CREATION OF SYMPATHETIC MEDIA CONTENT

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ABSTRACT

Taking ground in the *enactive view*, a recent trend in cognitive science, we propose a framework for the creation of sympathetic media content. The notion of sympathetic media content is based on two concepts: synesthetic media and empathic media transmission.
Synesthetic media is media that make use of multiple and alternative senses. The approach is to reconsider traditional media content from a different perceptual point of view with the goal of creating more immersive and affective media content. Empathic media transmission will consist in encoding the emotional content of media into multi-sensory signals. The encoded emotions are then mediated to the audience through actuators that provide the physical manifestation of the multi-sensory information.
The two points, synesthetic media and empathic transmission, are addressed through the study of the relation between senses and emotions and the development of suitable methods for encoding emotions into multiple senses, in the frame of an efficacious transmission of emotions to the audience. The extraction of emotional information from media and the conception of a wearable, unobtrusive device are considered too. It is claimed that such a framework will help the creation of a new type of media content, ease the access to more immersive and affective media, and find applications in numerous fields.

Author Keywords

media, enaction, emotion, sensors, perception, senses

ACM Classification Keywords

H.5.1 Multimedia Information Systems — Artificial, augmented, and virtual realities,
H.5.2 User Interfaces — User/Machine Systems

INTRODUCTION

An emerging trend in cognitive science is the *enactive view* [6, 7] of sensorimotor knowledge. In this approach, perceiving is to understand how sensory stimulation varies as we act. In particular it implies the *common coding theory* [8]: actions are coded in terms of the perceivable effects they should generate. More in detail, when an effect is intended, the movement that produces this effect as perceptual input is automatically activated, because actions and their effects are stored in a common representational domain.

The underlying process is the following [9, 10]: first, common event representations become activated by the perceptual input; then, there is an automatic activation of the motor codes attached to these event representations; finally, the activation of the motor codes results in a prediction of the action results in terms of expected perceptual events. The enactive view and its corollaries support the concepts of:

- Synesthetic media,
- Empathic media transmission.

After a detailed definition of the new notion of sympathetic media as synesthetic media combined to an empathic transmission, its practical implementation is discussed. Namely, the way to encode emotions and to transmit them through multi-sensory channels is presented as well as the design of a device to achieve this aim.

DEFINITION OF SYMPATHETIC MEDIA

Sympathetic media is the combination of synesthetic media and empathic transmission.

Synesthetic Media:

In cognitive science, synesthesia (Greek, syn = together + aisthesis = perception) is the involuntary physical experience of a cross-modal association. That is, the stimulation of one sensory modality reliably causes a perception in one or more different senses. Specifically it denotes the rare capacity to hear colors, taste shapes, or experience other equally startling sensory blendings whose quality seems difficult for most of us to imagine. A synesthete might describe the color, shape, and flavor of someone's voice, or seeing the color red, a synesthete might detect the "scent" of red as well. Transmission of emotions (for an enactive view on emotions, see [11]; on vision, see [12]), tones, moods or feelings intrinsically contained in media or that a creator intends to transmit via a media to an audience relies heavily on only two senses, the audition (music or speech) and the vision (images or text). On the contrary, human communication relies on a wide range of senses. Moreover, this reliance on only two senses fails in some cases to convey sufficient information to break cultural barriers or to reach audiences with sensory disabilities. The efficiency of information transmission, including emotions [13], can be limited due to an overloading of the visual and aural channels, for example by textual information such as subtitles that is perceived through vision and imply a cognitive effort. The idea of using alternative sensory channels to create more immersive, affective or realistic context and content for the audience is not new,

especially in the fields of Ambient Intelligence [14], Immersive, Perceptual or Affective Computing [15], and Human-Computer Interaction [16]. To take an example, most Virtual Reality (VR) rooms include several kinds of sensory outputs (wind [17], scent, force, haptic or temperature [18]) other than vision or audition. Nonetheless, most of these works remain not easily accessible to audiences. Either because of their bulky nature (dedicated spaces for VR) or because there is no seamless integration of the extra sensory information in the media that contains them. Moreover, these works are mostly dedicated, and somehow limited, to re-create perceptual sensations identical to the ones that are virtually embedded in a media (for example, the vibration of some game controllers for simulating shocks). Few works try to reconsider a given media [19] from a totally different perceptual point of view.

Empathic Media Transmission:

In cognitive science empathy is the recognition and understanding of the states of mind, beliefs, desires, and particularly, emotions of others. It is often characterized as the ability to "put oneself into another's shoes", or experiencing the outlook or emotions of another being within oneself; a sort of emotional resonance. For instance, if an observer sees another person who is sad and in response feels sad, that individual is experiencing empathy. Empathy can occur in response to cues of positive emotion as well as negative emotion. To qualify as empathy, the empathizer must recognize, at least on some level, that the emotion she or he is experiencing is a reflection of the other's emotional, psychological, or physical state. In addition to widen the sensory bandwidth, it is necessary to develop empathic media transmission, able to embed emotional cues in sensory-based coding of perceived events. The encoding is done directly into the physical expression of these additional senses by using suitable actuators integrated in a wearable, non-intrusive device. The audience who receives this multi-sensory information through the device and is thus in a state of partial sensorimotor immersion, will decode it for inducing emotions that ought to be identical to the emotions the creator of the media content intended to transmit.

Thanks to the synesthetic property of the newly defined media, and the empathic transmission of emotions that are contained in media, a more emotional link between the media and the audience is created. This is something already achieved for example in cinema through the background music or visual clues. The goal here is to improve the empathic relation to the media. How much this empathic link can be reinforced without breaking the duality audience / media is an interesting subject going beyond the scope of this presentation.

SENSES TO EMOTIONS

Following our definition of sympathetic media as a combination of synesthetic media and empathic transmission the translation / encoding of virtual emotional information into real / physical sensory information transmitted to the audience through actuators must be addressed. Two ways are proposed.

The first way to adress the problem of inducing emotions into the audience, is by extending the classical approach. This is done by adding sensory channels to the already present ones, usually sound and image. The relation of senses to emotions is studied for determining the most efficient ways to induce emotions from multi-sensory content. This includes the study of the attainable richness that a given sense or combination of senses can provide to encode virtual emotional content embedded in media content.

The second way to achieve the transmission of emotions is based on the enactive view and is thus favored. The method is to induce the emotional cause from its physiological consequences as perceived by the experiencing person. There is some evidence that this afferent feedback can modulate emotions (this is at the basis of the somatic-marker hypothesis [4] as well as the facial feedback hypothesis [1]). For example, a person experiencing stress or shame might have the feeling of a rise of the temperature. In the right context, rising effectively the temperature might help to induce the intended emotions, here stress or shame. Another technique is to use actuators to divert attention or generate subtle changes of emotional disposition [3]. Techniques such as surveys might help for this study by determining the best sensory channels and types of signals to use for inducing given emotions, with in mind works in cognitive science (enactive view), psychology and physiology.

To better see the difference in these two approaches, that are not exclusive, a second example is proposed. An emotion like sadness could be induced through visual (in a movie, dark atmosphere, rain, faces of the actors, etc...) and auditory (use of a certain type of music) clues. This is the classical approach. Sadness might be induced too by, for example, lowering the temperature and exercising slight pressures at appropriate locations on the body of the audience. While it can be argue that the first approach is already doing a good job at transmitting emotions, even without widening the sensory bandwidth; the second approach might be used in case of the absence of given sensory channels (for example, a radio program), the absence of a right context (looking at a movie on a portable device) or for audience with sensory disabilities.

SOFT AND HARDWARE FOR SYMPATHETIC MEDIATION

Existing media can be manually annotated or the emotions being automatically extracted. Given the difficulty to automatically extract emotional content from a given media, especially in the case of real-time applications, manual encoding will the first step in the creation of sympathetic media. Emotional tags could be considered to annotate the media in a way quite similar to the subtitles tracks on a DVD. An encoding module must be developed that encodes emotions to senses thanks to sets of rules and algorithms.

The hardware can be separated into two elements. One that supports the processing unit (notably the encoding module) and a transmitter and is interfaced with the media. This first element communicates with a second element that is a wearable device constituted of a receiver and the actuators. For this hardware part, we propose to design and conceive a wearable [22], unobtrusive, non-invasive, multi-actuators device, that will bring sympathetic media into homes in a similar way new technologies have brought cinema into

homes through the Home Cinema.
Assessment of available actuators that can serve our purpose of providing relevant and efficient physical sensations and of being integrated in a wearable device will be conducted. As a first step, only actuators that act in non-invasive and external fashion relative to the human body will be considered. These actuators are, for example, actuators that can induce the following perceptual inputs: vibration, pressure, temperature, touch,... All these actuators act through the skin. Non-invasive actuators that act on internal organs of the human body (such as the galvanic vestibular simulation [20, 21]) will not be considered here but their existence will be discussed.
The design itself is another concern that can nonetheless be eluded at this stage. This device will contain a minimum of processing parts, except what is necessary for wirelessly communicating with the encoding module and for sending the received signals to the actuators. Because the actuators are non-invasive, the device which main function is to support these actuators will be non-invasive too. Nonetheless, most of the actuators are contact actuators and act through the skin. It implies that the device will be somehow attached to the body. For limiting the invasive feeling, the device will be for example designed as an armband. The future addition of other types of actuators will certainly lead to a reconsideration of the design, including location on the body.

FUTURE WORKS

Three types of future improvements can be foreseen.

- At the level of the senses in relation with the actuators. The progress in cognitive science and in nanotechnology make possible to think of new types of actuators that will be able to directly act on the brain of the audience without necessarily being invasive, and even directly induce emotions through electromagnetic signals [5], [2]. It should be noted that even in this case, encoding is necessary and that this type of brain stimulations can be somehow considered as a sense. Such actuators will inevitably rise ethical questions. At the same time, it opens the door to more immersive and affective virtual communication or experience.

- At the level of the emotions through their automatic extraction. The progresses in computing power, cognitive science, psychology, or semiotics makes us think that both the understanding of how emotions are induced and how to extract them automatically from media content will improve. The outcome of these advances will be useful to the future of this research.

- By implementing a mirror function to the whole system. The proposed system is aimed at transmitting emotions from a media to an audience. By adding sensors to the wearable device that could monitor the emotional state of the audience, a bi-directional empathic communication could take place with the possibility of interacting with the media. The media could "react" to the emotional feedback of the audience.

ACKNOWLEDGEMENTS

The authors would like to thank Carson Reynolds for interesting insights and references.

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