
Character Computing: Challenges and Opportunities

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Figure 1: Animation to depict the complex combination of traits reflecting the user's character.

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Abstract

Systems that adapt to the states of users show great potential for creating novel user experiences. However, most approaches in affective computing only rely on the current state of the user. Furthermore, personality computing has recently evolved, it shows a few examples of how personality traits can be inferred from different types of behavioral evidence. We envision introducing novel user experiences by learning more about the user through extracting the building blocks of their character including; morals, mentalities and believes. In this workshop we aim to introduce *Character Computing*, a novel approach to examine and leverage characters to build ubiquitous and non-obtrusive character-aware adaptive systems. This workshop aims at engaging participants in reflection and practical work exploring the evolving research strand in hand.

Author Keywords

Character Computing; Affective Computing; Personality Computing

ACM Classification Keywords

H.5.2 [Information interfaces and presentation (e.g., HCI)]: Miscellaneous

Introduction and Background

Ubiquitous adaptive systems have been on a rise in a variety of disciplines like education [11] and industry [6]. For any system to adapt to its user it should first know the user. Humans can be described using two states; the general state which is the user's character and the current state which is the affect.

In recent years, the current state of the user i.e. Affective Computing [9, 8] has been the main focus of many research studies and industries. There are many applications in that field using various queues [5, 10, 4, 12, 7, 1].

There are also significant advances in personality science aiming at analyzing and understanding personalities and behavior. Personality Computing [15] aims at providing technologies for dealing with human personality from three main perspectives; Automatic Personality Recognition, Automatic Personality Perception and Automatic Personality Synthesis. Personality Computing has been researched from different perspectives [16, 3, 2, 14, 13].

While personality refers to the outer behavior of a person, the character consists of a set of moral and mental qualities that make up the hidden traits of a person. An individual's personality may change over time although their character usually stays the same.

The aim of this workshop is to harness and extend the advances of Affective and Personality Computing for and through computational means. *Character Computing* aims at providing a novel perspective on affective and personality computing, enabling the presence of ubiquitous and non-obtrusive character-aware adaptive systems.

We define *Character Computing* as computing that is based on, detects and adapts to human character traits. Character

is the defining variable of any human. If systems can understand character, combine it with the current state and respond accordingly this would be a step towards bridging the gap between humans and machines.

Character Computing has the following building blocks and goals:

- Defining human characters as a complex profile resulting from a combination of different personality types and traits Figure 1.
- Developing methods for extracting and understanding character traits based on:
 - Pattern detection from previous states and lifelogs
 - Correlations between traits and bio-sensor and other real-time data
- Developing ubiquitous non-obtrusive systems that adapt to character, personality and affect. These would provide multi-modal and dimensional insights about the users, their current needs and how to fulfill them.
- Having a detailed character profile that can be used as a stand-alone platform or as a plug-in for adaptive systems.

Workshop Goals

The aim of the workshop is to inspire novel techniques on how state, personality and affect-aware systems could be addressed and leveraged for enhanced interaction and novel user experiences. Past research has frequently focused on the adaptation of the systems based on the current state of the user. This workshop instead, seeks to promote *Character Computing* as a design material for the

creation of novel adaptive user experiences based on the evolving character of the user.

We aim to bring together researchers (with diverse backgrounds), students, designers, psychology experts, and application developers who are interested in hands-on exploration of new ways in which *Character Computing* can be realized and deployed. Commercial bio-sensors will be available to facilitate the ideation and application envisioning processing without requiring any prior background knowledge.

Workshop Plan

Our workshop will be planned as a one day workshop, with set of 4 sessions. The first session will comprise of short presentations about the participants research field and interest, to identify the background of the participants. This will be used for creating groups with diverse background for the planned ideation sessions.

The following session will consist of brief presentations and mini-tutorials on principles of personality and affective computing, challenges and limitation finishing up with introducing the *Character Computing* term as a novel perspective of this research theme. Additionally, in this session we are inviting a psychology expert to present personality and character classification basics.

The third session will be an active ideation and brainstorming active session. Participants will conceptualize different contexts, applications and user groups where *Character Computing* could be applied to enhance user experience. Novel interactive systems and modalities will also be discussed. This session will end up with short group presentations, depicting their envisioned applications.

The output of the brainstorm session and discussion will

feed to the final hands-on sessions and activities later in the day.

Topics of Interest

This workshop invites submissions that focus on character computing from different perspectives.

This includes submissions that aim at learning character traits from continuous learning systems like lifelogs, bio-data, and pattern detection means.

Life logging is a technology that records personal activities using different sensing devices [5]. The everyday captured information from lifelogging systems can be used for blog generation, improving communications and the analysis of life patterns and personal trait [10]. If the system had a reliable record of users' activity, it would become possible to detect their personal traits and preferences. Therefore, submissions that address and study the role of lifelogging in defining personal characteristics is of interest in this workshop.

Recently, a lot of work aimed at studying physiological indicators of human emotions, such as heart rate, skin conductance [6], skin temperature [1], blinking rate, and eye movements [7]. Extensive research has been done to deduce the emotional state of individuals from facial expressions, tone of voice [4], or text-based [12] interaction. Thus, the workshop appreciates any submissions that investigate the possibility of learning characters using various sensors and correlating between personal traits and captured bio-data.

Character-aware systems can learn more about the users and adapt their behavior according to their bio-data. Robust detection of emotions and correlating it with the users' traits can help enhance the accuracy of character-aware systems in an unobtrusive way. For example, adaptive systems

can enhance the quality of education by responding appropriately to a student's internal state given his emotional feedback and personal traits. Additionally, future character-aware systems can come with machine learning and data science approaches that can be used for dynamically mapping bio-data to character traits. Thereby, we invite contributions that focus on the previously mentioned areas.

Further, submissions can focus on studying character-based adaptive systems for different applications e.g. education, domestic systems, gaming, assistive means for cognitively challenged individuals, and customized web and mobile applications.

In summary, topics of the workshop include, but are not limited to:

- Personal traits detection using various approaches, e.g. lifelogging, pattern detection systems, and bio-data.
- Learning characters from various sensing devices and correlating between traits and captured bio-data.
- Infrastructures, frameworks and tools for the development of real and non-real time character-aware systems.
- Applications of character-based adaptive systems.
- Use of machine learning and data science approaches for mapping users' bio-data to character traits.
- Recognizing unobtrusive bio-sensors that are suitable for detecting personality traits.

Expected Outcomes

The main aim of the workshop will be to foster a community of researchers and practitioners interested in exploring the potential of *Character Computing* as a novel computing theme. We aim to coin the term *Character Computing* as an ongoing research theme. Moreover, participants will contribute to better define the presented strand of research.

Participants will gain knowledge of character types and how they differ from personality traits, from the invited psychology expert. Additionally, the output from the hands-on session will result in collaboratively created designs for potential applications. We anticipate joint publication of the findings from the workshop in an article that highlights the main insights. We also aim to use the workshop's drive to prepare a special issue of a journal, e.g., IEEE Pervasive. Finally, based on the participant's feedback, we plan to conduct series of follow up workshops, aim to define further direction and concrete research trends.

Overall, we hope that the workshop creates an active and long-lasting community around the workshop's topic.

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