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# Demonstration of eMate – stimulating behavior change via mobile phone

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## 1 The eMate system

### 1.1 Aims and functionality

The eMate system is an intelligent system that aims to support patients with Diabetes Mellitus type II, hearth diseases or HIV in adhering to their therapy. The therapy consists of lifestyle advice and/or precise instructions for medication intake. Although the system has been implemented for those three diseases, the system can be used for all scenarios in which behavior change is important.

Research has shown that a ‘cooperative assistant’ – i.e., with a coaching character, able to explain and educate, and expecting high participation of the user – is more effective than a ‘direct assistant’ – i.e., with an instructing character with brief reporting and low expectations on participation [1]. The eMate system therefore operates as a coach, using both a mobile phone and a website to interact with the user. Via the website, the user can get an overview of his progress on three different domains: medication intake, physical exercise, and healthy food intake. An overview shows the extent to which the user has reached his/her goals in the past week, which is represented as a percentage and a iconic thumb. Figure 2 shows the overview page of the website. A mobile phone application for the Android platform has been developed that can pose questions and send messages to a user. Figure 1 gives an impression of one specific screen of the mobile system.

The system has been developed in the context of a ZonMW funded project “Intelligent Monitoring and support of chronic patients”. It has been developed by researchers of the VU University Amsterdam in collaboration with Evalan BV, a company that develops innovative telemetry solutions for health care.

### 1.2 Model-based reasoning

The kernel of the system is a computational model of behavior change, based on theoretical frameworks [2]. The model is used to analyze the state of the patient with respect to his/her behavior change goals. It does so by investigating via simple questions which of the factors that influence behavior change are probably the most problematic for this patient. This mechanism is called model-based diagnosis [3]. These factors are then targeted with specific messages and interventions. For this purpose the model is represented into a rule-based format that allows for backward reasoning over the psychological factors in the model.



**Figure 1. Screen of the mobile application**



Figure 2. Overview page of the eMate website.

## 2 Demo scenario

The demonstration consist of a time-lapse walkthrough of the interaction of a patient with the system, illustrated by a visualization of the reasoning process that takes place within the system. It will be shown how the patient initializes the system via a web-based questionnaire, and how this will result in specific values for the factors in the computational model of behavior change. Using a graphical representation of the computational model, it will be shown how the model-based diagnosis process will lead to hypothesis about the psychological causes of the behavior, and how this will lead to questions to the patient via the mobile application. These questions will be answered on the phone, and again it will be illustrated how these answers are processed and fed into the computational model. After a number of interactions, this will result in specific messages to the patient that are delivered via the mobile phone. In this way, the demonstration mimics the interaction that a patient has with system during several weeks in a few minutes.

The total duration of the demonstration is 15 minutes. The demonstration requires a computer with internet access and a large screen (for the illustration of the reasoning process), a laptop for controlling the system, and a mobile phone for the end-user interaction with the system. The latter two components will be provided by the demonstrators.

## References

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- [2] Michel C.A. Klein, Nataliya Mogles, and Arlette van Wissen. Why won't you do what's good for you? using intelligent support for behavior change. In Albert Salah and Bruno Lepri, editors, *Human Behavior Understanding*, volume 7065 of LNCS, pages 104–115. Springer Berlin / Heidelberg, 2011.
- [3] Davis, R.: Diagnostic reasoning based on structure and behavior. *Artificial Intelligence* 24(1-3), 347–410 (1984)