UNIVERSITY OF
BIRMINGHAM

Chatbot Overview

1. Purpose

Chatbot is one of the emerging technologies leading the agenda in 2016. Microsoft launched "Tay" in March 16. Facebook announced in April 2016 that businesses would be able to provide chatbots to deliver automated customer support via its "Messenger" services. Other providers include IBM and Microsoft are also providing development platforms to develop the chatbots. In this scenario, this article will give an overview of chatbots, explaining the concept and types of chatbots and it will introduce several different development platforms to create chatbots. Finally, we will conclude our paper with findings and recommendation on how chatbots could be used in the University.

2. Chatbot Overview

2.1 What is A Chatbot

A bot is a piece of software that is designed to automate a specific task. A chatbot is a computer program which conducts a conversation via auditory or textual methods. Such programs are often designed to convincingly simulate how a human would behave as a conversational partner. Some chatbots use sophisticated natural language processing systems, but many simpler systems can scan for keywords within the input, then pull a reply with the most matching keywords, or the most similar wording pattern, from a database.

More recently, chatbots have worked as a user interface which can be plugged into a number of data sources via APIs, so they can deliver information or services on demand, such as weather forecasts or breaking news. Chatbots are working as connectors between the users and the apps. The following image describes the potential functions of the chatbots:
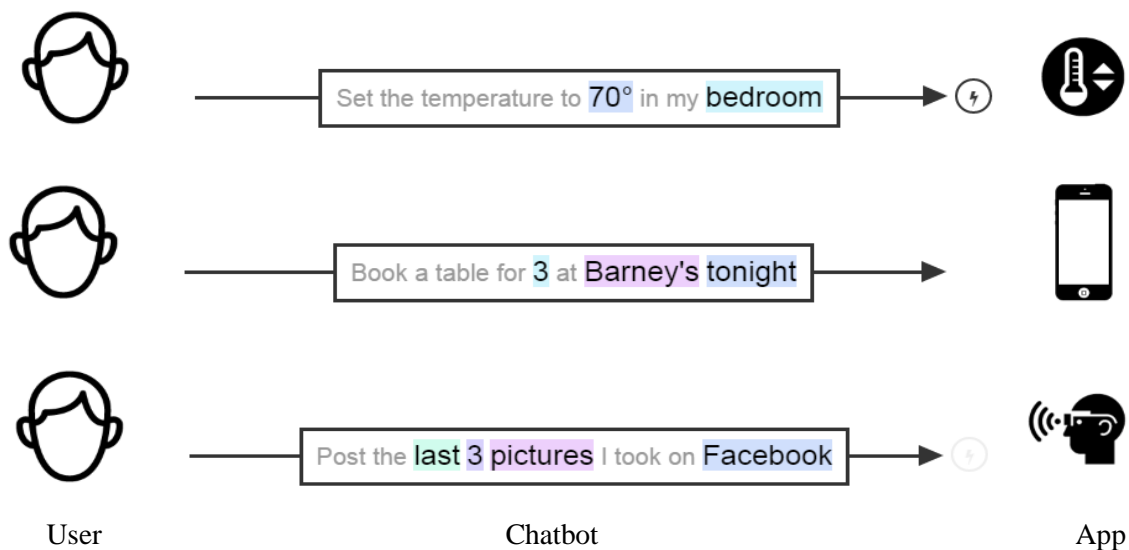

| User | Chatbot | App |

Figure 1 Chatbot Potential Functions

2.2 Types of Chatbot

Chatbots are typically used in dialogue systems for various practical purposes, including customer service or information acquisition. With the rise of artificial intelligence, there has been a trend of embedding the functions of the chatbots into various apps. Chatbots will act as the user friendly interface to automate the services of the apps.

There are largely two classes: content-driven chatbots and utility chatbots. Content-driven chatbots are focusing on providing content, which is not a new concept and can be tracked back to the first natural language processing programme named ELIZA in the 1960s. Utility chatbots can get something done following a prompt. For instance, Siri and Cortana users can have small talk with, as well as getting things done, so they are much harder to build. Because of the nature of the utility chatbots, they can also be called virtual personal assistant.

3. Chatbots Development Platforms

There are many chatbots around nowadays. According to www.chatbots.org, there are more than 1000 chatbots actively in use. These chatbots have been used in many areas, from health and beauty, cooking and lifestyle, to education etc. Many of these chatbots were developed using the AIML (Aritifical Intelligence Markup Language).

Although AIML can be used to develop chatbots, it is not effective enough and requires more time for developers to learn AIML itself. Developers writing chatbots all face the same problems: chatbots require basic I/O; they must have language and dialog skills; they must be responsive and scalable; and they must connect to users – ideally in any conversation experience and language the user chooses. This created a need for chatbot development platforms. In 2016, big companies like Facebook, IBM and Microsoft started to introduce their own development platforms to develop chatbots.

3.1 Wit.ai Bot Engine

- Developer Platform: https://wit.ai/
  On 12th April 2016, Facebook announced tools "wit.ai Bot Engine" for developers to build chatbots inside Facebook Messenger, bringing a range of new functions to the popular communication app. Facebook believes Messenger can become a primary channel for businesses to interact with their customers, replacing 1-800 numbers with a mix of artificial intelligence and human intervention. If they are embraced by the general public, chatbots could represent a major new channel for commerce, customer support, and possibly even the media.
- Features:

  Facebook provides the following main capabilities within the wit.ai Bot Engine for messenger:
  1) Send/Receive API: this capability includes the ability to send and receive text, images, and rich bubbles with call to action (CTAs).
  2) Generic Message Templates: structured messages templates with call to actions, horizontal scroll, urls, and postbacks, which enable the users to interact with the chatbots using tap buttons and images.
  3) Welcome screen + Null state CTAs: give the developers the flexibility to customerize their chatbots.
  4) Natural language assistance: It not only enables ongoing training of chatbots using sample conversations, but also converts natural language into structured data which provides a easy way to manage context and drive conversations based on the app's goal.
- Cost:
  The wit.ai Bot Engine is free to use, including for commercial use.

3.2 IBM Watson Dialog service

- Developer Platform: http://www.ibm.com/watson/developercloud/

  IBM Watson Developer Cloud offers many services in language processing, speech and text conversion, vision capabilities and data insights. Its Dialog service enables the developers to automate branching conversations between the users and the applications. It enables the applications to use natural language to automatically respond to user questions, walk users through processes, or even hand-hold users through difficult tasks. The IBM Watson Developer Cloud offers a variety of services for developing cognitive applications, and IBM Bluemix works as the cloud platform for deploying these applications.
- Features:
  1) Comprehensive Functionalities: IBM Watson Developer Cloud offers services in language, speech, vision and data insights. It supports "speech to text" and "text to speech" functions which are quite common features in chatbots.
  2) Messaging Platform Independence: developer can build the chatbots decoupled from a specific messaging platform which simplifies the task to make the chatbots available on other messaging platform.
- Cost:
  Watson Developer Cloud is not free, although it comes with the free trial period of 1 month. It also has different charges in terms of the different service packages.

3.3 Microsoft Bot Framework

- Developer Platform: https://dev.botframework.com/

  Microsoft introduced the Bot Framework on 30th March 2016 at Microsoft's Build conference in San Francisco. The Bot framework is a new tool to help developers build their own bots applications, and there is also a bot directory full of sample bots (https://bots.botframework.com/). A BotBuilder software development

kit (SDK) is available on GitHub under an open source MIT license. These bots can be implemented into a variety of applications, including Slack or Telegram or text messages or even email.

- Features:

  The Bot Framework has three components, including the Bot Connector, Bot Builder SDK and the Bot Directory:

  1) The Bot Connector lets the developers to connect the bots to text/sms, Office 365 mail, Skype, Slack, and other services.
  2) The Bot Builder SDK is an open source SDK hosted on GitHub that provides functions to build the Node.js, C# or REST API based bots.
  3) Once the bots are built, developers/providers can register the bots, configure desired channels and publish in the Bot Directory.

  The Microsoft Bot Framework is also messaging platform independent. Supported Channels as of Junly 2016 include: Text/sms, Office 365 mail, Skype, Slack, GroupMe, Telegram, Facebook Messenger, Kik, Web (auto configured, embeddable) and direct Line (API to host your bot in your app).

- Cost:
  Microsoft Bot Framework is an open source platform, and it is free to use.

4. Findings

Chatbots used to mean a computer program which conducted a conversation via auditory or textual methods, but this concept is evolving. The chatbots we are talking about here are essentially VPAs (virtual personal assistants). Chatbots are working as connectors between the users and the apps. They work as a user interface which can be plugged into a number of data sources via APIs, so they can deliver information or services on demand. They are becoming a vital way for users to interact with a service, application, website or mobile app.

It is widely believed that Chatbots are becoming the key applications in mobile and web applications. Currently, we have different web and mobile applications in the university. Automating some of these services with chatbots can deliver business benefits across many domains. Monitoring the chatbots development and prototyping one or a few of the applications using chatbots will be the first step to test the chatbots technology maturity and the wider user acceptance. Potential applications using chatbots could include:

1) Automating answers of the enquiries from the new applicants and further direct them to the relevant department or resources;
2) Using Chatbots to relieve some of the workload on the IT Service Desk, Legal Services, HR and Estates etc. For instance, automating IT Service desk call: answering users' queries, according to the complexity of the problem either provide users with the answer or help user to email and call the service desk;
3) Events booking chatbots: In response to the user's interest, help staffs and students to book the events across the campus.

It is worth to mention there are some limitations and functions requirements of the current generation of chatbots:

1) Chatbots work best within the constraints of clearly defined subject areas and currently require ontologies (or equivalent business rules) to be defined for them by human beings. Nevertheless, they can be highly effective within such limits.
2) The first use of chatbots is likely to be in answering simple queries in clearly defined areas, thus freeing-up people to deal with more complex ones. A number of leading law firms in London are trialling legal chatbots and it appears that the technology is well suited to subjects such as the law.
3) Eventually, most casual users of applications will interact with them using chatbots, at least during the initial steps. Chatbots are likely to replace menus and search boxes.
4) Chatbots are well suited to more diverse user devices with varying screen sizes, audio etc.

5. Future Work

As the initial step of the trial of Chatbot, IT Innovation Centre has employed a student intern to work on the experiment of using the chatbot to automate some of the services for the IT Service Desk. The experiment will use chatbot to answer users' queries, according to the complexity of the problem either provide users with the answers or help users to email and call the service desk.