Chapter 8
KalaamBot and KalimaBot: Applications of Chatbots in Learning Arabic as a Foreign Language

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ABSTRACT

Chatbot technology is a subfield of Artificial Intelligence (AI) that deals with text-based or speech-based conversational agents. In general terms, a chatbot enables a user to have a conversational interaction with a computer. Chatbots have applications in several fields including trade, tourism, customer care, health services, education, et cetera. This chapter describes two chatbot systems that we are developing for learning Arabic as a foreign language. KalaamBot is a speech-based chatbot that converses with learners and teaches them the language in a conversational setting. KalimaBot is a text-based personal vocabulary assistant that enables students to search for the meaning of words, synonyms, antonyms, and word usage in context. This chapter provides extensive discussion of the several challenges second language researchers and chatbot practitioners encounter when designing chatbots for language learning. Then, it concludes with recommendations and future research.

INTRODUCTION

Conversational AI is a subfield of artificial intelligence (AI) that deals with text-based

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or speech-based conversational agents: chatbots. These agents automate intelligent conversations and verbal interactions between humans and machines. Scholars have referred to chatbots in a variety of ways, including machine conversation systems, virtual agents, dialogue systems, chatterbots (Abu Shawar & Atwell, 2007), conversational agents, and chatbots (Jurafsky & Martin, 2021). Chatbots have applications in trade, tourism, customer care, education, health services, automatic telephone answering systems, et cetera. They range from simple systems that extract responses from conversational datasets to more sophisticated systems that employ natural language processing (NLP) tools and deep learning techniques. Chatbot domains are classified as open or closed based on user input. Open-domain chatbots are trained on massive corpora of conversations. Consequently, the user can ask about anything without a clear goal (Shang et al., 2015). Closed-domain chatbots restrict user input and chatbot responses to a specific goal, such as booking a ticket, learning a language, et cetera.

This chapter focuses on incorporating recent advances in NLP, such as neural net transformers[1] (represented by the wav2vec 2.0 speech recognition system; Baevski et al., 2020), into the design of end-to-end language learning systems in order to leverage students' acquisition of both textual and oral language learning. It provides demos for two different chatbots in action and argues for ruled-based closed-domain architectures when using chatbots for second language learning. We argue that these architectures are suitable for second language learning with the aim of training learners on language tasks to achieve proficiency.

The rest of the chapter is organized as follows: *Chatbots' Architectures and Techniques* presents an overview of chatbots' architectures and techniques, and it discusses traditional, rule-based, and machine-learning chatbot design techniques. *Chatbots in language learning* provides an overview of recent advances and the use of chatbots in language learning. Both *KalaamBot* and *KalimaBot* sections overview the implementation and the design of the speech-based and text-based chatbots, respectively. The *Challenges and Future Directions* section overviews the technical and pedagogical challenges when designing chatbots for language learning. The chapter concludes with recommendations and future remarks.

CHATBOTS' ARCHITECTURES AND TECHNIQUES

Typically, the architecture of a chatbot involves three main components: Natural Language Understanding (NLU), Natural Language Generation (NLG), and a Dialogue Management Engine (DME). Some scholars consider the User Interface (UI) as a fourth component, while others do not. In speech-based architectures, two components are added: a text-to-speech engine (TTS) and a speech-to-text engine

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