Towards Somaesthetic Smarthome Designs: Exploring Potentials and Limitations of an Affective Mirror

Chi Tai Dang, Ilhan Aslan, Florian Lingenfelser, Tobias Baur, Elisabeth André
Human Centered Multimedia, Augsburg University
86159 Augsburg, Germany
dang@informatik.uni-augsburg.de,{aslan,lingenfelser,baur,andre}@hcm-lab.de

Figure 1: Feedback examples (ambient colored light, textual, animations): Happiness (left), Fear, Disgust, Sadness, Surprise.

ABSTRACT

Have you ever experienced a mirror that not only "sees" how you see yourself, but tells you how others perceive you? May such a smartmirror help not only adapt/improve oneself externally (look) but also internally (mood, emotions)? What are the expectations, fears (privacy)? The acceptance of such a smart thing requires approaches that go beyond technology-driven designs. In this paper, we report on the construction of an affective emotion-sensitive smartmirror as a smart piece of furniture for smarthomes and explorative studies with that system which address somaesthetics and aims to help inhabitants in self-reflection. The paper presents and discusses the prototype implementation and the results of a study in which the ideas, concerns, and experiences for/with the self-reflection capabilities of the affective smartmirror were explored by participants using the prototype as a technology probe.

CCS CONCEPTS

• **Human-centered computing** → **Interaction devices**; *HCI design and evaluation methods*; *Interactive systems and tools*; • **Computer systems organization** → *Embedded and cyber-physical systems.*

KEYWORDS

smarthomes, home automation, smartmirrors, magic mirrors, affective mirrors, emotions, facial recognition, positive computing, somaesthetics, design

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1 INTRODUCTION

The proliferation of smarthomes (or smart home automation) has been increasing significantly in recent years and the technologies, and ecosystems continue to evolve rapidly. Driven by the many and rapid developments in industrial IoT technology, the range of smarthome products and technologies is expanding at a comparable pace, since smarthome products (as IoT technology) benefit from the multitude and high availability of hardware components, cloud infrastructures, or software components. Regardless of whether smarthomes are made smart incrementally or are already considered during construction, smarthomes are usually designed to achieve specific goals from particular views. Wilson et al. [43] identified three broad views in research literature, namely the functional view (e.g., *better manage daily demands*), the instrumental view (e.g., *reduce and minimize energy usage*), and the socio-technical view (i.e., *digitalization of everyday life*). Nowadays, these goals and views are usually pursued – in the design of smarthomes – with technology-driven approaches, which can also be observed in the developments of smartmirrors (e.g., [1, 20, 22, 33]). However, there is something very special about mirrors compared to other smart things in the household. A mirror is not necessarily a thing but in its essence a potentially transformative experience. In fact, many living species on our planet are not capable to recognize their own images. In contrast, human infants develop self-recognition before the age of two (e.g., [2]) and the emergence of a notion of self is described as a major event in the development process of children (e.g., [5]). The experiential qualities associated with self-recognition have also been acknowledged by artists, such as by Salvador Dali who depicted the story of Narziss in Greek mythology in his well known painting "The Metamorphosis of Narcissus", which is about a young man falling in love with his own reflection in a pool and consequently morphing into a flower.

Richard Shusterman, who has defined the field of somaesthetics [38], which is (in a nutshell) about self-appreciation of our living sentient bodies, criticizes how bodily (somatic) self-consciousness in our culture is focused on a consciousness of our bodies' appearances to others considering conventional models of attractiveness, arguing that "*Virtually no attention is directed toward examining and sharpening the consciousness of one's actual bodily feelings and actions so that we can deploy such somatic reflection to know ourselves better and achieve a more perceptive somatic self-consciousness to guide us toward better self-use*" [38, p. 6].

In an age of image filtered selfies and altered self-images on social media (e.g., [30]) Shusterman puts a finger on an increasingly important contemporary issue about well-being and proposes nurturing bodily self-reflection skills as a potential solution. Traditionally, improving self-reflection, self-awareness, and mindfulness is associated with technology-free meditation practices since their praxis predate (digital) technology and technology has an ambivalent influence on well-being. Especially, early technology designs seem to have focused mainly on productivity. Today, it is clearer that technology can be both the potential cause and the cure for stress [39]. Indeed, there has been progress since personal informatics (e.g., [26, 27]) was initially used to describe an emerging class of systems, which focused on collecting personal information and consequently improving self-knowledge. Additional design and development philosophies have been emerging, such as Positive Computing [10], which propose to design for human potential and flourishing.

In this paper, we report on a series of design inquiries including an explorative study and focus group interviews to explore the concept of an affective smartmirror for the smarthome, which is capable to recognize (and potentially learn in a next step) a person's emotions and "reflect" them back to the person. Thus, the affective smartmirror not only reflects a disconnected bodily appearance but a holistic body image including actual bodily feelings, which we believe has the potential to support somatic self-consciousness more than traditional mirrors.

Contribution. The research contribution is threefold (i) we present an original prototype in a reproducible manner which utilizes open-source components, (ii) we describe results of our design inquiries providing insights for the design of affective smartmirrors in smarthomes, and (iii) we do this by adopting somaesthetics as a contemporary lens for the analysis and interpretation of smarthome designs.

2 BACKGROUND

Smartmirrors in Smarthomes

The idea behind smartmirrors, which are also occasionally referred to as "magic mirrors", is to present the viewer a mirror image (reflection) of themselves, augmented with dedicated information. Such mirrors can be realized, for example, with a video camera, which records the viewer, and a conventional computer screen (e.g., [32]) or a computer screen modified with a one-way mirror film to enable a reflective screen [6, 19, 46]. Smart mirrors have been increasingly studied, for example, in terms of re-thinking traditional usage of mirrors (e.g., makeup tasks [32], usage in fashion stores [28]), identification/authentication approaches [31], or enabling software frameworks [19]. Here, the open-source project MagicMirror[1] provides a versatile and modular software platform that enables a quick and easy implementation of a smartmirror.

Considering the trend in recent years to integrate smart things in the home, it is only consequent to also make the mirrors in a smarthome smart. Early work that addressed the usage of smartmirrors in smarthomes was presented by Helal et al. [20] with the "Gator Tech Smart House", which includes a smartmirror in the bathroom for important messages or reminders. Since then, more and more work (e.g., [6, 19, 31, 45, 46]) presented smartmirrors for the home context.

Facial Expressions, Emotions, and Smartmirrors

The traditional and natural use of a mirror is based on the reflection of oneself in the mirror. Hence, people intentionally position themselves in front of a mirror in a way that enables smartmirrors (equipped with a camera) to capture both the head and parts of the body (or even the whole body) for objective analysis.

[1] https://magicmirror.builders

The work of Rahman et al. [33], for example, make use of a camera in front of a mirror to recognize health features (heart rate, blood pressure) for health monitoring without the need of physical contact with sensors. Andreu et al. [1], on the other hand, employed a depth-camera in front of a smartmirror to perform a 3D morphological analysis of the face in order to determine the psycho-somatic status with the aim to non-intrusively recognize cardio-metabolic risks. Such physiological data (augmented in the mirror image) provide additional value to inhabitants of a smarthome within everyday routines in the bathroom.

Apart from such physiological data (e.g., heart rate) that cannot be directly determined by users, camera images also reveal data that users can recognize themselves in the mirror image, such as emotions emanating from their facial expressions [6, 45, 46]. Yu et al. [46] demonstrated the feasibility of a smartmirror, that was placed in a bedroom, to alleviate the emotion of users. If users were in a sad mood, the mirror played positive background music along with positive words and sentences. Their results indicate that positive voice and music, embedded in a smartmirror application, can improve the mood of users within daily routines that include the mirror image. Yang et al. [45] presented a smartmirror called iMirror, which recognizes users' expressed emotions from facial expressions and adapts the color of LEDs mounted around the mirror in order to reflect the recognized facial emotions. In their study, around 90% of the participants accepted facial recognition for smartmirror applications. A similar direction as in the present work was explored by Besserer et al. [6] with the concept implemented in FitMirror. The aim of their concept was to increase motivation, mood, and the feeling of fitness through exercises, such as jogging or push-ups, performed in front of a smartmirror. Furthermore, the users had to smile repeatedly to increase their mood, which was detected by means of a Microsoft Kinect sensor based on the facial expressions of the users.

Somaesthetics in HCI, Positive Computing

It is not unusual for the inner workings of the human body to be hidden from conscious awareness, allowing users to perform tasks in an efficient and automated, but often mindless and self unaware manner. While there are good reasons to blend away details of embodiment for healthy persons, Richard Shusterman who has defined the field of somaesthetics argues how bringing the inner workings of our bodies to the foreground for times of reflection can help; e.g., recognize and regulate unhealthy behavioral patterns [38].

Recent developments in computing and design propagate designs for well-being (e.g., [7, 15, 37]), mindfulness (e.g., [3, 47]), (soma)esthetic appreciation [21], mental and physical health (e.g., [9, 13, 35]). To this end, researcher build on foundations and advances in affective computing and user experience research and take inspirations from emerging (interdisciplinary) fields, such as positive computing [10], somaesthetics [38], and mindfulness based stress reduction (MBSR)[23]. Today, the number of devices and applications measuring and displaying data about ourselves, our bodies, and daily activities has been increasing. Their aim is to provide support, and ultimately to increase self-awareness and maintain control over our own physical and mental fitness.

While the idea of bringing the inner workings of our bodies to the foreground for times of reflection and mindfulness, and in order to improve well-being and happiness seems reasonable and desirable, difficult design challenges exist. Some important challenges are due to the quality and nature of physiological and behavioral data, which needs to be recognized, computed, and interpreted. Other equally important challenges with such designs and interactions are associated with a need to be embed them seamlessly and meaningfully into our daily routines. As a consequence, the body of work in exploring and transforming traditional self-monitoring practices, techniques to increase self-awareness, and foster self-reflection have been increasing over the past few years with researchers in the area of human-computer interaction and interaction design proposing various ideas to display, utilize, and interact with physiological data (e.g., [18]). Our research contributes to the burgeoning body of research in positive computing and somaesthetic designs, by exploring the mirror as a paradigmatic smarthome artifact with its natural materiality and cultural routines inherent to them as artifacts for self-reflection. Ultimately, our aim is to inform stakeholders of smarthome designs in how mirrors can be transformed to foster well-being in future (smart)homes.

3 SYSTEM OVERVIEW

Our implementation of an affective smartmirror includes three technical functionalities, which influence its design: (1) User monitoring with respect to affective state recognition from facial expressions; (2) Display of reactive content on the mirror combined with the mirror reflection of the user; (3) Enable ancillary feedback mechanisms, e.g. in the form of ambient light with emotional color coding.

Figure 2 (left) sketches the technical setup of the smartmirror. Basically, it consists of three main components to enable the required functionalities: First, a computer monitor (in our case a 32“ TV, Samsung LE32B530P7W) in the background is used to augment the user's view on the smartmirror with additional customizable content. This content is presented in combination with the reflection of the user on the second component - a spy-mirror plate. This semi-transparent material allows the simultaneous presentation of the user's mirror image together with textual and graphical content. Monitor and mirror plate are combined within a wooden frame that also features a recess to unobtrusively mount a small camera

(Hercules Optical Glass Webcam, 800x600 px @ 30Hz) and RGB lamps (Philips Hue White and Color Ambiance E27 LED, 4.th Gen) on both sides to create ambient lightning around and from behind the mirror.

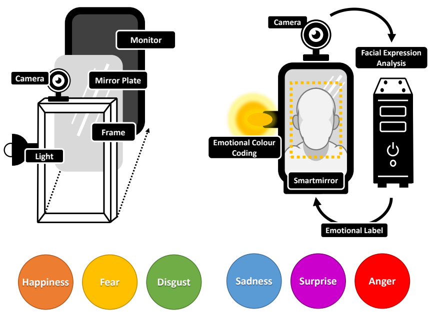

Figure 2: Left: Technical setup of the smartmirror; Right: System overview of facial expression analysis for emotion label recognition; Bottom: Emotional color coding.

Real-time Emotion Recognition

The most evident way to access information about the emotional state of a user interacting with the smartmirror is the recognition of monitored facial expressions. This is addressed via a real-time processing pipeline using live input from the camera. The following 5-block architecture is consequently applied to each frame of the recorded video: (1) Face detection using a standard cascade detection algorithm [42]; (2) Localization of characteristic points of the face (facial landmarks) [44]; (3) Extraction of SIFT descriptors from the facial landmarks [29]; (4) Classification of Action Units (AUs) based on a hidden-task learning approach [36]; (5) Mapping from SIFT descriptors and AUs to an emotion label.

The first two blocks ensure that the recognition system automatically recognizes and analyses a user's face in front of the mirror. Next, SIFT features are extracted from the tracked face and a set of linear classifiers are used to estimate AUs. In the final block, we map the obtained SIFT features and AUs to an emotion label. The open-source library OpenCV [8] is employed to determine the face position with Viola-Jones [42] and the library VLFeat [41] to compute SIFT descriptors. The cascade of regression models for landmark estimation was created using the following manually labeled databases: LFWP [4], AFW [34], and HELEN [25]. The emotion recognition classifier uses SIFT features and AUs to determine the currently observed emotion category. It applies multinomial logistic regression and is trained on the affective picture dataset used in [36]. To establish a real-time recognition pipeline with live camera input, we incorporated the described processing chain into the SSI framework[2] (Social Signal Interpretation), a modular open-source framework able to handle real-time sensor input, signal processing, and classification tasks. The whole process is handled locally without the need for internet and deletes the data instantly after analysis in order to meet data privacy requirements.

[2]https://github.com/hcmlab/ssi

Application

Within our first prototypical application for the technology probe, we used gathered affective information to create a scenario for the user. The sole purpose of the technology probe was to enable users to obtain an impression and to experience the effect of self-reflection together with the different types of feedback in order to be prepared for later discussions. For this purpose, we received monitored emotion labels from the emotion recognition module and simply presented affective feedback to the user, see Figure 1. Figure 2 shows basic emotion labels that can be recognized by the emotion recognition module. This is motivated by psychological studies of Paul Ekman, which proposed the existence of six universal emotions (happiness, fear, disgust, sadness, surprise, and anger) and corresponding prototypical facial expressions [14]. Emotion classes were coded with color schemes according to Kaya et al.[24] and [16, 40]. For the technology probe, we simply faded the ambient colors created by the RGB lamps between the respective values of the emotion classes. In addition to applying color coding to ambient lights, we displayed the current emotion state as a textual overlay in the smartmirror. This way the user was informed about his actual presentation (that may be perceived by other people) in a direct (textual overlay) and indirect (color of ambient light) way in combination with his/her live mirror image. If several negative emotion labels were recognized in sequence, the affective smartmirror showed a funny (cat) animation to evoke a more positive facial expression from the user, see 4.th example in Figure 1.

4 STUDY

First, we used our smartmirror prototype as a technology probe in an explorative user study to investigate future limitations and potentials of affective smarthome smartmirrors. Afterwards, a follow-up focus group interview with a few selected study participants was conducted to discuss some themes in more depth.

Explorative Study

Within the explorative study participants were given sufficient time to try out the technology probe and to explore and experience the functionality implemented in the affective smartmirror. In particular, participants had the opportunity to experience objective emotions emanating from their facial expressions together with the effect of self-reflection through the mirror image, that is to compare their perceived emotional state with the (subjective) visible state from the mirror image as well as objectively recognized state by the mirror application. Under the impression of these experiences, participants were asked about their moods, attitude towards emotion recognition, self-reflection, potentials, limitations, or further conceivable applications. Sixteen participants (4 female and 12 male) took part in the study, with an age range of 20-32 years (mean 25.25, SD 3.31). There were postgraduate business economics students, postgraduate computer science students, and one postgraduate psychology student. None of them lived in a smarthome nor had prior experience with smartmirrors. The study took place in a university laboratory (which is referred to by the lab staff as the living room) in which the smartmirror prototype was placed centrally on a long table, see Figure 1. There was nothing in front of the table so that participants could move freely (within an area of 2m x 2m) in front of the smartmirror.

Procedure. Participants went through the study one after another, that is independent of each other. After being welcomed by an experimenter, participants were given a written introduction that explained the goals and steps of the study which included: (1) a description of the smarthome context with an affective smartmirror, (2) a description of the emotion recognition feature of the smartmirror for self-reflection, and (3) the task that participants had to do, that is to explore and experience the functionality of the affective smartmirror. In addition, the experimenter explained to the participants that the prototype makes use of a camera to capture the participant and that the mirror augments the mirror image based on recognized emotions from facial expressions. By means of these objectively determined emotions, the mirror aims to help the user by self-reflection to determine possible differences between his perceived state and the state perceived from the outside, for example, by other people. Participants were given as much time as required to explore the technology probe. Each exploration session lasted between 2-5 minutes depending on the interest and willingness of the participant to explore the technology probe, that is to trigger certain facial expressions for emotions explicitly or to experience the effect of the ambient light in combination with the self-reflection. Afterwards, each participant conducted a semi-structured post-experience interview with the experimenter gathering comparative feedback on their experience with the technology probe.

Focus Group

In order to discuss the experiences and given statements of the participants in more detail, we carried out a focus group study with a few participants of the explorative study. Six participants (1 female and 5 male) were selected for the focus group discussion based on the quality of responses and willingness/openness to express opinions and thoughts about the previous explorative study.

Procedure. In preparation for the focus group study, we analyzed the statements of the interviews and selected/derived topics for a more detailed discussion. All participants met in the laboratory in which the mirror was placed and a discussion leader led through the topics, making sure that the participants discussed among themselves and everyone had the chance to participate in the discussion. The discussion lasted 24 minutes and was recorded with a microphone.

Results and Discussion

The semi-structured interviews – based on a catalog of predefined questions – were carried out by the experimenter directly after the exploration task in order to pick up the attitudes, opinions, and ideas of the participants under the impression of the experience with the smartmirror. The task was a highly bodily self-reflective experience as participants moved in front of the mirror seeing themselves with their facial expressions and body movements and at the same time experienced the effect of the feedback.

Mood before and after Exploration. People often feel uncomfortable and violated in their privacy when they are observed by a camera and judged by algorithms as our prototype does. In addition, this situation in combination with the effect of self-reflection of oneself through the mirror image could further intensify this influence. Therefore, the first question addressed possible negative influences on the mood and feeling after the exploration of the smartmirror. For this purpose, participants were asked to describe their mood and feelings with their own words during the introductory phase and after the exploration phase.

The answers given ranged from neutral to positive, which is why we classified them into the following 3 categories: *neutral* (e.g., "relaxed"), *positive* (e.g., "eagerly", "curious", "interested", "cheerful", "motivated"), and *very positive* (e.g. "happy", "cool"). We chose only 3 categories because we were interested in whether a change had occurred and not in measuring concrete values. Figure 3 summarizes the frequencies of moods at the beginning of the study and after the exploration of the smartmirror. The majority of the participants were in a neutral to positive mood before the task and afterward in a positive to very positive mood. In addition, from the transitions in the responses, in 25% of the transitions there was no change in mood and in 18.75% of the transitions the mood changed from neutral to very positive. Most participants (75%) received a positive influence on the mood through their experience, which is promising with regard to how reflecting a user's bodily affect with a smartmirror may improve the aesthetics of bodily self-appreciation.

Attitude Towards Emotion Recognition. Emotion recognition based on machine learning and cameras can be

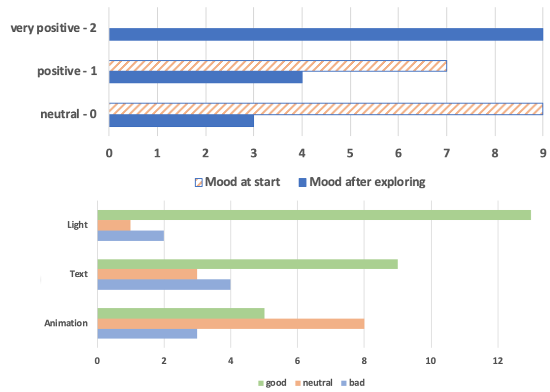

Figure 3: Top: Frequencies of moods; Bottom: Frequencies of ratings for feedback type.

implemented easily nowadays. However, it is rarely used in real-world applications. Reasons may be because people may feel uncomfortable or have more concerns about privacy when the benefits are small [11]. Therefore, the participants were asked whether they felt uncomfortable with emotion recognition and whether the benefit justifies the use of such a technology. Only 18.75% of the participants felt rather uncomfortable with emotion recognition and 25% of the participants felt the benefit of emotion recognition as hardly or not valuable. However, the remaining participants had no concerns about emotion recognition. They even suggested a more comprehensive usage through suggestions for extensions such as *"long-term emotion monitoring"*, *"feedback from unconscious emotions"*, *"feedback on negative emotions"*, or *"more functions through more sensors"*.

Self-reflection and Improving Mood/Well-Being. Participants were asked whether the concept of self-reflection together with an affective mirror application could improve their mood and well-being over a long period if regularly used. Overall, 31.25% of the participants could imagine achieving an improvement for a short time after usage of the smartmirror. All but one of these (31.25%) participants could not imagine a long-term improvement. Altogether, 37.5% of the participants could imagine that such a smartmirror could improve their mood on a long-term basis. One of the participants responded that such a system could *"improve his effect on other people"*, which is in-line with somaesthetics' goal of bodily self-improvement and the notion in positive computing, which argues that designs should foster competence to progress human potential and flourishing.

Affective Feedback and Visualization. Our design realized three types of feedback (ambient light, textual description, animations), which were integrated into the affective smartmirror to show the recognized emotions or to influence the mood. The participants were informed in advance that the implementation in our design was only intended to give them an impression, to observe their perception and to experience possible effects on their self-reflection experience. Under this impression, participants were asked what kind of feedback they thought was good or bad with regard to their effect and to give reasons for their assessment. Figure 3 shows the frequencies of ratings for each of the types of feedback. The majority of the participants (81.25%) rated the colored light feedback as good stating, for example *"very cool"*, *"can positively influence the mood"*, or *"good for expressing emotions"*. Three of these participants described the perception of the colored light as subconscious and not direct, as the light are in the peripheral field of view when the user's focus is on the mirror image. This would allow the colored light to be used to unconsciously influence the mood. More than half of the participants (56.25%) found the textual feedback good because of its easy comprehensibility. The use of animations to support and improve the mood was good for only 31.25% of the participants, while most rated for neutral, stating that the animations distracted from self-reflection and could be annoying over time.

In summary, participants felt the ambient light to be most suitable for the affective smartmirror and self-reflection. However, designs of affective smartmirrors should consider that colored light do not only emit emotions but itself has an influence on the mood of users [40] as well as that cultural differences exist [17] and use these effects constructively.

Focus Group Discussion.

The focus group served to gain detailed insights on specific topics that have arisen from the qualitative responses of the participants – given in the explorative study – or have shown very different perspectives. Discussion topics and results:

Self-Reflection and Emotion Recognition: Participants realized both potentials and dangers in emotion recognition for self-reflection. All participants agreed that regular self-reflection is becoming increasingly important today, especially in places like one's own home. One should take time regularly, take a deep breath, listen to oneself and ask oneself - how do I feel? An affective smartmirror could contribute in a supportive way (e.g., colored lights, calming sounds) or remind for self-reflection if the necessity is recognizable by the course of the moods. Here, the smartmirror should take context, more sensors ([1, 12, 33]), and situations of daily routines into account, for example, in front of the mirror in the bedroom in the evening rather than in the bathroom in the morning, before the user hectically wants to leave the home. On the danger side, improper utilization of the recognized emotions might have a negative effect on the self-confidence of users, for example, repeated (daily) prompts for self-reflection and thus hints to negative expressions on users' face. Uncertainty among a user could also be increased if recognized negative emotions (conveyed to the user) and perceived moods diverge permanently.

Privacy: When it comes to privacy, data such as camera images and recognized facial expressions/emotions as well as their usage within smartmirror applications play an essential role. The subject of security is just as important since all participants had concerns that trespasser (e.g., criminals, hackers) might be able to access this data. This is particularly delicate because smartmirrors in a bathroom/bedroom might record very intimate situations and the long-term recordings of moods may contain health-related findings. Such data could be abused for criminal purposes (e.g. extortion). When thinking about unnoticed surveillance and hackers, a mirror was particularly scary to the participants, since one usually looks into a mirror. In comparison to surveillance cameras, one can cover one's face at least.

Situatedness: For the participants, placement in the bathroom did not seem to be the most important place for an affective smartmirrors, as typical hygiene tasks are carried out in the bathroom and self-reflection may be less important. Much better would be an installation in the bedroom or in a corridor in front of the front door, because there one can either take time for self-reflection or "correct"/practice one's facial effect on other people before leaving the home.

Applications: Beyond the typical applications (see Section 2) for affective smartmirrors, our participants pinpointed and discussed another application worth mentioning. One of the participants would practice his talks in front of the affective smartmirror and thereby optimize his appearance and emotional effect on others. The smartmirror could help him to recognize and train positive emotional effects, avoid negative emotional effects, or to use both strategically.

In summary, the results of our inquiries are indeed promising and motivate broadening our study to various somaesthetic and self-use improving practices involving mirrors, such as brushing one's teeth in front of a mirror, which we believe all potentially could benefit from improved self-reflection; i.e., a presentation of a holistic body image, which includes an interweaving of the body as mere physical object and its experienced and expressed emotions and feelings.

5 CONCLUSIONS

In designing smartmirrors for smarthomes, the purely technology-driven or function-driven approach will foreseeably not lead to a comprehensive satisfaction among inhabitants, for example if the mirror is merely transformed to an info-display for emails, weather, and calendars. Instead, we propose to extend existing approaches to integrate positive computing and somaesthetics perspectives, that is incorporating, for example, well-being, mood/emotions, improvement of self-use or bodily perception and experience as additional foci of analysis and design goals. Results show that reflecting a user's bodily affect through the mirror image of a smartmirror may improve the aesthetics of bodily self-appreciation. However, privacy of inhabitants and security of data is of particular importance because of potentially intimate images or health-related data. Therefore, a minimum requirement is that camera images are not stored persistently, but are deleted from memory immediately after analysis and that emotion data are stored and transported in encrypted form. Modulation of self-reflection should be realized carefully and prudently, as a purely technology-driven design may increase negative effects and uncertainties for/of inhabitants, particularly in the home where inhabitants want to feel safe, comfortable, and relaxed. The results of our exploration are promising and indicate that affective smartmirrors have great potential by modulating the self-reflection process to become not only a digital mirror augmented with information but improve and enrich daily routines, well-being, or effect on other people with smart technology. However, further exploration with a broader population might be useful to ascertain the concerns and issues.

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