

# Chapter 11

## Advanced Multimodal Frameworks to Support Human–Computer Interaction on Social Computing Environments

**Danilo Avola**

*University of Rome La Sapienza, Italy*

**Andrea Del Buono**

*Computer Science and Knowledge Laboratory, Italy*

**Angelo Spognardi**

*University of Rome La Sapienza, Italy*

### ABSTRACT

*In recent years, the growing improvements of the computational capability of the mobile and desktop devices, jointly to the potentialities of the current fast network connections have allowed the wide spread of advanced and complex applications and services belonging to the social computing area. The most current approaches used to interact with this kind of applications and services (hereinafter called social computing environments) do not seem able to provide an effective and exhaustive support to the human-computer interaction process. For this reason, in order to overcome this kind of problems, it is necessary to turn to more suitable interaction methodologies. In this context, human-oriented interfaces can be profitably used to support every kind of social computing environment. More specifically, multimodal interfaces enable users an effortless and powerful communication way to represent concepts and commands on different mobile and desktop devices. This chapter explores the more suitable possibilities to employ multimodal frameworks (and related algorithmic approaches) in order to interact with different kinds of social computing environments.*

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## INTRODUCTION

The novel hardware technologies used to improve the computational capability of the current mobile (e.g. smartphones, PDAs, palmtops) and desktop (e.g. tablets, workstations, laptops) devices, jointly to the more and more high performances expressed by the current LAN (e.g. ISDN, Cable, DSL, T-Carrier) and wireless (e.g. GSM, GPRS, EDGE, UMTS) network connections have allowed the wide spread of heterogeneous social computing environments that support human activities in everyday life. More specifically, all these novel devices and related connection potentialities have contributed to expand the boundaries of the current digital collaborative and social interaction on almost all main application fields: *professional*, *educational* and *entertainment*.

The most current approaches (e.g. keyboards, keypads, trackballs) used to interact with these innovative devices, and related complex digital environments, do not seem able to provide an effective and exhaustive support to accomplish the increasingly needs required to face the current challenges in the advanced human-computer interaction field. Actually, there are several reasons that lead to an evolution of the current human-computer interfaces used to interact with the mentioned devices and related social computing environments. The first one regards the *pervasive* concept by which the user can interact, anytime and anywhere, with any kind of device and related digital environments. This reason takes on even more significant considering the increasingly main role of the current heterogeneous mobile devices. The second one concerns the *amount of functionalities* related to every single social computing environment. In fact, independently from the kind of the specific digital environment, the current social computing applications and services tend to have an increasing amount of functionalities which often require more suitable ways to be effectively and efficiently used. The third reason regards the growing needs to have

*customizable* human-computer interfaces. Indeed, the customization of the access methods to both current and next generation of social computing environments is the actual challenge of the human-computer interaction.

All the mentioned aspects lead to define new types of interfaces able to interact with any kind of both device and related social application or service. In particular, these new interfaces must have three main features: *intuitiveness*, *human-oriented* and *Web 2.0 designed*. The first feature highlights that the user should perceive the usability criteria of the interface in natural, effortless and simple way. This means that there should be a direct interaction process with the applications or services, regardless of the characteristics of a specific interface (and related device). The second feature focuses on the need to use human-oriented styles during the interaction process. In fact, the final frontier of the human-computer interface research is to allow users to interact with any device, application or service by using the same “tools” employed during human to human interaction, such as: voice (and related tone), expressiveness by handwriting and freehand drawings, gesture, facial expressions, and so on. The last feature regards a technical aspect of the interface design. In particular, this feature expresses the need of a development process compliant with the high standard of the Web 2.0 which is strongly based on two main concepts: *advanced interaction* and *content sharing*. For this reason, the Web 2.0 technologies can be considered the natural support for the social computing interfaces.

Multimodal interfaces provide a powerful tool to solve any kind of mentioned problem tied to the interaction processes: *pervasiveness*, *amount of functionalities* and *customization*. Besides, they satisfy the features related to the innovative interfaces: *intuitiveness*, *human-oriented* and *Web 2.0 designed*. In particular, multimodal interfaces, by using human-oriented modalities (e.g. speech, handwriting, freehand drawing, gaze) enable users to express concepts, provide commands and

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