Feedback Presentation for Mobile Personalised Digital Physical Activity Coaching Platforms

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ABSTRACT
User interface design and feedback are important in personalisation of behavior change support systems. This paper discusses two service platforms that monitor user’s physical activity through wearable sensors and that present the user personalised feedback. Important principles for effectiveness of such systems are personalisation or tailoring, context-awareness, feedback and interaction. We focus here on the presentation of feedback to the user. We present results of a number of short and long term user studies in which we compare different forms of feedback presentation: text, graphics and with or without an anthropomorphic graphical talking character. Results show that although some users like the talking character they don’t have a positive effect on adherence to the activity program. The outcomes of the user evaluations support our beliefs that personal motivation is of primary importance for the effectiveness of these systems. Technical challenges ahead are to support more personal and context-aware feedback, more variations as well as the possibility for more interaction with the coaching system.

Categories and Subject Descriptors
H.5.2 [User Interfaces]: Graphical user interfaces

General Terms
Human Factors

Keywords
Behavior Change Support Systems, Embodied Agents, Physical Activity, Multi-Device Systems

1. INTRODUCTION
Cool2BeFit is a new lifestyle program running in several places in Twente, in the Province of Overijssel, Netherlands. Cool2BeFit targets young people aged 8-13 that are either overweight or obese. Children that participate in the program are motivated to take the challenge and to work together with their parents and under supervision of a dietician, a psychologist, a physiotherapist and a sport coach to maintain a healthy and active lifestyle. The four pillars of the program are: the engagement of parents, being physical active, more healthy food intake and life style change. Children are selected for the program to take part in group-based activities. The population of children that suffer from overweight and obesity is steadily growing. In the Netherlands currently 16% of the children have overweight and 6% is obese. Children like pizza, french fries and pancakes. When Marleen, one of the participants, is asked if her weight bothers her, she says: “At the gym I always get picked last” and “I can’t choose clothes for children, they don’t fit”. Participation of parents is important: they buy the food and prepare the meals. They are expected to motivate the children when they have a hard time to sustain the daily challenges. Recent research in the Netherlands shows that children eat less and less fruits and vegetables and more and more fast food and drinks containing sugar. Currently 93% eat less than the recommended amount of fruit and vegetables and 85% of the children are not physical active enough. Dutch children are no exception in Western countries. Figures are generally worse in the United States. For references see the figures mentioned in [3] and in the critical paper [19].

“Gezond en Sterk op het Werk” (GSW) is a project at the University of Twente for employees of the University. GSW is a preventive program that targets individual employees having a more pleasurable work day and less absence. The idea is that healthy and happy workers are more productive workers. Employees are free to take part in the sport and fitness activities. Most of them know they should maintain a healthy and active life style but only a few are motivated to take the challenge and to work together with their parents and under supervision of a dietician, a psychologist, a physiotherapist and a sport coach to maintain a healthy and active lifestyle. In the mean time the population in Europe is growing older. A person’s health typically deteriorates with increasing age inducing a greater demand for long-term care. Finding innovative approaches to make our health care system affordable and sustainable is needed. Self-management

1http://www.cool2bfit.nl/

English: “Healthy and Strong at the Workplace”
of physical condition is becoming increasingly important in chronic care and in the support of the healthy elderly population. Information and Communication Technologies play a crucial role in supporting greater independence and self-management of lifestyle and disorders. The department Telemedicine of Roessingh Research and Development (RRD) identified patient management approaches that will ensure appropriate monitoring and treatment remotely. RRD developed a Continuous Care & Coaching PlatForm (C3PO) for continuous remote monitoring and tele-treatment. The focus is on applications for physical activity monitoring and feedback. The platform makes it possible to integrate ambulant sensing to measure relevant bio signals and context information with secure data handling and appropriate clinical decision support functionality to assist in both technical and clinical decision making. In addition, the system allows to provide feedback to both patients and care providers. The platform allows systems to provide continuous monitoring of health status, “with the promise of coaching, or continuous motivational aid aimed at achieving behavioral change, to support people to be more physically active by creating awareness and providing insight in the actual behavior (e.g. activities)" [17].

The Human Media Interaction group of the University of Twente participated in the EU funded Artemis project Smarcos focusing on design and evaluation of user interfaces for multi-device embedded service systems. Multi-modal and natural real-time mediated interaction with more and more intelligent autonomous systems is one of the main research areas covered by the group. The Smarcos system is a multi-device personal digital health coach. The service system supports users in attaining a healthy lifestyle by giving timely, context-aware feedback about daily activities through a range of interconnected devices [18]. The Smarcos coaching platform and the C3PO platform are examples of a growing number of information technology systems and services that are being developed to change users’ attitudes or behavior. A framework for the design of such Behavior Change Support Systems (BCSS) is proposed by [15], based on the fundamentals of Persuasive Technology as laid out by Fogg [5]. A BCSS is an information system designed “to form, alter or reinforce attitudes, behaviors or an act of complying without using deception, coercion or inducements” [14]. Many of these systems support people in their daily life by providing insights in the actual behavior. There is a growing consumer interest in products that help and support people to be more physically active by creating awareness and providing insight in the actual behavior (e.g. Nike+, Fitbit and DirectLife).

Young people, office workers, older adults, they all have different life styles, different daily practices, different abilities, different role models and they will have different motives to be more active or to lose weight. They ask for different ways of presenting feedback and of communication. In BCSS personalisation or tailoring feedback presentation and interaction style are important. One of the ways to present the system is by a graphical animated virtual human also called an embodied conversational agent. Some studies show that they have a positive impact on the therapy adherence, others come to other conclusions. Bickmore et al. reports about a study that examines the acceptance and usability of an animated conversational agent designed for older, mostly minority adult users living in urban neighborhoods. The agent plays the role of an exercise advisor who interacts with subjects daily for two months on a touch-screen computer installed in their homes for the study. They conclude that “relational agents are an especially effective modality for delivering health communication and health behavior change interventions to older adults, especially those with low functional health, reading, or computer literacy.” [2] The system uses synthetic speech and an animated talking head. The user chooses their responses from a list of options. The interface uses large buttons with enlarged text to allow for easy readability and touch screen input. A numeric keypad allows users to enter their pedometer readings. Although participants were generally satisfied with the simulated conversational interaction style several participants mentioned that they could not express themselves completely using the constrained interaction: “When she ask me questions ... I can’t ask her back the way I want.”

This paper will discuss the various methods used to give users feedback in the Smarcos coaching system and in the C3PO platform and results of user evaluations with both systems. We have performed a number of user studies with the two platforms. In these studies we compared two forms of feedback presentation: with an animated conversational character and with a text only presentation format. In Section 2 we present the Smarcos multi-device service platform. Section 3 describes how feedback is presented to the user. The first user evaluations with the coaching system are discussed in Section 4. Additional evaluations with the telemedicine platform developed by Roessingh Research and Development are described in Section 4.1. In section 5 we reflect on our experiments and findings. We conclude with presenting some challenges ahead in developing personalised mobile animated feedback systems.

### 2. THE SMARCOS COACHING SYSTEM

The Smarcos system is a multi-device coaching system that sends timely, context-aware feedback about daily activities. The system supports users in daily life, for example at home, at the office or on-the-go.

Figure 1 shows the overall architecture of the coaching system. All information from the monitoring devices and manual input from the users are uploaded to the cloud and stored in a central knowledge base. The coaching engine contains coaching rules and continuously keeps track of all user data. When the coach receives a trigger it starts to evaluate the coaching rules. When one of the rules is true, it will select a suitable message from the coaching content database and send the message to the user through one of the available output devices. Output devices that are able to run a Behavior Markup Language (BML) realiser, like the PictureEngine, are called BML enabled devices. BML enabled devices in the Smarcos coaching system are marked in purple. These devices are able to present feedback through animated spoken interaction with an embodied conversational agent (ECA). Feedback from the system can be presented as a text message, in a graph or by an ECA.

The system is designed for two user groups: Diabetes Type 2 patients and office workers. The diabetic patients get feedback about their medication intake and activity level. The office workers only receive feedback about physical ac-

3http://nikeplus.nike.com
4http://www.fitbit.com
5http://www.directlife.philips.com/
Figure 1: Overview of the Elckerlyc architecture. Behavior Markup Language (BML) input is processed by the Elckerlyc system by different engines. The result is combined into one embodiment.

Activity level. The feedback to the users of the system consists of personalized reminders, advice and tips, and users can get an overview of their own progress in the past. To investigate which kind of message, on which device and in which context users like to receive we asked people from both target groups to complete an online questionnaire [9] (15 diabetes type 2 patients and 49 office workers) where the participants can state their opinion on questions and statements about the feedback.

In order to present feedback the coaching system makes use of different input and output devices. Input devices of the coaching system are a smart pill dispenser and a 3D accelerometer-based activity sensor. The smart pill dispenser measures medication intake by monitoring if the pill dispenser is opened or not. Every time the user opens the device it sends a message to the server. The smart pill dispenser is connected to a server via the GSM network. To measure the amount of physical activity of the user a 3D accelerometer is used. Users have to wear the small sensor all day long and have to dock the sensor to their computer to upload the data to the server.

The output devices of the prototype system are Android smartphones, desktop/laptop computers and (smart) TVs. From questionnaires it became clear that smartphones, PCs and (smart) TVs are by far the most popular devices in terms of device ownership and the preferred devices to receive feedback by office workers and diabetes type 2 patients [9]. Smartphones can act as an input and output device, they gather information about the location of the user, can ask for self-report and are able to receive feedback messages from the system. All devices are connected to a central server. On this server a virtual coach keeps track of all the input from all the devices and decide when it is time to present feedback.

The fact that this coaching system is a multi-device system has a number of consequences. First of all a multi-device service system is able to combine the advantages of single device feedback systems and brings them together on one integrated service platform. It allows users to have multiple contact points in various contexts: at home, at work and on the road. A multi-device system is able to gather more context information of the user compared to a single-device system and it can combine this information to present better feedback to the user. Interventions with several contact points are expected to be more effective in stimulating change in health behavior than those that use a single contact point [13]. A second point of interest has to deal with inter-usability. Inter-usability entails a seamless user experience across devices, platforms and situations and the ease with which users can reuse their knowledge and skills for a given functionality when switching to other devices [20]. Interacting with a multi-device (coaching) system should not differ between the devices; all data should be available on all the devices, and users should experience the system as
3. PRESENTING FEEDBACK IN A MULTI-DEVICE COACHING SYSTEM

The Smarcos coaching system is able to present timely and context-aware proactive feedback messages. It has been shown that by giving regular feedback, positive results can be reached for changing peoples behavior [11]. The content and intention of the feedback message should match the context, personal user preferences, and device availability. The user should be in control of the modality and the timing of the feedback.

These feedback messages are updates about the progress of the user, daily or weekly overviews, reminders and/or tips about physical activity or medication intake and requests to insert data about glucose levels into the system. These messages are pushed by the system to the user. Users are able to lookup information about their progress and look for more detailed information. All the devices in the coaching system are able to present graphical overviews of the progress for today and from the past. Figure 2 shows the dashboard overviews of the system on PC and mobile phone. Before presenting feedback to the user it is good to think about how, when and on which device to present the feedback. In the next sections we will discuss the different feedback modalities, the selection of different feedback devices and the timing of the feedback.

3.1 Modality

The feedback from the system can be presented in different formats or modalities. The system is able to present feedback by using an embodied conversational agent (ECA) which presents the feedback in a verbal and nonverbal way, it can send simple text messages and graphical overviews. Figure 3 shows two different output modalities on a smartphone. When a feedback messages is pushed to the user the user will be notified. The different modalities are available on the mobile phones and desktop applications. At this moment the smart TV is able to show text messages and graphical overviews. To be able to present feedback by means of an ECA we developed a lightweight PictureEngine [8]. The PictureEngine is a behavior markup language (BML) realizer that is able to run on Android devices and desktop computers. In BML the behaviors -including speech, non verbal gestures, facial expressions and body animations- are specified. The specifications of the animated virtual character are generated at run-time. Sometimes glanceability of feedback is important. Glanceability can be defined by how quickly and easily users can understand information [4]. Reminders or alerts should be presented in a way such that users understand the message immediately, while weekly overviews can be presented in a less “glanceable” way at a time when the user has time to read the message.

3.2 Devices

The coaching system should select the best available device on which it can present the feedback. The different output devices of the system have different capabilities and limitations. Devices differ in screen size, processing power and mobility. Based on the available devices and the location of the user the best device can be selected. If the user is at home, the television is maybe the best available device. When the user is on the road the only available device can be the mobile phone of the user.

3.3 Timing

Mobile phones allowing proactively delivered messages compete for the user’s attention and can contribute to interruption irritability and overload. Research has shown that messages delivered at activity transitions were found to be better received, thereby suggesting a viable strategy for context-aware message delivery in sensor-enabled mobile computing devices. [7]. The timing of the feedback messages are based on triggers. Based on online user questionnaires [9] a number of these triggers were selected. These trigger moments can be based on the time of the day (like 12:00 pm lunch time), or on specific events (like reaching the goal or uploading activity data).

4. USER EVALUATIONS

To investigate if the system offers what users expect from a coaching system we conducted several short and long term user evaluations. In two short term user evaluations we evaluated the system with diabetic type 2 patients and office workers. In a one week diary study we evaluated the coaching system with five diabetic patients. The diabetic patients used the system on their smartphone and PC and received feedback about their physical activity and medication intake. In a two week user evaluation we evaluated the physical activity coaching system for office workers on smartphones with nine office workers. In this user evaluation we compared two different ways of presenting the feedback to the user. One version presented the feedback as a text
message. The other version of the system presented the feedback by an ECA. The ECA present the feedback in a verbal and nonverbal way. To present the feedback by an ECA we used the Elderly system for Android.

A number of studies have been performed after the effects of using an ECA on the interface [12] [2]. At first sight outcomes of different studies after the users’ assessments of an ECA interface seem to be contradictory. But a closer look shows a variety of situations. Murano summarises a number of experiments where it was shown with statistical significance that in certain contexts anthropomorphic user interface feedback is more effective and preferred by users. One of the three experiments showed that the anthropomorphic feedback was not as effective as the non-anthropomorphic equivalent. They conclude that more research is needed to find in what contexts and for what types of feedback anthropomorphic interfaces are favored [12]. Our user experiments differ from Murano’s in several ways. Ours are long term user evaluations and concern feedback presentation on a mobile device. Murano’s experiments are short controlled lab experiments with a computer screen. Moreover, in Morano’s experiments feedback was presented by prerecorded movies showing real persons. We use a graphical animation whose behaviors are real-time generated allowing real-time responsive behavior.

Results of the user evaluations with the Smarcos system showed that user were able to learn and use the system easily. Diabetes type II patients were positive about the system and think a coaching system like this can help people to live a healthier life. From the user evaluation it also became clear that the timing of the feedback can be improved. An example is the timing of a medication reminder. Medication intake is related to moments when patients will have lunch or dinner. Lunch and dinner are not fixed moments on all days of the week. Office workers stated that the system could help people to live a healthier life, but the user should be motivated to change his/her behavior in order for the system to really work. If you do not want to use the system you simple ignore the messages and continue with your daily activities. The participants had mixed feelings about the presentation of feedback by text or an ECA. They could imagine that feedback presented by an ECA can be more motivating, but some stated also that they prefer text feedback above ECA feedback.

In ongoing long term (7 weeks) user evaluations (80 participants) we are looking into whether the feedback modality can have effects on the user experience and the effectiveness of the coaching program (in terms of performance, therapy adherence and retention rate). During this user evaluation the participants will use the coaching application for physical activity on their own mobilephone. We will compare three different conditions: 1. ECA feedback 2. text feedback 3. no feedback. Participants in condition 3 will only carry a accelerometer and use a website that shows the amount of physical activity in the past. They will not use the mobile coaching application.

4.1 Evaluations in a telemedicine platform

The Telemedicine group of Roessingh Research and Development (RRD) has over the past few years been working on a technology platform for supporting physical activity behaviour change in patients suffering from various chronic diseases, as well as for healthy individuals. This platform, called the Continuous Care & Coaching Platform, or C3PO, consists of a 3D-accelerometer based sensor, a smartphone, back-end server and connected web portals (see Figure 4). The platform has been used successfully in trials with patients suffering from chronic obstructive pulmonary disease (COPD), chronic low back pain (CLBP), chronic fatigue syndrome (CFS), and obesity [17], and is constantly under development to increase its effectiveness in real-time, tailored coaching. While earlier research focussed on tailoring the delivery of motivational messages to the user in terms of timing and content (see e.g. [16]), the visual representation of the feedback has been largely ignored. Due to the modular architecture of the smartphone application, we were able to quickly integrate the PictureEngine in order to enable a more natural communication to the patient through the use of the ECA.

Two separate experiments where carried out to evaluate the PictureEngine integrated with the C3PO platform. The first is a controlled experiment to evaluate user perception and experience with receiving feedback from the ECA compared to the regular text-based user interface. For the second experiment, a more complex system was developed, similar to the Smarcos system described in the previous section, where feedback was presented to the user on various interconnected devices, including two BML enabled devices (PC and smartphone). For both experiments, the target user groups were healthy office workers.

The first user evaluation comparing the use of an ECA to the standard text feedback message interface included 14 participants, aged between 22 and 61 (µ = 37, σ = 13.3) and consisting of 8 males and 6 females. Figure 5 shows a comparison of the two different feedback interfaces that were being evaluated. Participants were randomly assigned to either the text-first condition, in which they received the standard text based interface in the first week, and the ECA in the second week, or the ECA-first condition. All participants finished the evaluation, with 1 participant not being able to complete full measurement days due to a faulty sensor. In both conditions the system generated a motivational cue message every hour, based on the user’s current activity progress compared to a predefined reference activity pattern. When asked about the user’s preference for either of the two conditions, only 3 users preferred the ECA, 10 users preferred the text-only condition, and 1 user had no preference. The single most important reason given by the users for preferring the text-only condition is glanceability. As the ECA pronounces the feedback message with real-time subtitling (letter for letter), it takes a much longer time to convey the entire message compared to the text-based interface, where
users can read it immediately. When asked directly about the ECA, users responses where varied. Four participants found the ECA fun and enjoyable, and three participants said the ECA added personality to the system. On the negative side it was commented that the ECA does not add anything significant to the system, and that the ECA was not believable because it was not a real person. Two participants commented that the ECA did not show enough enthusiasm, while another thought the ECA was too enthusiastic to the point of it not being believable anymore. With only 3 out of 14 users preferring the ECA over the simple text version it can be concluded that the result of the evaluation is not in favor of using ECA’s in this application. However, besides the fact that obvious improvements can still be made (e.g. better graphics and voice output), an interesting observation is the dichotomy between user’s opinion about the ECA as personification of the application. This dichotomy was also mentioned as a key outcome of a study on Embodied Agents in 1996 by Koda & Maes [10]. It seems that the perception of an ECA is highly personal. Comments regarding future improvements to the system from the users are in line with this, which include suggestions about making the ECA more relevant to the target audience, enabling users to choose between different visual/auditory styles of the ECA, and enabling the user to choose whether or not to use the ECA at all.

For the second evaluation we have implemented a multi-device component to the system. For the target population of office workers, the idea is that throughout a regular work day, the user communicates with various devices that each offer unique capabilities in terms of physical activity coaching. While performing desk work, the PC would be the most suitable device for delivering communication from the system to the user, if the user is getting a coffee, a public screen mounted next to the coffee machine can offer coaching through social influencing, and while the user is travelling, the Smartphone can take over the coaching role for ubiquitous availability. In order to accommodate the virtual coach migrating across devices with the user, we have added a server component that manages so-called user-requests. Whenever a particular output device (PC, Smartphone, Public Screen) notices that the user is near it and available for communication, the device would send a user-request to the server. The server then decides which is the most suitable device for coaching, and notifies the devices of their ability to engage with the user. Also implemented for this evaluation is the ability to engage in short dialogues with the ECA on the PC or Smartphone. Users where presented with spoken questionnaires and where able to use speech input to answer the (multiple choice) questions. Six participants took part in the evaluation of this multi-device version of the coaching platform, 4 females and 2 males. The evaluation was small and focussed on usability testing and a “thinking aloud” procedure. Users where observed while performing a set of tasks involving desktop computer work, going to the coffee machine, and walking around the office.

5. DISCUSSION

We have performed various user evaluations with two different mobile physical activity coaching systems, the RRD mobile activity coach and the Smarcos digital activity coach. Regarding the question whether users of the mobile activity coaching application have a preference for feedback presentation by a talking embodied agent compared to a textual presentation we can draw the following tentative conclusions from the various user evaluations.

- There are no remarkable differences between users of the RRD coach\(^6\) and users of the Smarcos system\(^7\) with respect to how users assess the ECA interface. The differences regarding feedback concern the timing and the content. In the RRD system feedback is presented every hour, in the Smarcos system this depends on the time of docking the sensor and the performance of the user. The contents of the feedback messages are slightly different in text but comparable in length, style and intention.

- Feedback delivered by the ECA is less glanceable than feedback in the simple textual format or the graphical formats

- Some users turn off the sound in which case the text spoken which is typed on the screen character by character in the tempo of speaking should be read off the screen. This takes too much time and attention.

- Messages are short, repeating and the ECA’s appearance doesn’t add to the message. The quality of the voice is insufficient. The animations are quite restricted (smile, eye blink, lip movements).

In the data collected during the user experiments we performed, we have not found any evidence suggesting that an ECA offers a valuable addition to the mobile health coaching system that was used. We did discover that in our situation, one of the main drawbacks of the ECA was the fact that feedback delivered by ECA is less glanceable than feedback delivered by plain text.

The negative outcomes regarding the use of ECA as interface seems to contradict some earlier findings (see [12])

\(^6\)Refer to the MSc thesis of Jordi Hendrix[6]
\(^7\)Refer to the MSc thesis of Saskia Akkersdijk[1]
for a discussion). However, there are a few important differences between our study and these earlier studies. The most important is that our studies are field studies not lab experiments. Moreover, in our study the ECA is interface on a mobile platform (a smart phone application) whereas most earlier studies consider the use of ECA on a PC screen. In our study users did wear the system for a longer period so that the first positive assessments with the rather new technology were overruled by the daily interaction when users became experienced. It is after all not the user experience that counts but the practical value on the long run in terms of the effects on physical activity and health condition. In particular the user attentiveness in situations in which the system presents itself on a mobile is different from situations where the user is behind a PC or watching TV. It should be remarked that the selection of users to take part in the evaluations were not based on their personal need and motivation to take part in a physical activity program. Most of them were not intrinsically motivated, with only a few exceptions. Most participants responded positively on our invitation because they were curious to see how this new technology works, not in the first place because they wanted to be more physical active. It remains to be seen how different motivations to use the system influences the perception of the system and the outcomes of the evaluations. It will be clear though that users who really want to use the system are more keen on the practical value for themselves and on the functions it offers than those users who have more remote interest in the technology.

The comparative user studies reported here actually give an answer to the question if users like feedback content presentation by means of an ECA more than when the same feedback is presented in plain textual format. The idea behind keeping the same feedback was that we didn’t want to vary too much variables that may influence the outcome. Reflecting on the outcomes of the user evaluations reminds us of the fact that “the medium is the message” and that intention, modality, timing, content and presentation format are inseparable aspects of communication. These ingredients should somehow fit to make the whole communication work. The conclusion of our studies is thus that our ECA does not add to presenting the short repeatedly send feedback messages which better suit a glanceable graphical or numerical format. From this we can’t jump to the conclusion that there is no role to play for an ECA in this type of coaching applications. An ECA may add to the function and effectiveness of the coaching system if it is used for other purposes. For example when the system wants to get more personal information from the user, or when it gives more personal motivating feedback in some form of interaction with the user, not daily at regular times but in a more playful way. We will test this hypotheses in a future user evaluation study with an extended version of the coaching system that allows more interaction in the form of a dialog. Information obtained through these dialog about for example the user’s preferences for food, drinks, activities, will be used when the agent gives feedback.

Regarding feedback we think it will help the user if the system offers a practical interpretation of the rather abstract number of calories. For example to translate this into the number of sandwiches, drinks, pizza, or whatever the user prefers to eat or drink.

6. CONCLUSION

To be able to support and motivate people to live a healthy life we have developed a multi-device behavior change support system. This coaching system is able to support users in daily life in different contexts with different input- and output devices. Based on the input from the sensors or input from the user, the system is able to present feedback to the user. When the system sends a feedback message to the user, it is important to select the best possible message on the best available device at the best moment in time. When selecting the message and the modality in which the message should be presented, glanceability is an import aspect. Messages that require immediate action, such as warnings or reminders, should be received quickly and easily by the user.

In a separate, small prototype we investigated the automatic user interface migration in a multi-device coaching system in an office environment. Different devices in the office supported the user during the day. Feedback and interactions with the system could transfer from device to device, based on the user’s current location and task.

To take full advantage of the known benefits of personalization of the user interface of service systems, a mobile platform that is able to present embodied conversational agents in mobile applications is presented. For mobile platforms these systems can use the PictureEngine to present an animated virtual coach. Short term user evaluations with the Smarcs coaching platform have shown that it matters if users are really motivated to use the system. Long term user evaluations (7 weeks and longer) are underway in order to investigate the effects of personified coaching feedback on user experience, quality of coaching and effectiveness of the coaching program.

It is worth to explore the possibilities with the Picture-Engine for more rich animations of the graphical character on mobile Android devices. A different TTS system would allow to regain the speech-related functionality that is currently unavailable on Android, such as synchronization within utterances and viseme-based lip-sync. We also look for techniques to allow small idle and communicative movements by the ECA, such as nodding and shaking of the head.

Timing of the feedback can be based on event, time or context triggers. The current coaching system is using event and time triggers. Events such as uploading activity data or the time of the day are used to present feedback. In the introduction we presented several users groups that could profit from a system that monitors physical activity: youngsters, office workers and patients that suffer from chronic diseases such as diabetes. Each of them has their own preferences for feedback presentation. We are developing a more context- and activity aware strategy for timing of feedback. Context aware triggers make it possible to present feedback at moments users are more open to receive feedback. Medication reminders for diabetics should be send around breakfast, lunch or when having dinner. Combining sensor data from different sensors on a smartphone makes it possible to detect routines like “waking up”, “having lunch” or “returning home”. An application that is able to detect routines is Lifeliner. More information about Lifeliner can be found on http://cauit.erve.vtt.fi/lifeliner/ and
background of a smartphone and automatically detects the patterns of daily routines. Special events, like “lunch” and “returning home” can be specified, detected and used as a trigger for presenting feedback.

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7. REFERENCES