

# Uncanny Valley of Life : The Existence in 3D Animation in Shadow Puppets Theatre

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**Abstract** - Mori (1970) proposed a theoretical graph describing a nonlinear relation between a character's degree of human likeness and the emotional response of the human perceiver. With the current scenario that Wayang Kulit or shadow puppets is slowly being extinct; the pursuit of realism in virtual humans including Wayang Kulit 3D puppets can cause a phenomenon known as The "Uncanny Valley". Furthermore, 3D computer animated or virtual puppets are more focused on issues pertaining to realism compared to the abstract visual such as Wayang Kulit itself. Therefore, this research will discuss on issues which arises in the Uncanny Valley of Life that exists especially with Wayang Kulit 3D computer animated puppet characters.

**Keyword--** Mori, Wayang Kulit, realism, virtual humans, Uncanny Valley, 3D Puppets

## 1.0 The Scenario (Wayang Kulit )

Wayang Kulit or shadow play can be described as a form of art that combines the element of aesthetics and culture values within a society. It can be described as an art that involves motion (animation) and narration (storytelling) According to Hassan (2010), Wayang Kulit is the precursor of animation (and film) in the world, originating about 600 years ago. This fact has been recognised in the West and the first exhibit at the Museum of the Moving Image in London is a Wayang Kulit. Unfortunately, Wayang Kulit today is slowly being extinct as the vast technology and advanced modern thinking society are part of this problem. To an extent, Wayang Kulit (Shadow Puppets) was gazetted by UNESCO as a Masterpiece of Oral and Intangible Heritage of Humanity on 7th November 2003 in order to preserve and safeguard this valuable aesthetic traditional arts from extinct (Khor & Yuen,p.423).

Thus, Wayang Kulit at this point of time can be defined as 'Crossroads' survival in order for the younger generation to still appreciate it. From history, Wayang Kulit emphasised on the silhouette or vivid color motion shadows that appear on 'Kelir' or the white screen that symbolises or describes the concept of 'realm'(narrative and figure) as the puppets appear in and out of the screen in different sizes and shapes. Elusive shadows are vital in Wayang Kulit as it creates a notion of satire and communication tool with the audience. According to Thomas and Johnston, two of Disney's most renowned animators, shadows were used in cel animation even from the very early days "because they anchored the figure to the ground. Without some kind of contact with the background, the characters seemed to float around, walking on air, no matter how much weight had been animated into their movements." In relationship with Mori's theory in which the

original hypothesis states that as the appearance of a robot is made more human, some human observer's emotional response to the robot will become increasingly positive and empathic, until a point is reached beyond which the response quickly becomes that of a strong revulsion. This area of repulsive response aroused by a robot with appearance and motion between a "barely human" and "fully human" entity is called the Uncanny Valley. With computer 3D animation, it provides a platform for the audience to view visuals or shadow puppets with 3D perspective, depth, weight, size and emotions, in the realm of absolutely 'Real'.

## 2.0 Realism & Uncanny Valley

As technology and human mind are slowly evolving, the challenge towards creating much realism or realistic feature using computer is much questionable. Whether it is virtual human, objects or creatures still much need to be researched in terms of the perception or details compared to traditional or original art. To discuss further, the term 'mimesis' has been brought up here because the modern technology of cinema or cinematography can be visualised as contextual realisation of this ancient myth. As Göran Sorbom (1966) mentioned that the word mimesis 'has been used, first of all, to describe the basic character of works of art and as a means to tell what distinguishes works of art from any other kind of phenomenon; but it has also been used as a psychological explanation of the way in which we experience and act in response to works of art. Mimesis is a 'significant and philosophical term that carries a wide range of meanings which include imitation, representation, replication, mimicry, similarity and the art of resembling'. Therefore, mimesis can be related back to 'reality' because the term explains certain factors that affect a realistic outcome such as 'the art of resembling' such as Wayang Kulit itself. The pursuit of realism in virtual humans can cause a phenomenon known as The "Uncanny Valley". Renaissance painting and a computer image employ the same technique (a set of consistent depth cues) to create an illusion of space, existent or imaginary. This term looks a bit creepy and unpleasant that people will experience through perception and reaction such as robots or 3D virtual animated characters that are almost realistic or lifelike (even though the sense of realistic aura visually are still unable to fool people into thinking they are much realistic.)

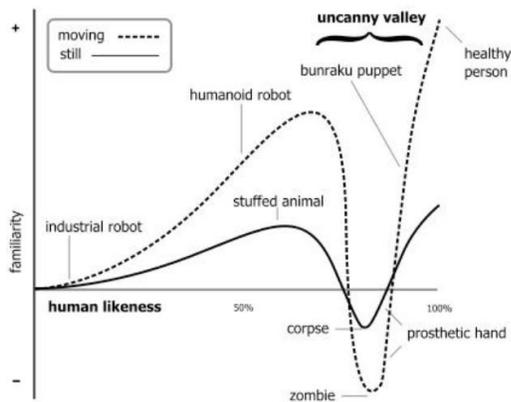


Figure 1.0 Mori's Theory of Uncanny Valley

Masahiro Mori, the roboticist who coined the term, expressed the idea in a graph that visualised the amount of positive, connotation, evolution and reaction as a function of realism (Jeffery, p.116-118). The graph (see Figure 1.0) describes the pattern of significant response to human perception and reaction as the robot or 3D virtual characters approaches but still unable to acquire the sense of actual or perfect visual or mood realism. As digital technology and techniques have supplanted analogue methods in various production, concept and visualisation contexts, especially visual art and animation, 3D animation has co-evolved symbiotically and stylistically with enhancement in CGI state of the art technology.

Durand (2002) argued that, although computer graphics has long been defined as a quest to achieve photorealism, 'as it gets closer to this grail, the field realises that there is more to images than realism alone. Non-photorealistic visuals can be more effective in conveying information, more expressive or more artistic' (p. 11). Mainstream 3D computer animation culture continues to be driven by a naturalistic agenda and the convergence of live-action SFX and animation is one of the driving forces. For example, James Cameron's *Avatar* (*Avatar* is made in stereoscopic 3D for 3D projection), uses seamless performance capture, so that the actors can be directed in real-time with the director simultaneously viewing the actions of the CG characters set in 3D CG environments (Pat,p.128). Only about 25 percent of the movie was created using traditional live performances on sets.

The rest takes place in an entirely computer-generated world combining performance capture with virtual environments that have never before been realised on film. His immersive 3D brings a heightened believability to *Avatar*'s live-action sequences gradually bringing viewers deeper into the exotic world of Pandora. Thus, realism and detail compositions are eventually required to create a more 'eye catching' and realistic event for the audience to mesmerize. For classical-era, Disney animators use a range of techniques and technologies to ensure that character movements were as realistic as possible. Even traditional stop motion artist Jan Svankmajer's 'Alice' shot his live action/animation film at full scale placing his live actress and animated characters within what appears to be real rooms, or outside on a rocky terrain.

The way in which this film was shot makes it realistic because of the mixture of a live action actress and animated real life objects such as the stuffed rabbit toy. Realism in animation can be good because the audience can relate to what they see and can almost gain comfort from what they know. The aim is a seamless synthesis of the real and the virtual, even during direction and production (Durand et al, 2002). Even though Mori's theory can be argued, but the fact is that visual details and expression of notion provides a juxtaposition between realm and virtual. The human eye-brain fills in the details and incorporates them into a comfortable internal representation, a notion articulated famously in *Understanding Comics* by Scott McCloud in 1993. Furthermore, puppets are more like non-living objects, the puppet, brought to life, is always a metaphor.

But when there is too much detail, less is left up to interpretation. The Uncanny Valley is part of manifestation in order to evaluate the audience's perception looking into details as a possible coherent relationship between an object's appearance or motion and how people perceive the object. Even though The 'Uncanny Valley' has been used in several ways since its inception especially good robot design process or as a justification for a robot design, however, more recently it has been used to formulate a hypotheses when conducting psychological experiments into human affect or reactions to robots. The visualisation graphs indicates that the concept of motion and visual appearance instils a discomfort especially related to realism (virtual or 3D computer animated) models.

The word 'reality' and 'realism' contribute to computer animation because people are endlessly re-duplicating the visible so that the viewer can relate to the imagery and be impressed by what can be achieved using these technologies. Therefore, the role of realism will always be apparent and a defining factor in computer animation. With the accessibility of the internet, freelance artists are constantly out-doing each other which are also driving the production of reality effects and advancements in technology including reviving the conventional traditional arts with new digital technologies. Next, we look into Mori's Uncanny Valley theory relationship within the domain of 3D computer animated shadow puppets (including shadow puppet or Wayang Kulit).

### 3.0 Experimenting Shadow Puppets & 3D Animation

Shadow Puppetry, is a form of theatre that involves manipulating carved puppets in front of a light source so that they cast shadows on a screen visible by the viewer (Lim, 2011). The set of Wayang Kulit Kelantan or Siam collective sets are basically between 60 to 120 puppets representing identity, symbol and satire characters from Ramayana (Ghulam Sarwar,p.79). Identically, the characters' figure and personas represent the noble or refine common or typical characters in shadow puppetry such as protagonist (Seri Rama, Laksamana, Sita Dew) who are slim and tall compared to antagonist or villain ogre characters such as Rawana or Indrajit which are more dominant, large and bulky. Shadow puppets in Wayang Kulit are more unique, satire, and always within their own 'world' who are able to communicate and entertain the audience. Shadows provide important visual cues for depth, shape, contact, movement, and lighting in our perception of the world. The art of animating Wayang Kulit Kelantan characters are basically single articulated arms especially prominent characters such as Seri Rama or Sita Dewi except for humour characters such as Pak Dogol and Wak Long which are animated with both articulated arms with some moveable jaws and eyebrows.



Figure 2.0 3D Animated Wayang Kulit Characters

David (1998) defined that computer 3D animated puppetry combines the aspects of live puppetry, modelling, acting, mime, observation and animation. In Figure 2.0, the visual art of 3D animation Wayang Kulit uses the concept of replicating the existing visual styles of Wayang Kulit Kelantan by modelling and animating it with 3D software (Autodesk Maya). This visual quality of 3D modelling and animation creates a different proxemic and gestural expressivity notion. For example, the element suggested by Steve (1998) defined that Proxemics motion is another method that reflects the visual expressivity in this research which was identified in relationship with the movement of puppets in the 3D animation world. As 3D computer animation puppets are in the virtual and real time world, projecting the puppet characters to be more visible or placing it behind the camera, also has this mass, puppets move towards or distance from the cinematic 3D camera perspective. The outcome here is that they will appear larger, smaller or depth of field, respectively. Also, with proxemics animation, the momentum or quantum in each frame of movement are affected with 'physical qualities' such as mass, gravity, or ricochet features (metal, brick or rubber). The puppet motion is unlimited in a virtual 3D world, that it can be physically dropped, spun or rolled instantly, within the defined characteristics. There are a lot of people who would argue that just because these collections of polygons are a physical representation of the human form they do in fact lack the essence that is what makes humans human. So what makes us human? Is it our soul? How do you simulate in an animated character the innately human characteristics that we associate with 'soul' (individuality, empathy, awareness of environment, others emotional states) in a human being.

In a 3D realm, characters are modelled and rigged very similarly to stop-motion figurines. Just as in stop-motion, the characters are placed in environments with cameras and lights, and the world is animated frame by frame to create the illusion of motion using key frame as one of the alternative method. According to Md Izani et al. (2003), key framing is applied in 3D character animation, the animator specifies important key poses for the character at some frames, and the computer calculates what the frames between these keys should be with an interpolation technique. With 3D animation, the aspects of control and precision of digital 3D animation visualisation will be able to produce more convincing motion and immersive realms or worlds for the audience to mesmerise. 3D Modelling is concerned with the construction of the virtual characters, objects and sets used in the story structure. For animators, as decision have to be taken about modelling techniques where objects in this case are puppets who have to look real, and be able to be animated, decorated and textured, can be rendered in the form of an image. It is relatively easy to build complex models that consist of several thousand polygons. We choose to use a 3D visualisation for Wayang Kulit puppetry (see Figure 2.0) compared to 2D modelling techniques.

There are three main advantages of using 3D models over 2D models. Firstly, 3D models are flexible and can be changed or animated quickly with quicker rendering time. 3D geometric model has a variety of collection of primitive shapes, each having surface properties like color or textured images, and reflectivity. The ease of rendering allows it to be rapidly prototype models. 3D models in our puppet design for Wayang Kulit are more accurate than 2D models. The disadvantages of 3D models include difficulty and practice to create lifelike models. The significant differences that arise between the two forms of modelling are: the space in which the object is defined, and the ability to render such things as a perspective in 3D visualisation is the main focus area which consists of puppet 3D modelling. With 3D animated puppetry visual metaphor and animated movement, it creates a possible and almost realistic or aesthetics visual qualities that exist with traditional visual styles of Wayang Kulit. With most of the movement, for example, such as articulated approach, gestural, motions of in and out on the screen were capable of constructing in 3D computer animation. Similar to shadow puppetry or Wayang Kulit is an act of bringing inanimate objects to life through direct manipulation using light and shadows, where else 3D animation are basically almost coherent with shadow puppetry philosophy except that it belongs within its own 3D world or known as "Virtual" with 'real-time' capabilities.

#### 4.0 Discussion

Almost 30 years, the art and concept of Uncanny Valley has been defined or acted as a golden rule or guidelines for roboticists and animators. From Pixar computer animated to digital puppetry, creating characters with realism factors (too lifelike) is becoming a threat like never before. What exactly we are feeling and why we feel this way are questions that have finally found their way under the microscope. In Wayang Kulit, the characters in terms of modelling detailed feature or personas with 3D animation could achieve a more detailed Uncanny Valley approach if proper technology are applied such as using MOCAP or Motion Capture.

Furthermore, the puppeteers or Tok Dalang movement of each shadow motion within each characters in Wayang Kulit would provide an extensive realistic look with real-life human performances recorded data (performance capture) and finally animated in 3D virtual environment. the apparatus of head-rigs with face cameras to capture the puppeteer movement of the original puppets including articulate gesture or proxemic, including translucent shadows that will have to experiment with motion-capture markers on the puppeteers body with props "look-at targets" within the environment, to help embed the puppeteers' whole bodies within the environment as much as possible. According to Peter Travers described in Rolling Stone that 2001 Final Fantasy: The Spirits Within film (known as one of the first photorealistic computer animated films, but at the time not everyone was impressed) that the character attributes noticed coldness in the eyes, a mechanical quality in the movement (Rose Eleventh, 2013). The most important factors that surround the Uncanny Valley with 3D animated characters Wayang Kulit is the reactions from the audience, describing the characters personas or the visual qualities that One is not being able to tell whether something is more or not can be a deeply unsettling feeling in itself. Games such Half-Life or Movies such as Avatar, that we perceive the visual styles of Computer Generated Imagery (CGI) human or people most of the time. Mori's original examples of uncanny objects, like a wooden prosthetic hand, probably wouldn't raise an eyebrow today because they are so obviously fake.

Thus, with applying The Uncanny Valley theory, perhaps the technology of using 3D computer animation to create shadow puppet characters would result as creepy discomfort that people could experience in a similar reaction to robots or 3D animated characters that are almost lifelike (but not so lifelike as to fool people into thinking they are real). It is important that shadow puppets or Wayang Kulit characters aesthetics visual qualities are mostly within the physical outline of the puppets and also the shadows that are projected that calibrate graphical realism with behavioural realism. It reflects the details which is a possible relationship between an artistic appearance or motion and how people perceive the artistic visual styles. The uncanny valley is completely unnecessary and avoidable in the pursuit of distributing visual expression and identity. But there is still a possibility that Wayang Kulit 3D animated characters could end up or to a certain degree having the “Uncanny Valley” factor as Mori provided examples of several types of moving and still humanlike image, that he posited, and when such characters approach realistic similarity to humans, they stop being likable and instead become eerie, frightening, repulsive—“uncanny.”

The puppets character of Wayang Kulit visual styles in 3D virtual environment should have a proper structure and proportions in terms of modeling and animation. A good way to avoid the uncanny valley is to move a character’s proportions and structure outside the range of ‘human (referring to Golum character in Peter Jackson’s Lord of The Rings movie) stating that it has big eyes, and the shape of his face is not quite human. Characters such as Hanuman or Ravana in Wayang Kulit (Traditional design or 3D computer generated) with bulky eyes and gestural body proportions should provide more satire or volition looks visual expression and characteristic. Indeed, animators and roboticists generally agree that realistic eyes are the key to avoiding the facial “creepiness” associated with the uncanny valley (Tom Geller,2008). Overall, Wayang Kulit 3D animation could face the Uncanny Valley challenge in future that might affect the visual styles of this valuable traditional performing arts icon. Even though if this happens, Wayang Kulit would still requires a new medium (3D animation or MOCAP) technology for its survival and therefore the Uncanny Valley or factor would just be more like debatable or unsolved issues that rise within arts, human , technology and realism domain.

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