


Chapter 41

An Architectural Framework for Facebook Messenger Chatbot Enabled Home Appliance Control System

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ABSTRACT

The need to remotely control home appliances is an important aspect of home automation and is now receiving lot of attentions in the literature. The works so far are still at a development level making further research necessary. This article presents a framework for chatbot-controlled home appliance control system and was implemented by programming a Raspberry Pi using the Python language while the chatbot server was also implemented using a Node.js on JavaScript. The Raspberry Pi was connected to the chatbot server via Wi-Fi using a websockets protocol. The chatbot server is linked to Facebook Messenger using the Messenger Application Protocol Interface. Messages received at the chatbot server are analyzed with RasaNLU to classify the user's intention and extract necessary information which are sent over websocket to the connected Raspberry pi. The system was evaluated using control precision and percentage correct classification with both producing a significant level of acceptance. This work produced a Facebook Messenger chatbot-based framework capable of controlling Home Appliances remotely.

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1. INTRODUCTION

Interests toward enhancing interface usability of applications and entertainment platforms have increased in the past years. Human machine as a technology is known to generally incorporate diverse areas while the computational methodologies facilitate communication between users and computers using natural language (Popescu et al., 2003). The agent that aids machine conversation has been widely referred to as chatbot and is known to be a conversational agent which allows interaction with its users using natural language. The concept of chatbots have been in existence for a long time, and quite a lot of chatbot systems have been developed using text as the primary form of communication. Examples of such bots are ELIZA an agent which simulates a psychotherapist and PARRY also an agent which simulates a paranoid patient (Popescu et al., 2003; Comendador et al., 2015). These chatbots are known to be software systems, which can interact or “chat” with a human user in natural language such as English (Potamitis et al., 2003). Its relevance was further confirmed in early 2016 when Facebook launched a service for its instant messaging platform (Messenger) which allows developers to create chatbot accounts that can interact with Facebook users while a Software Development Kit (SDK) to interact with the service was also released. This recent effort from Facebook further justifies the needs for an enhanced interface usability of applications.

We are now living in the world of automation where most of the systems found in industries, homes and other business sectors are getting automated. Enhancing healthcare monitoring in homes using automation was considered by Dey et al. (2017) and Bhatt et al. (2017) while improving existing efforts on smart and secure city (Solanki et al., 2016) and smart home (Fong et al., 2018) have also been considered in literature. Home automation systems are advancements to the mechanization processes wherein human efforts are needed with the machinery equipment's to operate various loads in homes. In order to interact with the outside world, early generation appliances have depended mostly on hard wired connections to computers. With the obvious needs for home automation, a lot of researches have since been carried out to see the possibility of having automated homes. The absence of a generic standard for home appliances networking has previously posed a serious threat to these efforts but was subsequently eliminated after the Electronic Industries Association of America developed Consumer Electronic Bus (CEBus) in 1992. (Nicolas et al., 2000). In the past decade, there have been great advancements in Internet, Mobile telephony and Transmission Control Protocol/ Internet Protocol (TCP/IP) technologies which have resulted in many appliances having their own built in communication transceivers (such as Infrared, Bluetooth and GPRS). Therefore, these advancements have made it easier to build remotely configurable appliances that leverage on their in-built communication transceivers.

A home appliance control system enables the control of household appliances remotely. These appliances include fans, lights, air conditioners, television sets, etc. In a bid to achieve full home automation, all the appliances are controlled from a centralized control unit. Home automation involves the use of one or more computers to control appliances automatically and sometimes remotely over a communication network (Duk-Jin et al., 2006; Mohd et al., 2007; Mohd and Salim, 2009; Agarwal, 2014). The interface such as mobile applications, web applications for controlling of these appliances has however varied over time. This work will therefore focus on controlling appliances via Facebook Messenger chatbot.

Often times, people forget to either turn on or off some of their appliances before leaving their respective homes, and in some cases, are just unsure of the current state of an appliance, whether it is on or off (Oguntimehin, 2016). This ultimately, requires such people to return to their respective homes in order to turn these appliances off and as a result inhibits their conveniences. Other users may decide to

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