobile he/she can give the input. The application is trained using NLC such that it accepts the input both in the form of text or speech in regular English. It processes the input using Conversation Services during which chatResponse and responseData are used as mentioned in the pseudocode. If the input which is not trained is given by the user the error message is displayed to the user.

## 5. RESULTS AND SNAPSHOTS

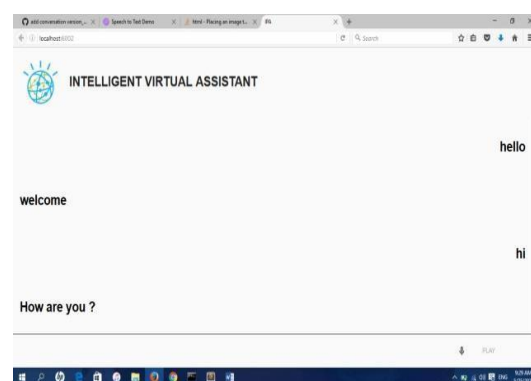


Fig: 5.1 Greeting message to the user

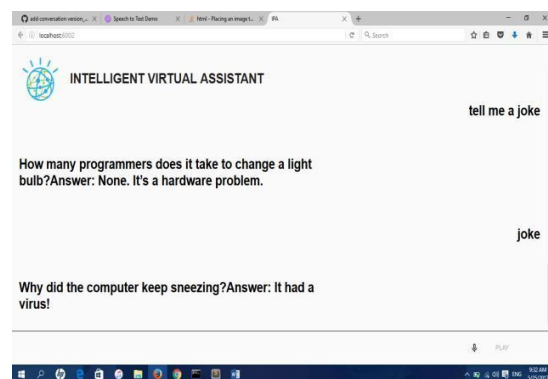


Fig: 5.2 Displays joke to the user

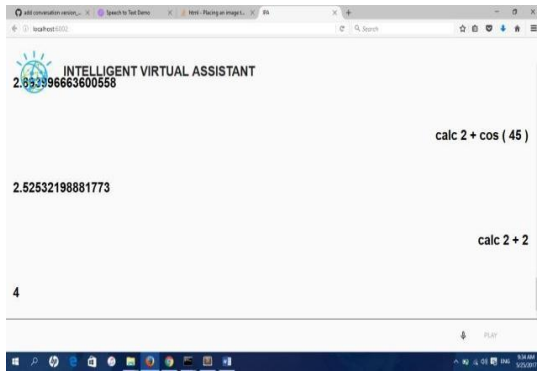


Fig: 5.3 Opens the mail for a user

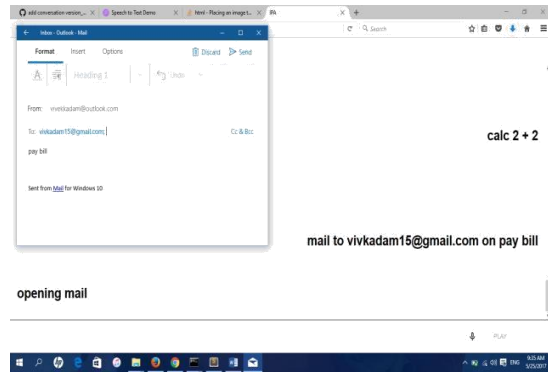


Fig: 5.4: Calculates the given values

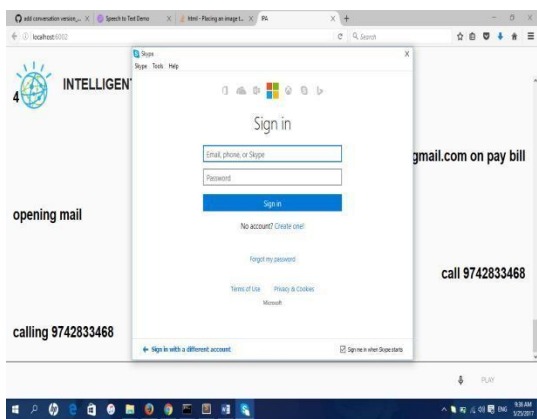


Fig 5.5: Makes a call to the

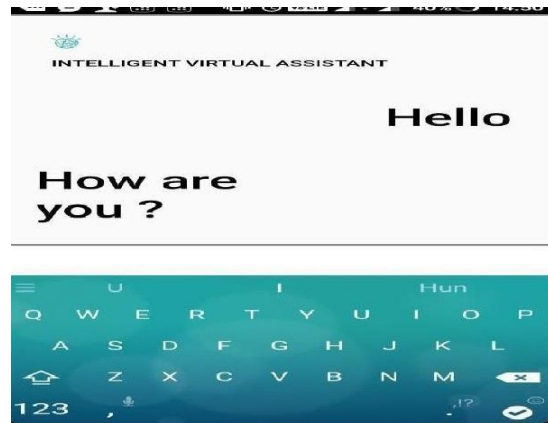


Fig 5.6: Mobile application

Requested user number

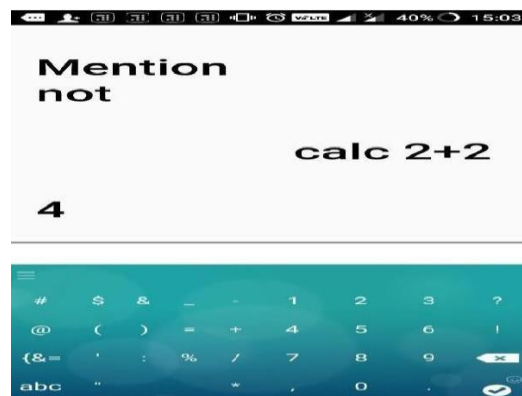


Fig 5.7: Response for thank you

## **6. CONCLUSION AND FUTURE SCOPE**

Advancement in the Artificial Intelligence(AI), Robotics, Internet of Things (IoT) have ensured that the new transfer of knowledge and skills will be carried out through software directly rather than involving humans. Intelligent Virtual Assistant (IVA) that we have developed improves the user productivity by managing routine tasks of the user and by providing information from online source like Google Maps, Email, and phone. Here we have made use of IBM Watson Services to carry out short conversation with our IVA in English. Intelligent Virtual Assistant is the most elegant and effective way for humans and machines to interact. Voice commands and Natural language voice recognitions will ease the way to interact with technology. With the increase dependence on voice search and organizational platforms there might be serious impact on the future of home devices, payment and commerce.

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