Chapter 14
Humanizing Conversational Agents:
Indisys Practical Case Study in eHealth

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ABSTRACT
This chapter describes an eHealth human-like conversational agent called Maria embedded in the Web page of the Health Department of the Junta de Andalucía in Spain. Although this implementation is based on a strong theoretical background, a more practical approach has been preferred for the real-world case hereby described. Maria has been designed to perform several major tasks: she can arrange a doctor’s appointment, reply to queries pertaining to many varied subdomains, and navigate through the Web page. One of Maria’s most remarkable features is the successful application of advanced design and humanizing techniques which endow her with unusual skills and an enticing personality. Maria has been developed by Intelligent Dialogue Systems (Indisys) within a larger scale Web development project conducted by Sadiel SA.

1 INTRODUCTION
Conversational Agents (CAs) can be defined as “communication technologies that integrate computational linguistics techniques with the communication channel of the Web to interpret and respond to statements made by users in ordinary natural language” (Lester et al., 2004). Embodied Conversational Agents (ECAs) are empowered with a human representation that shows some degree of empathy with the user as the dialogue goes on.
The fact of adding explicit anthropomorphism in Conversational Agents has some effects over the solution designed:

- A number of the user interactions are actually social dialogue or “small-talk”, where the users interact with the ECA informally (Robinson et al., 2008).
- Users may perceive the combination of embodied characters with advanced natural language processing techniques and social dialogue strategies positively. But on the other hand, if the language understanding performance or the social dialogue strategies behave poorly, users perceive the solution worse than the equivalent text-only chatbot without any character (De Angeli, Johnson, & Coventry, 2001; Schulman & Bickmore, 2009).

Deploying high-quality, intelligent ECAs which actually serve the purpose for which they were designed continues to be a challenge in a society which perceives computers as incredibly powerful machines for which natural language should be such a trivial task. In particular, failing to be successful in the first interactions seems to have a negative, long term impact on users, who are usually not very permissive. This situation becomes more critical as the linguistic coverage of the ECA is highly ambitious, which is the case of the application at hand.

Natural language processing for commercial ECAs applications shows some peculiarities. Usually, customers and service providers come to an agreement on the set of questions and services that the final users may request from the ECA. Customers demand optimal performance and fast reaction time over the previously agreed domain.

Throughout this chapter we will try to demonstrate how an adequate combination of design issues, solid theoretical background, and efficient computational techniques can actually produce the desired result. Since this is a commercial application, the project description provided is eminently practical and in terms of the different stages and components in the implementation.

Each section therefore provides relevant background on the specific issues discussed in that section, only to continue explaining how that research has been implemented in Maria. The chapter is organized as follows. Section 1 introduces the chapter. Section 2 describes the context of online ECAs. Section 3 focuses on the design principles which have guided the development of Maria. Section 4 describes the application from the perspective of eHealth and natural language complexity. Section 5 outlines how the design principles and the natural language complexity described in Sections 3 and 4 are reflected in the functional components of the system’s architecture. Finally, Section 6 concludes with an analysis of the application’s performance, user’s perception and statistics of use after its first 2 months of deployment.

In the context of the type of applications described in this chapter, the “humanizing” process of ECAs is understood in terms of the overall outcome rather than just the specific humanizing techniques described in forthcoming sections. Maria’s level of humanization is reached only through the combination of state-of-the-art Natural Language Processing and Dialogue Management technology described in Section 4, with the additional design and cognitive strategies illustrated in Section 3. It is therefore important to portray the solution in terms of all its components and implementation levels in order to understand its complexity and potential for further development.

2 RELATED WORK

Since the first appearance of ELIZA (Weizenbaum, 1966), a naïf rule-based system that simulated a psychotherapist, a huge number of different chatbots has been published on the web. The holy grail of these applications has always been the Turing
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