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## Agent-based support for behavior change

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# Summary

**Agent-based support for behavior change:** Models and applications in health and safety domains

How can we change our behavior when change is hard? And how can we make sure our change is actually a change for the better? Human behavior and decision making is notoriously complex, as it involves many different facets, such as uncertainty, priming, and automatic responses. We use heuristics to guide us, yet heuristics are fallible and we often lack good coping strategies to respond to unexpected situations. Because of this, our decision making often could use a little help. There are two types of domains in which humans can especially benefit from support, namely those with highly demanding tasks (for example, emergency or evacuation scenarios), and those in which humans have particular difficulties functioning in accordance with their intentions and goals (such as patients trying to adhere to a therapy).

Although we traditionally support each other in our efforts to change (think of health counselors, personal coaches, and AA sponsors), computerized coaches have shown their own potential in the domain of behavior change. Ambient agents are intelligent and autonomous systems that are specifically designed to observe human activities, derive situational contexts, and to interact with people in a nonintrusive manner. Such agents have shown great potential as e-coaches: behavior change support systems that can function as social actors to persuade people to change their attitudes and behaviors.

This dissertation aims to answer the question of how agent-based systems can effectively support behavior change using computational models. The answer to this question is sought by using two approaches. First, several computational models of prominent theories in the field of decision making and behavior change were developed. In order to support people in making better decisions and to help them to change, it is important to have an understanding of why they behave the way they do. The models that were developed aim to shed light on the workings and implications of theories from the field at different levels of explanation (e.g., physiological, cognitive, behavioral and social levels). Ambient agents can use these models to simulate, predict and reason about human behavior.

Second, it was examined if computational models can be used (i) to create agent-based simulations of real-world behavioral processes and (ii) to develop agent-based systems that perform interventions to promote and establish behavior change. Several empirical studies were performed on how computational models can be applied and evaluated in agent-based systems.

Existing approaches to e-coaching can be characterized by three aspects: the complexity of persuasive techniques, the use of artificial intelligence techniques, and whether they utilize user models that have a solid theoretical foundation. This dissertation improves the state of the art of e-coaching by developing computational models of users for different domains, and by presenting and evaluating a functioning agent-based support system for lifestyle change, which integrates all three characteristics of e-coaching systems.