Emotions Detection on an Ambient Intelligent System Using Wearable Devices

Angelo Costa[1], Jaime A. Rincon[2], Carlos Carrascosa[2], Vicente Julian[2], and Paulo Novais[1]

[1]*Centro ALGORITMI, Escola de Engenharia, Universidade do Minho, Guimarães, acosta@di.uminho.pt, pjon@di.uminho.pt*
[2]*Universitat Politècnica de València. D. Sistemas Informáticos y Computación, jrincon@dsic.upv.es, carrasco@dsic.upv.es, vinglada@dsic.upv.es*

Abstract

In this paper we present an Ambient Intelligent System, the iGenda, and the integration of a wearable device. The aim is to detect emotional states through the wearable device and ultimately represent and manage the social emotion of a group of entities. The advantage of this action is that its usability is in line with retirement homes and similar places, where the community is extended and an harmonious environment is imperative. The iGenda serves has the visual interface and the information centre, receiving the information from the wearable device and managing the community emotion by sending information to the care-receivers, caregivers, or changing home parameters (like music or lighting) to achieve an specific emotion (such as calm or excitement). Thus the goal is to provide an affective system that directly interacts with humans by discreetly improving their lifestyle.

1 Introduction

Ambient Assisted Living (AAL) is an booming area where a large number of projects are being developed with the aim of providing assistance to elderly and disabled people [1]. What we can observe is that most of them have as a goal to be simple and provide the least interaction with the users as possible. But a common issue that they possess is that they rely solely on automatisms and static user profiles. While they are effective to a certain degree (simple tasks and basic likes) they do not encompass punctual changes that are part of

the complex human states (like boredom), which forces changes to the profile [2]. These changes are usually associated to certain emotional states [2, 3] that affect the human procedures, and asking every time the user for its consent to every action/decision defeats the purpose of being discrete and ubiquitous.

A solution would be the adoption of an adaptive system that is able to perceive these emotional changes and adjust to them. Furthermore, with sufficient information, emotional profiles could be created in order to mimic the user common response and pre-emptively use this information to respond to decisions.

They way that humans perceive the world influences their emotional state and that has a repercussion on the physical level. While most can hide facial expressions and body movements (like hiding a state of surprise) there are low-level signals that the human body sends inadvertently like skin/muscle tensioning, pupil dilatation and micro-movements. These most of these signals have a corresponding bio-electrical impulse, thus they can be captured by sensors.

We propose the usage of a wearable device in form of a wristband, named *Emotional Smart Wristband* (ESW), that monitors the GSR and Photoplethysmogram and sends that information to be processed and provides that information to other systems like the iGenda [4, 5, 6]. The platform that supports the ESW is able to receive the information of multiple ESW's and process them individually or in group. The group emotion detection is very useful to determine the general emotion status of an environment that is composed of multiple people, like an nursing home. In the AAL concept the individual is the most important factor in the system, but that is applicable only when there is only one individual in a smart home; when we consider multiple individuals we find that the best way to maintain an harmonious ambient is when most of the people tend to an overall emotion (of course with varying degrees).

The ESW platform is composed of agents that calculate the group emotion (or Social Emotion) of the participants, through the Social Emotion Agent (SEtA) and resorting to machine learning techniques and makes it available for consumption.

The task of the iGenda is to consume this information a use its scheduling feature to change the events of each participant, based on his/her profile, to achieve a specific emotion, thus guiding the group to a common emotional state. The emotional states are measured and placed in the PAD [7] model, outputting a representation of the emotional state, easing the task of the iGenda on choosing new events.

A new development is the inclusion of virtual actors in the system that emulate the real participants. This feature aims to enhance of the decision-making process of the system, detecting in advance the possible emotional states and preparing changes to the participants surrounding environment to accommo-

date these changes and proactively shift them to other states if the expected state is not desirable.

2 Conclusions

The main goal of this project is to create cohesive environments in which the users are happy and feel accomplished. This is an arduous task as people is composed of individuals that most of the time are very different to the rest. Furthermore, there are several different applications to the ESW ecosystem apart from the healthcare area, like: crowd control, visual interfaces management, stress and fatigue monitoring, virtual environments societies, among others.

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