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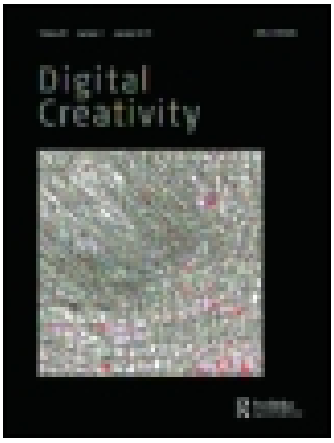

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Enacting archetypes in movies: grounding the unconscious mind in emotion-driven media

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Abstract

The concept of emotion-driven media integrates affective computing into developing new types of digital media by including the human spectator as an essential part of the whole system. Enactive media, as a landmark in this direction, provides a theoretical basis that is rooted in the enactivist approach in cognitive science. Based on this thesis, it is required to establish a practical procedure for developing the media content through integrating psychological approaches. We demonstrate a systematic approach for developing the content for emotion-driven media. The theory of archetypes, one of the psychoanalytical approaches, was applied for editing movie clips as the media content, and coupled the content with emotional responses by using experimental psychological methodologies. The results showed that it is promising to utilise archetypal movie clips as the content of emotion-driven media and archetypal symbolism can be a useful resource for developing the content of media systems.

Keywords: enactive media, emotion, archetypes, movie, psychological approach

1 Introduction

In the field of human–computer interaction (HCI), there have been tremendous endeavours in recent years to build an intelligent system that is capable of communicating with humans in a natural way. Affective computing, as a branch of HCI, specifically aims at enhancing the communication between human and machine by expanding the emotionally charged channel (Scheirer and Picard 1999). Researchers have made considerable progress moving from user interfaces based on the physical level of user activity to a multimodal interaction that takes into account affective states of users. This has expanded the vision of research in the HCI field, and pushed HCI into the next paradigm where interaction goes beyond the traditional input–output mechanical process through a physical interface. Various applications of physiological technology are employed to measure and recognise human emotion, so that intelligent systems are empowered to react not only to users' explicit conscious behaviour but also to users' unconscious affective states. The advances in affective computing considerably facilitate the

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development of applications in different fields, especially digital media.

Tikka (2010) has set a nice example of new paradigms for applying affective computing in developing digital media: *enactive media*. The theoretical foundation of the idea originates from enactivism in cognitive science, which takes a 'groundless' stance that resists the mind-body dualism, and argues that mind, body and world are interrelated and interdependent (Varela, Thompson, and Rosch 1992). Extending enactivism to the cinema experience, Tikka considers cinema as a metaphorical externalisation of embodied mind, saying that the spectator's mind and the image of the cinema emerge and interplay with and within each other (Tikka 2004, 2006). That is to say, the spectator and the cinema have to be put together into a systematic context that mutually and continuously creates its own meaning. Based on this phenomenological argument, she made an attempt to develop a media system that technically brings the spectator and the narratives together in an *enaction* (Tikka 2010). Two of the most important notions of the enactive mind theory are *autonomy* and *sense-making* (Froese and Di Paolo 2011). The idea is that a living organism (i.e. the spectator) is autonomous in a way that it not only responds to the external world (i.e. the media) in the traditional sense of producing the appropriate action for a given situation, but actively regulates the conditions of its exchange with the world (Di Paolo, Rohde, and De Jaegher 2010). This exchange process is inherently significant to the living organism, who directly participates in the generation of meaning by his or her action. In essence, the spectator *enacts* the whole system; the system would be *disembodied* without any spectator; an enactive media system together with its spectator creates a looping cycle to form a self-contained and self-organising system—a system that the autopoiesis theory described as a living organism (Maturana and Varela 1980). To enable the whole system, *emotion*, as the key coupling between the spectator and the media, is highlighted as the central part of the functioning mechanism (see Figure 1). The content of the media system dynamically changes with the spectator's real-time emotional states while her emotional states are also influenced by the generated content (Tikka 2010). The concept of enactive media not only establishes a new paradigm of emotion-driven media systems, but also raises many interesting research questions on various aspects. For example, how does the designer of the media system develop the content? And how does the designer couple the content and the spectator's emotional states in a methodologically valid way?

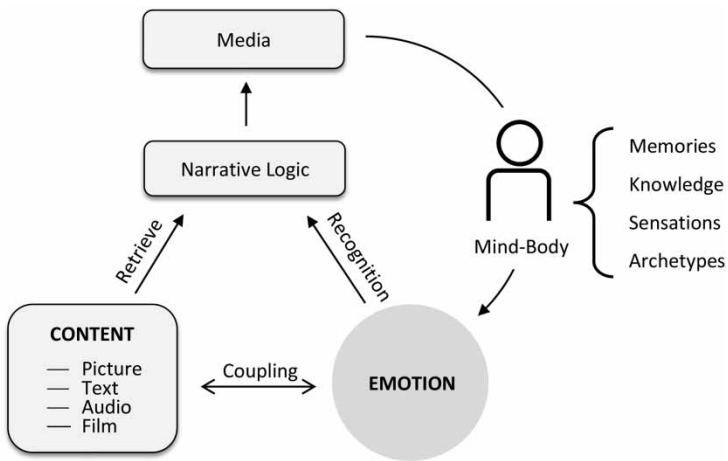

Figure 1. The conceptual framework of an emotion-driven media system.

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Emotion is assumed as the mediator between two parallel processes: consciousness and unconsciousness (Rauterberg 2010). While conscious thought and intentional behaviour have been investigated for a long time, the importance of the unconscious mind has long been overlooked by mainstream science and just started to attract more attention to contemporary research (Westen 1999). The common biased view in cognitive psychology often equates unconsciousness with subliminal information processing, which is too trivial to enter our consciousness. However, a growing body of recent studies has indicated that many thoughts, behaviours and decisions are formed or made unconsciously before we are consciously aware of them (Dijksterhuis 2004; Gigerenzer 2007; Wilson and Bar-Anan 2008; Custers and Aarts 2010). It is suggested that the unconsciousness functions as a higher level of human mind that precedes the arrival of consciousness in terms of its unintentional nature and the inherent lack of awareness (Bargh and Morsella 2008). While the focus of mainstream science attends to this new direction, the field of psychoanalysis and psychotherapy has long been studying the unconscious mind. Psychologist and psychiatrist Carl Jung proposed the theory of *archetypes*, elaborating a universal inherent tendency in all humans' unconscious mind (Jung 1959). This theory grounded the basis of analytical psychology and has been used to explain other psychological concepts (e.g. Percival 1993; Engel 1984; Martin, Carminati, and Carminati 2013). The theory of archetypes has influenced various disciplines, e.g. research in personality (Munteanu et al. 2010; Hautala and Routamaa 2008; Robertson 2013) and marketing research (Tsai 2006; Lim, Acito, and Rusetski 2006; McLoone 2010; Woodside, Megehee, and Sood 2012; Caldwell, Henry, and Alman 2010). One of the extended theories of archetypes—*archetypal symbolism*—was proposed to document different forms of archetypal content that were distributed in different cultures and religions all over the world (Ronnberg and Martin 2010). It became an important resource for research on media and movies (Faber and Mayer 2009; Hauke and Alister 2001). However, very few studies have attempted to investigate the emotional responses to archetypal content. It appears that archetypal symbolism could be a promising resource for developing content for interactive media.

Although media content can be presented in various forms, e.g. pre-recorded film clips, audio tracks or text excerpts, or even real-time behaviours (Kaipainen et al. 2011), the narrative of media content plays the key role in delivering the artistic meaning of the whole work to its spectators. For developing emotion-driven media systems, the most challenging part is to make the content meaningful in terms of emotions. Designers need to take into account what emotion is to be induced while a spectator is watching a specific scene, and then consider how this induced emotion can connect to other emotions to form a story. Most researchers have used a *story-based* approach. They position the spectator as a second author to tell the author's story in different ways, i.e. the second-order authorship (Tikka 2010). The designer needs a complete story as the basis for the media content, and then decomposes its storyline into a number of meaningful scenes. By mapping proper emotional states to each scene, the author could construct a *narrative space* as a predefined script for dynamic storytelling (Tikka, Vuori, and Kaipainen 2006). In other words, the original story remains, but the storyline is dynamically reshuffled by the spectator according to the real-time changes in his or her emotional states. However, this approach is specific for one story and cannot be generalised to other stories. We propose a new approach—the *theme-based* approach—to prepare the content without taking an initial story as a reference. This approach requires meaningful 'themes' to be a generic classification for specific scenes and thus collect scenes across different movies according to these themes. In order to apply these themes in emotion-driven media systems, the links between the themes and corresponding emotional responses have to be unique. It is necessary to examine whether the content in each theme induces a unique pattern of emotional responses that can be reliably recognised by computational systems. The theme-based

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approach allows emotion-driven media to provide mixed content that is related to similar experiences. In terms of authorship, the spectator becomes the first author who creates a new story by mixing various movie clips in the same theme.

In the present study, we applied *archetypal symbolism* as the main reference for classifying scenes in different movies. In order to verify the validity of this classification, we developed several sets of movie clips and conducted an experiment to examine whether these archetypal movie clips are suitable for emotion-driven media systems. The developing process consists of two stages: edit and verification. We first utilised a Jungian approach to collect seven categories of archetypal clips edited from commercial movies that are available in the market; the categorisation follows the theory of archetypes. Next, in order to verify the feasibility of using our archetypal movie clips as the content of emotion-driven media systems, it is necessary to evaluate whether archetypal movie clips in different categories can be differentiated based on the participants' emotional responses. We conducted a study that applies a typical design in psychological experiments specifically for studying emotion. In this experiment, we harnessed two different techniques for emotion recognition—self-reports and physiological measures—to capture conscious and unconscious emotional responses simultaneously. This allows us to further discuss whether it is possible for the spectators to interact with the archetypal content of the media system with their unconscious mind.

2 The collective unconscious and archetypes

After the idea of the unconscious mind was popularised by Sigmund Freud, Carl Jung (1959) proposed a broader concept: *the collective unconsciousness*, based on his own observation of his patients during their therapeutic sessions and his extensive research on myths, religions and cultures. This theory suggests that all human beings share a deep level of unconscious mind universally, which is hidden beneath the personal psyche (including personal conscious and personal unconscious minds). The collective unconsciousness contains some contents and modes of behaviours that are identical in all human beings, and thus constitutes a common psychic substrate of a universal nature that is present in every individual. As a result, all human beings, sharing essentially the same biological equipment (e.g. the central nervous system), would show a tendency to perceive common meanings embodied in a symbol, even at an unconscious level (Bradshaw and Storm 2013).

Jung further proposed the concept of archetypes (Jung 1964). Archetypes are defined as the components of the collective unconsciousness, which is an inborn tendency that cannot be consciously acquired to experience things in a certain way. They exist universally in the psyche, and prepare individuals psychologically to deal with life experiences that are universally common (Walters 1994). Archetypes are unconscious psychic impulses that are impersonal, inherited traits that present and motivate thoughts, emotions and behaviours long before any consciousness develops. An extreme analogy would be describing archetypes as the structure of the psyche, which is similar to organs of the physical body (Jacobi 1973). In this way, archetypes are similar to other sensory and cognitive models, e.g. receptive fields of the retina are not consciously perceived, but determine the structure of visual perception (Perlovsky 2007). Some researchers consider archetypes as a universal knowledge that is rooted in our unconsciousness (Chang et al. 2013a). Humans interpret the world with archetypes, though they are unaware of the existence of these archetypes. These theories have built a basic framework of the unconscious mind, and further became the theoretical basis of analytical psychology and Jungian psychotherapy (Roesler 2012; Knox 2001).

Since archetypes are in the deepest level of unconsciousness, it was claimed that archetypes cannot be directly described in a conscious way or in a logical sense, but archetypes can be observed indirectly through symbols (Jung 1964). Archetypes can be manifested by ancient

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people as observable patterns such as repeated thoughts, ideas or imaginings throughout history that come to be represented in symbols found globally in artwork, religion and myth (Bradshaw and Storm 2013). These phenomena are called *archetypal images*—the symbolic representations of the activation of archetypes that are manifested in infinitely many forms of content (Jones 2003). Although its form might vary, the archetype itself always remains intact (Nunn 1998). In addition to ancient artwork and myths, many archetypal images are still manifested in modern society in many different ways, especially in mass media. For decades, Jungian scholars have kept documenting the archetypal images in ancient cultures and exploring archetypal images in modern society (Gronning, Sohl, and Singer 2007). They founded a field of study, 'archetypal symbolism', to investigate the essence of how the world is originally conceived through spontaneously interpreting the symbolic meaning of all the phenomena that emerge in a human mind. Movies, as a contemporary form of creative artwork that reflects societal and cultural phenomena, appear to be a fruitful resource for research on archetypal images. Several researchers have used the theory of archetypes for movie analysis (Cabot 2011; Heyraud 1998; Broda 1994; Zehnder and Calvert 2004; Hauke and Alister 2001). From a Jungian standpoint, since all human beings share archetypes in their collective unconsciousness, all these archetypal images existing in the media that are manifested by humans conversely shape our unconscious thoughts and behaviours.

Jung's theories were often criticised by the mainstream cognitive science for the unfalsifiability of his explanation about the collective unconsciousness (Walters 1994; Jones 2003). Although the theory of archetypes has not yet been confirmed in terms of empirical evidence, it is broadly used for analysing narratives, such as myths (Campbell 1973) and movies (Hauke and Alister 2001). In the context of media design, it appears that archetypal symbolism can be positioned as a *design pattern* for creating symbolic content, such as narratives. When it comes to emotion-driven media systems, it is necessary to determine whether this design pattern can be coupled with specific emotional responses across people in order to serve as a valid reference for designers to create new content. Our goal was not to justify the underlying hypothesis of the theory of archetypes, but to evaluate the feasibility of applying this theory to developing media content.

3 Archetypes in movies

Movies are a very complex form of symbolic content that communicates delicate and rich visual-audio information to the audiences by means of storytelling. Due to its special contextual setting of viewing a movie in a cinema, it offers not only visual-audio narratives, but also both a means and a space similar to psychotherapeutic sessions that enable the viewer to witness their psyche in projection (Hauke and Alister 2001), which means that spectators are in a process of projecting the image of themselves in the movies and not just being an indifferent observer. Moreover, it is also claimed that the cinema delivers a contemporary experience for the spectators to set apart from their physical life and engage their unconscious in a manner similar to hypnosis and dreaming. This might resonate to the concept that Tikka (2004, 2006) intended to put forward: cinema as a model of mind. As Tikka suggests, the cinema experience itself is already an implementation of the enactive mind. Since archetype is unconscious knowledge that cannot be directly accessed, a phenomenological stance has to be taken in order to reveal the symbolic meaning of archetypal images in movies.

Some researchers have put efforts into elaborating symbolic meanings on modern movies according to Jung's theory (Cabot 2011; Heyraud 1998; Broda 1994; Zehnder and Calvert 2004; Hauke and Alister 2001). These efforts have provided good references for our analysis of archetypes. A typical Jungian approach to analysing creative works is suggested to take a *visionary* standpoint (Jung 1967). Instead of viewing the whole work of art as a physical entity to decom-

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pose, the analyst should take a first-person point of view of the character in the scene to actively go through the situation, and describe the experience that is relevant to archetypes. It is similar to a process of *embodied simulation* (Tikka 2010). The analyst should experience the fictional world with her own experience, taking into account the context of the scene, other figures that the character is interacting with, and the mental states and the personality of the character that is being simulated. Rather than logical reasoning, the Jungian approach places more emphasis on associating and experiencing. By living in the moment that the character is experiencing, the symbolic meaning of archetypes would emerge only through the *enaction* between the analyst and the movie. It appears that the enactive approach and the Jungian approach fit well together within the context of the cinema experience. While the enactive approach is more sophisticated in philosophical discourses of the human mind, the Jungian approach focuses more specifically on the symbolic meaning of the archetypes in movies.

Jung first discovered several essential archetypes: *hero*; *shadow*; *anima*; *animus*; *mentor* (or wise old man); and *mother* (Jung 1969; Neumann 1970). Furthermore, mythologist Joseph Campbell (Campbell 1973) extended Jung's concept of the hero archetype to a more complete scope—*monomyth*[1] (or hero's journey)—a common structure in all mythical hero stories in different cultures and religions. This structure depicts seventeen stages that the hero has to go through to complete his adventure. These stages can be generally divided into four larger stages: departure; trials; rebirth; and return. In total, there are nine archetypal categories that are considered fundamental: anima; animus; four stages of the hero's journey; mentor; mother; and shadow. The hero archetype, as a symbolic form of the self, represents a metaphorical instance of who lives his life as going through the hero's journey repeatedly. Other archetypes, such as mentor, mother, etc., represent the essential figures that a person would meet on his or her lifelong journey.

As one of the motivations of this study, we developed a standard procedure for editing archetypal movie clips for the content of emotion-driven media systems (see Figure 2). We applied this procedure to analyse the abovementioned nine archetypes in movies and edited proper clips as the content for media systems. First, we surveyed many commercial movies in the market to find suitable movies that might contain narratives relevant to these target archetypes. Then, we selected scenes that convey experiences of specific archetypes from a first-person point of view. In order to edit movie clips that can be used in experiments as well as in a media system, the format of the clips needs to be defined first. All the selected scenes should be edited into the same format and a dataset of movie clips built up that is ready for later experiments. The format of the movie clips we edited is described as follows:

- for adequate statistical power, at least three clips in each category are required;
- the unified length[2] of each clip is 60 ± 6 seconds;
- every clip contains scenes selected from only one movie;
- the transition between scenes uses fade-in and fade-out effects;
- the screen resolution of the movie clips is 720×480 pixels with AVI file format.

To further confirm that the selected scenes authentically represent archetypes, we cooperated with Jungian scholars from The Archive for Research in Archetypal Symbolism (ARAS)[3] to review the film clips we had collected. They did the review separately for all the clips. Only those clips that they all agreed to consider as archetypal clips were kept in our collection. After several iterations of discussions and strict filtering sessions, we built a set of movie clips that are verified as archetypal images. Although we attempted to use clips for all the nine essential archetypes, we could not collect enough clips for *animus* and *mother* within the limited time span (only two clips collected). The main reason is that these two archetypes are less explicit, so it is extremely difficult to demonstrate a full archetypal experience within one minute. Therefore, we proceeded with the seven categories of movie clips to the later experiment, which are:

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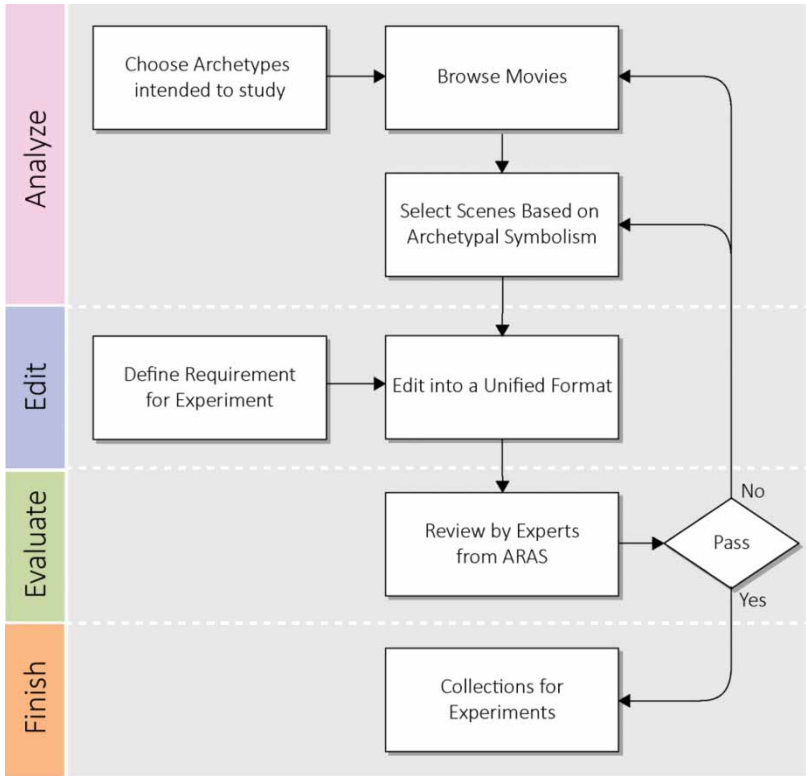

Figure 2. The editing process for archetypal movie clips.
Note: ARAS means *The Archive for Research in Archetypal Symbolism.*

anima; *hero's departure*; *hero's trials*; *hero's rebirth*; *hero's return*; *shadow*; and *mentor* (see Table 1). Full descriptions of the symbolic meanings of each archetype are reported elsewhere (see Chang et al. 2013b).

4 Coupling emotional responses with the content

When an archetype becomes activated and is experienced with associated feelings and thoughts, it will result in a complex within the personal unconscious (Walters 1994). According to Jung, a complex within the personal unconscious is an independently organised conglomeration of emotions and ideas that are specific to an individual and are products of interactions among a number of archetypes (Jung 1959). Although the stimulated emotions and thoughts cannot directly be accessed by our conscious introspection, the physiological measures still provide us with chances to infer the unconscious emotion. Since emotion plays a central role in coordinating humans and the media in an emotion-driven system, it is necessary to investigate the correlation between the elements of the content and the induced emotional responses in order to build the interactive mechanism afterwards. Each element of the content should be indexed by corresponding emotional responses. However, the real challenge is to confirm the validity of the correlations between emotional responses and the content. Precisely recognising human emotion from these physiological data is still challenging (Picard 2003). This might be due to the fact that an ultimate definition of emotion is still unavailable. This is not surprising, because for the last century the same situation has also per-

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Category: description	Movie	Start	End
Anima: A female image that makes a male touchy, irritable, moody, jealous, vain, unadjusted, and discontent.	*American Beauty* (Mendes 1999)	0:16:15	0:17:17
	Malena (Tornatore 2000)	0:19:18	0:20:20
	Perfume: The Story of a Murderer (Tykwer 2006)	0:18:03 0:21:20	0:18:18 0:22:15
Hero departure: A sudden tragedy happens to a young kid's peaceful life, so that he is forced to leave home.	*V for Vendetta* (McTeigue 2005)	0:41:55	0:43:03
	Braveheart (Gibson 1995)	0:10:10 0:14:13	0:10:46 0:14:43
	The Lord of the Rings: The Fellowship of the Ring (Jackson 2001)	2:21:12 2:22:37 2:23:10	2:21:47 2:23:06 2:23:16
Hero trials: A road of trials that one young hero has to go through. He is mentally and physically devastated.	*V for Vendetta* (McTeigue 2005)	1:23:29	1:24:34
	Braveheart (Gibson 1995)	2:07:39 2:08:47	2:08:37 2:08:58
	The Matrix (Wachowski and Wachowski 1999)	2:02:25	2:03:25
Hero rebirth: A miracle happens. The wounded hero resurrects from the fire and water and gains great power as a process of transcendence.	*V for Vendetta* (McTeigue 2005)	1:24:59	1:26:00
	Braveheart (Gibson 1995)	2:15:39 2:17:35	2:16:15 2:18:01
	The Matrix (Wachowski and Wachowski 1999)	2:04:35	2:05:45
Hero return: The hero returns home with the given great power. But he has to give away everything, even his life, to achieve a higher value for his people. His spirit remains alive as a legend.	*V for Vendetta* (McTeigue 2005)	2:02:40 2:03:22	2:03:04 2:04:06
	Braveheart (Gibson 1995)	2:48:56 2:49:11 2:49:54	2:49:08 2:49:53 2:50:09
	The Matrix Revolutions (Wachowski and Wachowski 2003)	1:53:40 1:54:02 1:54:33 1:55:24 1:56:02	1:53:47 1:54:05 1:54:50 1:55:39 1:56:29
Mentor: A wise old man who supports the hero along the way to the early trials. He represents the support, the knowledge and the guidance that the hero needs when growing strong.	*The Lord of the Rings: The Fellowship of the Ring* (Jackson 2001)	2:03:05	2:04:10
	The King's Speech (Hooper 2010)	1:42:13 1:42:58 1:45:33	1:42:44 1:43:18 1:45:52
	The Lion King (Allers and Minkoff 1994)	0:24:38 0:25:29	0:25:05 0:26:06
Shadow: The dark side of the self, personifies everything that a person refuses to know about himself, represents inner desire, hate, and brings the deepest fear.	*The Lord of the Rings: The Two Towers* (Jackson 2002)	1:35:19	1:36:20
	Fight Club (Fincher 1999)	1:48:24	1:49:32
	The Dark Knight (Nolan 2008)	1:24:22	1:25:30

Table 1. The descriptions for the categories of archetypes and the sources of the movie clips.
Notes: The clips consist of one or more fragments that were cut from the movies at the times specified in the last two columns. The time format is [hours:minutes:seconds].

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plexed psychologists, who are still debating the nature of human emotion (Lindquist et al. 2013). Some researchers claim that there are only a small number of basic emotions that are 'hard-wired' into brain circuits, such as anger or sadness (e.g. Ekman and Cordaro 2011). Others argue that emotions are constantly constructed by the human mind so that emotions should not be of discrete, natural kinds (e.g. Barrett 2011). In the case of our study, it is contradictory to take the former assumption because the fundamental assumption of the enactive mind is that psychological events are enacted, not pre-existing. It would be more feasible to assume that emotions are not just basic kinds but an ongoing psychological phenomenon that is enacted when a living human is embodied in the world.

In light of this, we do not attempt to identify basic emotional qualities in each clip due to the fundamental conflict of theory, but concentrate on whether these categories of archetypal movie clips can be differentiated by the emotional responses so that the media system is able to react accordingly. To measure emotional responses in laboratory settings, researchers often apply either self-report techniques or physiological measurement. The most simple and straightforward way to measure the content of a mental representation of emotion is often considered to be self-reports, which rely on the participant's conscious introspection (Barrett et al. 2007). However, this technique requires extra efforts from the participants that might distract them from the affective stimuli (Soleymani et al. 2012). On the other hand, physiological measurement directly monitors bodily changes in physiological states. These spontaneous bodily changes are initiated by the autonomic nervous system (Kreibig 2010), which provides a great opportunity to measure unconscious emotion (Miller 1992). Since most of the previous studies in this area focus on conscious emotions, their experiments assumed that self-report results are the *fact*, that humans can honestly and precisely introspect about their current emotional state and report it. Therefore, their goal is to examine how well the physiological signal can explain these predefined basic emotions (e.g. Rottenberg, Ray, and Gross 2007; Soleymani, Pantic, and Pun 2012).

Since the emotion toward archetypal images is a new research topic, it is still unknown whether it is conscious or unconscious. Therefore, in order to have a more comprehensive view of the emotional responses to archetypal images, it is suggested that both self-reports and physiological measures are included for emotion recognition (Chang et al. 2013c). By comparing the results from the two measurements, it is possible to infer whether any unconscious emotions are induced. Our first research question is to ask whether each category of archetypal content induces unique emotional responses that can be classified with recognition rates higher than chance level. If the answer to the first research question is positive, the second research question is to examine which technique of the emotion recognition (self-reports or physiological measures) is more robust for classifying each movie clip category.

5 Experiment

An experiment was conducted to examine whether all the categories of archetypal movie clips can be differentiated from each other according to participants' emotional responses. For experimental design, we followed the methodological paradigm in experimental psychology that has been well developed specifically for using film clips to elicit emotions in laboratory settings (e.g. Rottenberg, Ray, and Gross 2007; Soleymani, Pantic, and Pun 2012). The only difference is that our movie clips were categorised based on archetypes instead of basic emotions. As these studies suggest, our experiment applied a within-subject design. Every session accommodated one participant, and every participant viewed all the twenty-one movie clips we collected. Before the presentation of each movie clip, the participant was asked to adjust their breathing to regain the baseline emotional state in order to avoid the overlap of the emotional responses to the previous movie clip. As a double-blind design, movie clips were played in a random order. Neither the experimenter nor the participant knew the sequence of the playlist.

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5.1 Apparatus

The experiment was held in the Ibux-Lab research laboratory at the CETpD Research Centre, which was arranged as a living room to make the participant feel comfortable and relaxed sitting on a sofa. Movie clips were projected onto a white wall (325 cm by 175 cm). The experimenter could observe from outside of the room through a one-way mirror so that the participant was left alone while viewing the movie clips and providing self-report data. For gathering self-report data, the self-assessment manikin (SAM) (Bradley and Lang 1994) was adopted. SAM is widely used in psychological experiments (e.g. Soleymani et al. 2012; van den Broek 2013). It applies the dimensional model to represent human emotion, using three dimensions to construct affective space: valence; arousal; and dominance. It is claimed that these three scales are capable of representing most of the commonly known human emotions. For physiological measurement, electrocardiography (ECG) and skin conductance data were recorded with Shimmer™ wearable wireless sensors (Burns et al. 2010) and sent to an Android device via Bluetooth™ protocol.

5.2 Participants

Twenty-two volunteers participated in our study. Most of the participants were undergraduate or graduate students at the Technical University of Catalonia. We also recruited several participants of an older age. Of the twenty-two participants, nine were women and thirteen were men. The average age for the women was 28.67 years (SD = 9.39) and for the men it was 27.77 years (SD = 6.13). The participants had diverse national backgrounds (four from Asia, fourteen from Europe and four from South America). We required the participants to have normal or corrected to normal vision and hearing. Prior to the experiment, each participant signed an informed consent form and was later rewarded with a small present for participation in the laboratory session, which took approximately 1.5 hours. The trials were carried out according to the experimental plan and all the collected data were analysed.

5.3 Procedure

The whole procedure is demonstrated in Figure 3. The participant was invited to sit on a couch in the test room at the laboratory. The participant was then asked to read and sign an informed consent form. After signing the agreement, the participant put on electrodes and physiological sensors following the experimenter's instructions. The connection of the sensors was checked while the participant was filling in a short questionnaire on demographic data. Once the questionnaire was filled in, the experimenter gave a tutorial about the experiment and an example of what the participant should do throughout the session.

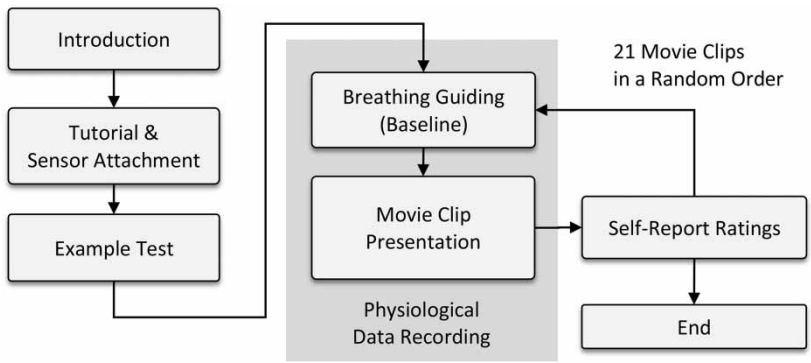

Figure 3. The procedure of the experiment.
Note: Movie clips are played in a random order.

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For the example test, a neutral clip extracted from the movie *Coral Sea Dreaming: Awaken* (Hannan 2010) was used. The participant was taught how to provide self-report data about her emotion by filling out the SAM scale. We did not disclose any information about archetypes or the content of the movie clips to the participant during the session. After the example test, the light in the laboratory was dimmed to make the viewing experience similar to a real cinema. Then the presentation of movie clips started. Before each clip, the participant followed a breathing-guiding video for 20 seconds to adjust the respiration rate of the participant to the initial baseline. The physiological data recorded during the video with a breathing pattern were later used in the analysis as physiological baseline. After viewing each film clip, the participant provided a retrospective self-report by rating her emotion along the dimensions of the SAM with paper and a pen. After giving ratings, the breathing clip would be shown again to start the next presentation. The experiment ended when the participant finished viewing the entire collection of twenty-one movie clips.

5.4 Results

In our experiment, each participant viewed all the archetypal movie clips in a random order. Thus, the study had a repeated-measures design where physiological measurements were made on the same individual under changing experimental conditions. Moreover, the participants provided reports via the SAM ratings after every experimental condition. The multivariate analysis of variance (MANOVA) for repeated measures was applied to analyse data and explore the relationship between the categories of archetypal movie clips (independent variable) and the participants' emotions (dependent variable) measured by SAM and physiological responses. The main effect of MANOVA tested whether the patterns of the participants' physiological responses were different between various categories. All statistical tests used a 0.05 significance level.

The descriptive statistical analysis on the SAM data is summarised in Table 2. The MANOVA for repeated measurements was performed for the SAM ratings of valence, arousal and dominance. It demonstrated a significant main effect of the archetypes presented in the film clips on the SAM ratings [$F(18, 351.210) = 10.060$, $p < 0.001$ (Wilks' lambda)]. The results of the MANOVA conducted for the features extracted from the physiological signals indicated that there is also a significant main effect of the archetypes pictured in the film clips on the participants' physiological responses [$F(216, 548.182) = 1.310$, $p = 0.007$ (Wilks' lambda)], which confirms the significant relationships between the categories of the movie clips and the SAM ratings as well as between the movie clip categories and the physiological responses. In order to examine whether the emotional responses were universal across different cultural backgrounds, we put 'countries' as a between-subject factor in the statistical analyses. However, the sample size of the current study is insufficient for performing between-subject multivariate tests (twenty-two participants vs thirty-six features extracted from physiological signals) and the numbers of participants from different countries were not balanced.

	Valence		Arousal		Dominance	
Archetype	Mean	SE	Mean	SE	Mean	SE
Anima	5.879	0.291	4.515	0.429	5.803	0.353
Hero departure	4.015	0.229	4.485	0.364	4.515	0.393
Hero trials	3.864	0.266	4.909	0.388	4.439	0.345
Hero rebirth	5.924	0.278	4.455	0.356	6.197	0.298
Hero return	6.318	0.291	4.818	0.373	6.742	0.328
Mentor	6.273	0.193	3.455	0.273	6.348	0.295
Shadow	4.591	0.231	4.576	0.420	5.212	0.324

Table 2. Mean values and standard errors (SE) of the self-report results recorded by SAM ratings, ranging from 1 to 9.

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We therefore looked into the results of analyses on the interaction between categories of the clips and the nationalities of the participants. For the SAM ratings, there was no significant effect on this matter [$F(216, 156.887) = 0.905$, $p = 0.752$ (Wilks' lambda)]. Similar results were obtained from the analysis on physiological signals [$F(2592, 1008.114) = 1.091$, $p = 0.051$ (Wilks' lambda)]. The results suggested that cultural backgrounds did not introduce significant effects on the participants' emotional responses to archetypal movie clips.

Next, we proceeded to build and evaluate predictive models that quantify these relationships. The evaluation was performed through comparison of classification accuracies achieved by the predictive models obtained with linear discriminant analysis (LDA). By feeding a set of recorded data, LDA would generate a predictive model that allows us to justify how well these categories of stimuli can be differentiated according to the emotional responses. In Tables 3 and 4, we demonstrate the confusion matrices of the predictive models generated by LDA based on self-report data and physiological data. Each row in these tables shows how well the model can correctly predict the membership of the movie clips in each category. The shaded cells indicate the percentage where the category was correctly predicted, and the emboldened numbers indicate the highest classification rate among all the predicted group members: that is, only those cells with shades and bold numbers are successfully differentiated by the statistical model.

We started with the self-report data. The predictive model derived from LDA on self-report data about archetypal symbols only obtains 24.2% accuracy (cross-validated) and the effect size is medium (canonical correlation = 0.539). The confusion matrices are demonstrated in Table 3. Among all the seven categories, three categories were successfully differentiated based on the self-report data: hero's trials; hero's return; and mentor. Next, the same analyses on physiological data were performed. We extracted useful features from the raw data of electrocardiography and skin conductance: heart rate; skin conductance level; and skin conductance response. These data were then fed to LDA for further evaluation. The predictive model generated by LDA on the physiological features reached an accuracy of 34.4% (cross-validated) and the effect size of the predic-

	Predicted group membership							
Archetype	Anima	Departure	Trials	Rebirth	Return	Mentor	Shadow	Total
Anima	5 (7.6%)	6 (9.1%)	3 (4.5%)	0 (0%)	**21 (31.8%)**	19 (28.8%)	12 (18.2%)	66 (100%)
Hero departure	7 (10.6%)	16 (24.2%)	**21 (31.8%)**	0 (0%)	5 (7.6%)	8 (12.1%)	9 (13.6%)	66 (100%)
Hero trials	6 (9.1%)	14 (21.2%)	**26 (39.4%)**	0 (0%)	6 (9.1%)	5 (7.6%)	9 (13.6%)	66 (100%)
Hero rebirth	10 (15.2%)	5 (7.6%)	5 (7.6%)	0 (0%)	**19 (28.8%)**	15 (22.7%)	12 (18.2%)	66 (100%)
Hero return	6 (9.1%)	1 (1.5%)	4 (6.1%)	0 (0%)	**27 (40.9%)**	16 (24.2%)	12 (18.2%)	66 (100%)
Mentor	8 (12.1%)	2 (3.0%)	5 (7.6%)	0 (0%)	11 (16.7%)	**30 (45.5%)**	10 (15.2%)	66 (100%)
Shadow	8 (12.1%)	12 (18.2%)	**18 (27.3%)**	0 (0%)	9 (13.6%)	11 (16.7%)	8 (12.1%)	66 (100%)

Table 3. The confusion matrix of the model obtained from LDA on the self-report data for the movie clips [count (percentage)]. *Notes*: Canonical correlation = 0.539; effect size = medium; 24.2% of the cross-validated grouped cases are correctly classified. Each row in these tables shows how well the model can correctly predict the membership of the movie clips in each category. The numbers in bold indicate the highest classification rate for each archetypal image. The shaded cells are correct predictions for each archetypal image. Only three categories (Trials, Return, and Mentor) are successfully differentiated by the statistical model.

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	Predicted group membership							
Archetype	Anima	Departure	Trials	Rebirth	Return	Mentor	Shadow	Total
Anima	**33 (50.0%)**	6 (9.1%)	8 (12.1%)	5 (7.6%)	5 (7.6%)	7 (10.6%)	2 (3.0%)	66 (100%)
Hero departure	8 (12.1%)	**18 (27.3%)**	8 (12.1%)	6 (9.1%)	8 (12.1%)	10 (15.2%)	8 (12.1%)	66 (100%)
Hero trials	3 (4.5%)	9 (13.6%)	**26 (39.4%)**	6 (9.1%)	8 (12.1%)	4 (6.1%)	10 (15.2%)	66 (100%)
Hero rebirth	8 (12.1%)	9 (13.6%)	3 (4.5%)	**24 (36.4%)**	9 (13.6%)	6 (9.1%)	7 (10.6%)	66 (100%)
Hero return	5 (7.6%)	5 (7.6%)	9 (13.6%)	8 (12.1%)	**23 (34.8%)**	12 (18.2%)	4 (6.1%)	66 (100%)
Mentor	13 (19.7%)	7 (10.6%)	6 (9.1%)	8 (12.1%)	7 (10.6%)	**18 (27.3%)**	7 (10.6%)	66 (100%)
Shadow	8 (12.1%)	9 (13.6%)	16 (24.2%)	10 (15.2%)	3 (4.5%)	3 (4.5%)	**17 (25.8%)**	66 (100%)

Table 4. The confusion matrix of the model obtained from LDA on the physiological data for the movie clips [count (percentage)]. *Notes*: Canonical correlation = 0.414; effect size = medium; 34.4% of the cross-validated grouped cases are correctly classified. Each row in these tables shows how well the model can correctly predict the membership of the movie clips in each category. The numbers in bold indicate the highest classification rate for each archetypal image. The shaded cells are correct predictions for each archetypal image. All the categories are successfully differentiated by the statistical model.

tive model for archetypal symbols is medium (canonical correlation = 0.414). Based on the review provided in (Novak, Mihelj, and Munih 2012), the predictive power of our model obtained from physiological data is in line with other related studies in terms of classification accuracy. The confusion matrices are demonstrated in Table 4. It should be noted that all the seven categories were successfully differentiated based on physiological data, which means that the emotional responses measured by physiological signals toward each category show a unique pattern that allows a media system to couple the archetypal movie clips and emotional responses.

The overall classification rates of the self-report data (24.2%) and physiological data (34.4%) toward archetypal movie clips are both higher than a chance level (14.29% for seven categories). Moreover, the classification rates of the self-report data are mostly contributed by the three categories that can be successfully differentiated (hero's trials, hero's return, and mentor), which are even less than half the number of all categories. Meanwhile, all the categories can be differentiated by the predictive model of physiological data at a recognition rate no less than 25%, ranging from 27.3% to 50.0%. It appears that the performance of the predictive model obtained from the physiological data is higher than the one gained from the self-report data. These results revealed some interesting findings that are new to the state of the art in psychology.

6 Discussion

The results of our experiment suggested that archetypal movie clips in different categories can be correctly classified with recognition rates higher than chance level. This has confirmed the answer to our first research question. In order to answer the second research question, it is necessary to compare the robustness of the predictive models obtained from self-reports and physiological signals for further inferences about whether any unconscious emotions were induced by archetypal media content. Previous studies collected affective stimuli based on the categorisation of basic emotions, and they reported higher recognition rates from self-report data than the results of the physiological data (Desmet, Monk, and Overbeeke 2004). While our results of physiological data showed a comparable accuracy of

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recognition, the performance of the predictive model obtained from self-report data is significantly lower than previous studies on basic emotions, which is a new finding that related studies have not yet discovered. However, there are many ways to explain this finding, especially when this might relate to some very fundamental questions that have been under debate for years. We consider our results as a preliminary finding so that we have to keep it open for all possible explanations.

6.1 Unconscious emotion

From a methodological standpoint, if we assume that it is possible to consciously feel emotion towards archetypal movie clips, a reasonable explanation would be that the existing dimensions of SAM are not comprehensive enough to cover the emotions elicited by archetypal symbols. The development of the SAM scale mostly focused on quantifying emotions into three dimensions: valence; arousal; and dominance. It appears that these three dimensions are inadequate for representing emotions induced by archetypal movie clips. More dimensions are needed for higher-order emotional qualities. Some topics related to emotion would be inspiring for new dimensions, such as mindfulness (Hamilton 2006) or spirituality (Moberg 2010). However, the real challenge is to find proper means of measuring these qualities in psychological studies. Another possible explanation is that the self-report technique is not suitable for measuring emotions other than basic emotions. It might be problematic to ask participants to report their emotions through rational introspection because people do not always say what they really think (Nisbett and Wilson 1977). Moreover, it is suggested that emotion belongs to the cognitive system of intuition, not the reasoning part (Kahneman 2003). In this sense, the self-report data collected through rational reasoning could be a *translated* version from their intuition, so that these data might be biased and cannot authentically reflect the true emotional qualities. Other self-report techniques that rely on association might fit better for our purpose. For example, in the field of psychoanalysis, guided affective imagery (GAI) is a self-report approach that is designed to observe the participant's unconscious emotional state in a way similar to hypnosis (Leuner 1969). Since the cinema experience is similar to the process of hypnosis from a Jungian perspective, it might be a promising direction to apply GAI in the context of psychological experiments.

Although the above explanations about self-report techniques still require more studies for further justification, the analysis on physiological data has shown promising results for measuring emotional responses toward archetypal movie clips. Although the archetypal movie clips in the same category are edited from different movies, the predictive model obtained from physiological data still allows us to differentiate each category. To some extent these results have provided preliminary evidence for the assumption that people have similar bodily responses while being exposed to archetypal content. Archetypes are unconscious knowledge that cannot be accessed by the conscious mind. However, it can still be manifested through some unconscious reactions, especially unconscious emotions. In the context of the cinema experience, the results of the self-report data collected by introspective reasoning have indicated the inaccessibility of the conscious mind, but the results of physiological measures showed a relatively effective power to couple the archetypal content with emotional responses. This explanation is also partly in accordance with Damasio's proposition about the distinction between *emotion* and *feeling* (Damasio 2010). He argues that emotions are the phenomena that are carried out by cognitive actions in our bodies, which can be observed through physiological signals, whereas feelings of emotions are composite perceptions of these actions in body and mind. In other words, feelings are images of emotions rather than emotions themselves. Feelings and emotions are not always identical, and not all emotions can be perceived as feelings. Although Damasio's thesis has been broadly accepted and seems valid for supporting the hypothesis that archetypal movie clips induce unconscious emotion, it is still

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an open question for future studies to explore human unconsciousness.

The present study did not aim to justify the validity of Jung's theory specifically on its universality. Although our participants had diverse cultural backgrounds including eleven nationalities, we did not recruit equal numbers of participants from different countries and most of the participants were from Spain, where the study was conducted. Nevertheless, we conducted further statistical analyses specifically on the cultural backgrounds of the participants in order to answer this question. There were no significant effects on the interaction between the categories of movie clips and the countries where the participants were born. Although the results to some extent support Jung's theory, more studies are required specifically for assessing the universality of archetypes.

The validity of emotion recognition across people has been a difficult problem even in psychology, because people may have different reactions while experiencing the same emotion (Russell 1994). In our study, we intended to examine whether the participants have a similar pattern of emotional responses to the given categories of archetypal content. Although the results suggested that seven categories of archetypal images can be recognised via measuring physiological signals, this finding cannot be generalised as evidence proving the existence of the collective unconscious. Nevertheless, archetypal symbolism provides a new perspective on analysing media content, which may be valuable for designing emotion-driven media systems.

6.2 Implications for media design

The results of our experiment revealed the drawback of using conscious judgment about emotional experience for analysing movies. Previous work on developing media content for emotion-driven media usually relied on the author's subjective judgment on what emotions were induced in the given scenes. However, the generated outcome might be inconsistent because the conscious emotional feeling of the author and the spectator may differ. Bearing in mind that emotions may be unconscious, physiological measurements would be a more reliable approach for validating emotional responses elicited by the given scenes. In order to confirm the validity of the correlation between the scenes and the corresponding emotional responses, it is necessary to conduct an experiment as we have demonstrated in the present study.

More importantly, the results of our experiment have suggested that movie clips belonging to the same categories of archetypal image induced similar emotional responses, even if these movie clips were extracted from different movies. As we pointed out earlier, this theme-based approach focuses on common affective elements across different stories, while the story-based approach can only be applied to a specific story. The theme-based approach allows designers to expand their collections of media content in a more flexible way and the generated outcome would have richer content, encompassing various scenes and characters appearing in different movies. This approach enables a 'mash-up' style in generating media content for emotion-driven media systems because the archetypal movie clips extracted from different movies deliver similar symbolic meaning and meanwhile induce mutual emotional responses.

For designing the content of emotion-driven media, archetypal symbolism can be considered as a design pattern of narratives that are universal to stories in different cultures. Due to the fact that many myths, legends and fairy tales in different cultures share the same structure and components, many scholars in different fields have endeavoured to generalise a universal pattern that fits all kinds of stories (e.g. Campbell 1973; Propp 1984; Lévi-Strauss 1955). These structures can still be seen in modern screenwriting (Vogler 2007; Field 1984). Although it is still debatable whether these patterns cover all stories or movies exhaustively, these structures can be considered as a useful reference for designing the content of media systems. For example, the collection of movie clips about the 'mentor' archetype is a useful resource for designers to create media content that is intended to deliver the feeling of

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being safe, being guided and kindness. Our study stands as a showcase for utilising archetypal symbolism as a design pattern to develop the content of emotion-driven media systems for the narratives that fit the theory of archetypes and the structure of monomyth.

7 Conclusions and future work

These new findings about emotion and archetypal content might shed some light on several new directions both in the design of emotion-driven media systems and research on the unconscious mind in cognitive science. In terms of design, we proposed a new approach—the theme-based approach—for developing media content for emotion-driven media systems. Our study included seven essential archetypes in the present study as a starting point and has confirmed that archetypal content extracted from different movies can induce a similar pattern of emotional responses across individuals, which was robust enough for emotion recognition. These new findings have expanded the possibility of developing new types of emotion-driven media systems in addition to the traditional story-based approach. While the results of this preliminary study are promising, there are more archetypes that are mentioned in Jungian movie analysis, such as trickster and shape-shifter. To apply archetypal symbolism in practice, it is suggested that more archetypes should be included to establish a basis for experimental evidence. Although our study has proved the validity of physiological measurement in recognising emotional responses to archetypal symbols, the classification rate is relatively low for practical use in design. More movie clips should be included in each category in order to enhance the statistical power of the predictive model and achieve a higher classification rate.

From a psychological perspective, our study revealed new evidence about unconscious emotion. The research on the unconscious mind has drawn more and more attention. As a theory that has been used to explain human unconsciousness, Jung's model of the human mind might shed some light on exploring new directions in cognitive science. We conducted an empirical study according to the psychological paradigm and the results showed that archetypal movie clips in the same category of archetype were correlated to a unique physiological pattern that can be distinguished by computing systems. While the results are promising, more evidence is needed to justify the hypotheses that Jungian scholars have put forward. From the standpoint of cognitive science, our study provided more questions than answers. Research on media content and the unconscious mind of humans is worthwhile to proceed with this direction for future studies.

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Notes

[1] Monomyth is a metaphorical structure representing mythical narratives about heroes. However, when this concept is used in movie analyses, the hero here is different from the 'superhero' that is known as a special theme, but can be any characters that go through a self-evolved process to become better or bring greatness to others.

[2] The one-minute duration was chosen for practical reasons. First, if the whole experiment takes too long, the participants might get tired and give biased results. Second, the length of the stimuli influences the adapting speed of the system. If the length is five minutes, the media system also needs five minutes to start to generate correct predictions when adapting to a new spectator. Third, although the length should be as short as possible, it still cannot be too short to enact emotional experiences. Therefore, one minute appears to be a reasonable choice.

[3] Since the early 1930s, The Archive for Research in Archetypal Symbolism (ARAS), founded by Jungian scholar Olga Fröbe-Kapteyn, has been collecting and annotating mythological, ritualistic and symbolic images from all over the world and from all epochs of human history.

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