Using Personality Models as Prior Knowledge to Accelerate Learning About Stress-Coping Preferences

(Demonstration)

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ABSTRACT

The management of (dis)stress is an important factor for a long and healthy life. Yet, stress affects people differently and everyone manages stress in different ways. In this paper we introduce PeSA, the Personality-enabled Stress Assistant, an agent-based application that accounts for this individualism. PeSA merges several agent techniques: Reinforcement learning is used to learn about preferences of the users, prior knowledge and knowledge transfer is applied to accelerate the learning process, agent mirroring helps to enable communication and offline functionalities. Based on these mechanisms, PeSA guides through stressful phases by proposing coping strategies that are tailored to the personality of each individual user. Users can assess these advices and thus provide a reward or punishment signal that helps PeSA to improve its suggestions.

Keywords

Human-Agent Teamwork; Human-Behaviour Models; Reinforcement Learning

1. INTRODUCTION

Psychological stress is a well-known trigger for several physical diseases and has a significant impact on our health and health care costs (cf. [5]). The problem that we address with PESA is that the perception of stress is highly individual—as are the actions that may help to relieve stress [2]. PeSA accounts for this very fact by adapting its coping-strategy recommendations to the individuality of the user. In doing so, individual preferences, characteristics, and personalities are supported.

The implementation of this capability is based on a combination of a data-driven and a theory-driven mechanism and directly addresses one of the unsolved human-agent interaction challenges that were described by Prada and Paiva [9]. The theoretical component acts as an accelerator for learning individual preferences and is based on models that were established by human-factor psychology. The data-based component learns by receiving rewards from the users. Knowledge from other PeSA agents is also used to accelerate the learning process, however, to make this work, their users have to have compatible personality models.

PeSA for itself is basically a combination of agent-based software engineering and learning algorithms that use the humans’ feedback as reward signals. From a technical perspective, any PeSA instance is a software agent that autonomously collects data, individually detects situations in which stress-relieving actions are required and adapts its recommendations to the personality of its user. To make the learning process faster, we extended the agents’ capability to share knowledge with other PeSA agents. The basic idea behind this is that users with similar personalities prefer similar countermeasures (cf. [2, 3]), thus, it is possible that relatively new PeSA agents can learn from agents that have already collected experiences in relieving stress levels—given that their users show similar characteristics.

In our demo, we show how an experienced PeSA agent recommends coping-strategies in order to relieve the stress level of its user and how this agent learns from user feedback. We also show how fresh PeSA agents request knowledge from ‘mature’ PeSA agents with similar personality profiles in order to become better assistants very quickly. To make this tangible, we show that the user of the new agent is treated in a similar fashion, once the knowledge of an available agent has been transferred and once a stressful situation has been detected. We also show that such knowledge transfer is only done when the personality profiles are actually compatible.

2. PESA IN A NUTSHELL

PeSA was implemented as an application for the Android platform with a cloud-based backend that hosts the multi-agent system. Within the Android container we implemented PeSA as a software agent using the multi-agent-framework JIAC V [7]. The backend hosts mirrors of the individual agents, enabling the communication within the agent-system. In more detail: The module that observes a user and triggers actions is separated from the one that communicates to other modules in order to exchange already learned information about how to treat particular person-
PeSA combines several agent-techniques in order to help users to manage stress and to live healthy. In doing so, PeSA demonstrates that human-behaviour models improve the interaction with real human beings, i.e. making informed decisions during planning for joint activities.

We are currently evaluating this improvement through the A/B test feature that is provided by the Google Play Store. Our goal is to empirically verify our hypothesis that personality-based information accelerates the learning stage.
REFERENCES


