Empathy and Mobile Applications

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Abstract—Mobile devices, such as mobile phones and personal digital assistants, have gained wide-spread popularity and are part of the everyday life of billions of people. Today's mobile phones represent a rich and powerful computing platform, given their sensing, processing, social and communication capabilities. Empathy is the ability to identify with and understand another person's situation and feelings. Our ability to empathize affects how well we communicate our thoughts and feelings with others, how well we understand others, and how comfortable people feel communicating with us. Mobile devices have made a huge step in trying to cultivate empathy to people and different social groups through interesting applications.

1 Introduction

Mobile devices are shaping-up users' lifestyles by adding new dimensions to the concept of socializing, performing actions and forming new habits [1]. As summarized by Fogg and Eckles (2007) [2], "mobile phones will soon become the most important platform for changing human behavior". Oinas-Kukkonen (2008) [3] argues that ubiquitous information systems are shaping up the creation and dissemination of information in new ways hence creating opportunities to foster healthier lifestyle.

Furthermore mobile applications which is software, developed to run particularly on mobile phones (smartphones) and tablet computing devices, have the potential to bring a new perspective to people's life in many sectors. The diffusion of mobile phones into our lives is an evidence of their popularity. The ever-growing liking and adoption of mobile phones (e.g. Blackberry, iPhone, Google Android, Nokia Windows Phone) is reflective of their mammoth potential to promote health and general wellbeing of users. Portability, continuous data streaming, advanced computing power and easy dissemination of applications give them an edge over other forms of in-

formation and communication technologies [4]. In addition mobile applications provide the opportunity and have shown promise in helping people to change social behavior, enrich education and help children and adults in many ways and sectors. Also, there is an effort and applications have already been created in order to detect or develop emotions to people and children. Especially great steps have been made with the aim to detect and cultivate empathy too.

Empathy is a "complex psychological inference in which observation, memory, knowledge and reasoning are combined to yield insights into the thoughts and feelings of others" [5]. The accuracy with which one person can interpret the feelings of another person is known as empathic accuracy. The ability to perceive the feelings of another person accurately is arguably the most fundamental and important aspect of empathy [6].

Empathy can also be considered to be equivalent to conviviality that allows individuals to identify with each other thereby experiencing each other's feelings, thoughts, and attitudes and hence is deemed a central concept to design a community [7]. From a synthesis of many researchers' work on empathy, Levenson and Ruef (1992) identify three different qualities of empathy: (a) knowing what another person is feeling, (b) feeling what another person is feeling, and (c) responding compassionately to another person's distress [8].

Devices cannot feel empathy. However, understanding the significant role of emotions and empathy and taking into consideration the rapid changes in Information and Communication Technologies (ICTs), mobile applications have been created that display overt signs of empathy. Satisfying progress has been observed in the design of mobile applications in order to support and promote empathy. The applications have been expanded in fields such us: mobile applications – empathy and health, mobile applications – empathy and elderly people, mobile applications – empathy and emotions/emotional agents, mobile applications – empathy and games, mobile applications – empathy and social change and mobile applications – empathy and social media.

The purpose of this literature review is to examine the current state of mobile applications targeting the development of empathy and provides an overview of the most representative studies. The studies chosen will be classified according to the areas of needs they serve.

2 Mobile Applications for Empathy

2.1 Mobile applications, empathy and health

Morris et al. (2010) developed "Mood Map", a mobile phone application with touch screen scales for mood reporting, therapeutic exercises for cognitive reappraisal and managing stress. Throughout the day, the phone prompts users to report how they are feeling. Users who indicate intense negative emotions, such as anger or anxiety, are prompted with an option to do an appropriate coping exercise drawn from cognitive psychology. For example, the application can present the user with an animated

breathing exercise or ask a set of questions aimed at deescalating the user's intense anger. Results indicated that "Mood Map" helped their participants significantly reduce their anger, anxiety and sadness ratings in order to help themselves and empathize with others [9].

Schmitz et al. (2013) designed a mobile learning game, "HeartRun", to train Basic Life Support (BLS) and Cardiopulmonary Resuscitation (CPR). The main goal of the heart run game is the acquisition of skills and abilities related to the Chain of Survival i.e. (a) to prevent cardiac arrest, (b) to buy time, (c) to restart the heart and (d) to restore quality of life. The game is initiated with a notification informing the CPR player about a victim in the direct surrounding. The player starts to identify the location of the victim and afterwards perform the steps required in case of a witnessed cardiac arrest. The game can be played with 2 or 3 players and there are 3 different roles foreseen: A CPR player, a player who documents the performance with video recording and an optional player who is responsible to find and get an Automated External Defibrillator (AED) to the victim. The players can change roles and play the game again. By ''putting oneself into other's shoes'' they have the chance to experience and control both feelings of panic and fear of emergency. Empathy, competence and roleplaying influence the willingness to help in case of emergency [10].

2.2 Mobile applications, empathy and elderly

Mubin et al. (2008) described "Walk 2 Win", a mobile game that older adults can play in group or individually and in which to progress, they need to walk in a closed environment and discover hidden artifacts. The application uses a smartphone and local Wi-Fi to detect the user's geographical location and a central server to synchronize and moderate the game. By simply playing, people increase their walking and socialize at the same time, positively affecting lifestyle and social support determinants. Furthermore the elderly expressed a strong preference and interest to have a bigger connection with their grandchildren. That leads in the cultivation of empathy elements for the elderly and the creation of stronger relationships [11].

Pfeil et al. (2007) (www.seniornet.org) presented 'Senior Net', an online empathic community for older people. This online community for older people will display a high degree of emotional support and trust especially when suffering from illness. The emotional support of the online community is seen as a helpful addition to the offline recovery program and the older ones can interact with each other using their mobile devices too [12].

2.3 Mobile applications, empathy and emotions/emotional agents

Francesca Rosella and Ryan Genz, the co-founders of CuteCircuit, invented the Hug Shirt which can provide virtual hug over distance which can give the real feeling of being hugged by exerting pressure and heat to person wearing it. Hug Shirt is sensor/actuator device which interacts with normal bluetooth enabled mobile phones to send hugs from MSN services. While wearing the shirt, the sender hugs himself and the recipient who is also wearing a Hug Shirt will feel pressure and heat in those are-

as. Hug Shirt exchanges emotions when people face problems or miss their friends and loved ones. It also has some very interesting applications in the medical field with the elderly and children [13], [14].

Gay et al. (2011) presented Aurora a mobile application whose primary function is emotion recording and sharing. The research team at Cornell University developed Aurora to provoke and energize social emotion sharing. It uses photographs as a mean of expressing and exchanging emotions. The pilot study found that Aurora motivated people to be more aware of their emotions and to share them with others, which led to a boost in people participating in socially supportive behaviors with others and as a result that also leads to the development of empathy. Moreover people using Aurora improve eating habits and health behaviors by interact with each other and sharing their emotional states [15].

Sollenberger et al. described "booST and hooPS", two mobile, social applications which main aim is to strengthen the social relationships through the exhibition of emotions and creating empathy. "booST" promotes positive physical behavior in young adults by enhancing their social network through an existing social circle with affective capabilities and interactive activities. Where "booST" departs from traditional social applications is in its use of the energy levels and emotional status of its users. The "hooPS" application is centered around socially connecting users with their friends while they simultaneously watch a basketball game and sharing their emotional state as well. Both applications exhibit sensitivity to their user's affective state and support the user in exchanging that state with other users [16].

Lim et al., (2005) introduced 'The Empathic Tour Guide System' a context-aware mobile system, including an 'intelligent empathic guide with attitude', offering the user a seamless, temporally and spatially dependent, multi-modal interaction interface. The phrase 'empathic guide with attitude' means a guide that does not only show emotions during interaction, but at the same time try to invoke empathy in the user. It will consist of two virtual agents each possessing a contrasting personality, presenting users with different versions of the story of the same event or place. An Emergent Empathic Model with Personality is proposed as a mechanism for action selection and affective processing. The system will mould to the behavior of the users and facilitate their movement, applying storytelling techniques which link the memory and interests of the guide as well as the visitor to the spatial location so that stories are relevant to what can be immediately seen, creating personalised communication. Multisensory systems will be integrated with the PDA, adopting wireless technology. Detection of the user's current physical position will be performed by a Global Positioning System [17].

Ståhl et al. (2011) presented The Health and Fitness Companion (HFC) acts as a conversational partner whose overall aim is to build a long-term relationship with the user. Planning the day becomes a compromise between the user and the system. The companion has a stationary component situated in the user's home and a mobile component, where the interaction is made through a mobile phone or device. A relationship between the agent and the user is built through dialogue. It provides advice and guidance throughout the day about lifestyle and combinations of diet and exercise. The main operation of the system comprises, not only, planning the day, looking for

user's well-being, but also including the user's tastes and preferences. However, the character acts more as a companion than a personal trainer, since it takes a persistent role in the user's daily life. The Health and Fitness Companion is an affective, empathic agent aims to set up a long lasting social and emotional relationship so as the user support overall lifestyle changes in his/her daily habits [18], [19].

Church et al. (2010) developed MobiMood, a social mobile application that enables groups of friends to explicitly share their moods with each other while on the move. MobiMood lets its users share their current emotional state. To do this they simple have to select one of the predefined emotions in the app or create a new one and send it to all the other users of the app. Moreover they can declare their emotions by texting. In addition the location, the time and the social event where the emotion was experienced is shared as well. The application increases mood and emotion awareness and that helps people understand one another through the interaction they have and increase the cultivation of empathy [20].

2.4   Mobile applications, empathy and games

Lim et al. (2009) presented ORIENT (Overcoming Refugee Integration with Empathic Novel Technology), a semi-immersive graphical environment depicting an imaginary foreign culture. ORIENT is designed to be played by a group of 3 teenage users. Each one of them takes the role of a member of a spaceship crew. Their mission takes them to a small planet called ORIENT, which is inhabited by an alien race – the nature loving Sprytes. The Sprytes are not aware of the danger that their planet is in: a meteorite is on destruction course and unless someone stops it, it would mean the end of life on ORIENT. It is the users' task to prevent a catastrophe. To do that the users first have to befriend the Sprytes and ultimately cooperate with them to save their planet. Through interaction with the Sprytes, ORIENT promotes cultural-awareness in the users, who have to put themselves into the shoes of guests to a strange and unknown culture (empathy). In ORIENT, the users will interact using mobile phones too with an embodied computer character running on a mobile phone device that plays the role of a human facilitator [21], [22].

Facer et al. (2004) presented "Savannah", a mobile strategy adventure game pilot combining the use of virtual and real spaces, mobile technologies and interactive whiteboards to provide a tool for supporting exploratory learning in 11-12 year olds. It was designed at the Futurelab with the BBC National History Unit. The game allows for a connection to be made between the physical space of the savannah and the virtual hub connected via PDAs over a network connection. School children play a simulation in which they are playing lions in the African savannah. They move physically around in virtual savannah areas and survive as a lion. In this way, they learn a lot about the balance of predators and prey and the impact of humans on the lions' living space. The evaluation shows that there is a lot of social interaction among the players. Learning outcomes from this game would support increased empathy with animals, consideration of aspects of how animals behave and act [23].

Liao et al. (2011) explored the design and the development of a handheld pet-nurturing game with a learning environment. The game is called My-Mini-Pet and

students learn with the help of a virtual pet by simulating the appearance and attitude of a real pet. The virtual pet motivates the student in the learning activities and simultaneously improves its bond with animals through the process of taking care of it. Three design strategies are adopted. First, the pet-nurturing strategy, which simulates the relationship between the pet and its owner. Second, the pet appearance – changing strategy, which externalizes the learning status of the student. Third, the pet feedback strategy, which links the behaviors of the student and his/her pet, the My-Mini-Pet acts as a facilitator of learning. Moreover the student - owner is aware of his/her pet's emotional status through its facial expressions [24].

Behbahani et al. (2011) designed a location-based game called "Catch Treasures" on the iPhone platform. "Catch Treasures" is a multi-player treasure hunt game in which players use their iPhone devices to find and collect the virtual treasures and also to track the other players on the game map. Players were required to walk to the physical location of rewards elements (represented on the map) to capture them and increase their scores. Four different privacy conditions in the studied game were implemented. The privacy categorization depended on whether players were able either to locate other players or to see their iconic images on the map. These conditions are as follows: Avatar-realism, Location-awareness (AL), Avatar-realism, No location-awareness (AN), No avatar-realism, Location-awareness (NL), No avatar-realism, No location-awareness (NN). The findings suggest that players with the least private conditions had more empathy towards other players during the game-play session [25].

Blindflug Studios designed "Cloud Chasers – A Journey of Hope", a game where the palyer guides a father and his daughter through a variety of deadly dystopian deserts, collect water and experience non-linear encounters with other desert dwellers. The game tells the story of Francisco and his daughter Amelia, a couple of immigrants in search of a better life beyond the desert, in a world above the clouds where the privileged live. Of course, just like in real life, this promised land is not easy to reach. There are robots guarding the desert and trying to stop you from reaching their cities. Users must also worry about survival and collect water in order to keep moving. You will depend on Amelia's fun glider to accomplish that. It shows the topic of migration from a completely new perspective and simultaneously brings empathy on the surface [26].

Lim et al. (2016) presented "Treasure hunt", an Android application game that utilizes location positioning technology equipped wireless communications devices. Players are given clues or direction to proceed along one of many predetermined treasure hunt routes based on their location. Based on these clues or directions, players change their locations. Based on these changed locations, as determined by the location positioning devices, additional clues or directions are given to the players until one of the players completes the treasure hunt route and arrives at the treasure to win the game. The application also includes a virtual robot head which presents the navigation instructions, poses the questions, and gives feedback (neutral or affective) on the correctness of the students' answers and at this point there is empathy on the side of the robot tutor [27], [28].

2.5 Mobile applications, empathy and social change

Froehlich et al. (2009) created The UbiGreen Transportation Display semi-automatically senses and feedback information about transportation to encourage green transit. It is mobile application designed to encourage users to maintain sustainable transportation behaviors. The UbiGreen app encourages greener alternatives, including carpooling, public transport and pedestrian modalities by providing visual feedback in the form of adapting the background graphics of the smartphone when users reduce driving. UbiGreen makes use of sensors to semi-automatically infer transportation mode and monitor users' transportation behaviours. The application also use "virtual polar bears" in order to motivate green behavior and as a result empathy is developed for environmental issues and for animals too [29].

2.6 Mobile Applications and social media

mCare is a mobile healthcare service which uses the underlying principles of social networking to provide efficient service for both patients and doctors. As a result, the patients can search or request help from different panels of doctors. For people with severe mental illness and life altering diseases, such healthcare services can provide continuous support, empathy and guidance for the caregiver and the patient. mCare was also used for soldiers who have returned from their service with the aim to animate them, provoke empathy, improve contact rates and positively impact the military healthcare system using mobile messaging [30], [31].

CaringBridge is a website that connects its members to share treatment and symptom information in order to track and to learn from real-world outcomes. CaringBridge is also available for iPhone and iPod Touch users. People gain social support or feel empathy for other people by talking to them during a health care event [32], [33].

3 Conclusion

The use of mobile phones has affected the youth and the adults to a large extent since it has become an unavoidable part of life. Technology is enhancing day by day. And therefore dependency on mobile phones is increasing due to its unique features. Mobile phones are not considered as a device for communication alone but it is considered as a media for entertainment, for education and many other things.

The range and availability of mobile applications is expanding rapidly. The study of mobile phone applications for supporting empathy is just now starting to expand. There exists a golden opportunity to utilize mobile phone technologies to cultivate empathy because it is important to encourage this ability to children and adults too.

This makes empathy a flexible human capacity as well as a method of gaining knowledge of understanding another, and it is susceptible to social cognitive intervention, such as through training or enhancement programs for targeting various goals (e.g., reeducation of antisocial personalities, training of psychotherapists or physicians, and training early at-risk children).

This review has highlighted the applications that have been developed in order to detect and develop empathy to different social groups and in different fields.

Although big progress has been made yet it is apparent that there is leeway for further research that will help designers to develop efficacious and effective mobile applications for empathy.

4　References

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