Too close to be true: VR images bring the visible speaker into your face (literally)

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#Abstract#
In Virtual Reality (VR), images of persons are displayed closer to the viewer than ever before. Therefore, images of strangers can come much closer into the experiences and private sphere then in accustomed socio-cultural interactions or in "conventional" moving images. Each micro movement of the face is visible in focus, allowing to read the face of a virtual person in greater detail than ever permitted in conventional distances in the real non-virtual reality.

The sensation of immersion in VR changes the way the images are depicted compared to regular moving images. The bodily representations of a virtual person differ depending on the distance of the image-framing. Thus distance affects how vision and sensorimotor interaction are anchored into somatic, mental and neural processes – into an embodied perception. Accordingly, images not only affect the visual and kinesthetic imagery but also influence the way of thinking, analyzing and understanding something or someone, and VR adds a new dimension to all those cognitive processes by enabling extreme close-ups impossible on a common screen. An unconventional immersive close-up of a person can intimidate through the unfamiliar, extremely short interpersonal distance, as the speaker is just too close to be true.
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#Keywords#
Interpersonal distance, close-up images, virtual persons, 360-degree VR videos, Virtual Reality
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Introduction

Moving images are getting closer to our bodies in many ways. Especially the recent developments in Virtual Reality (VR) technology increases the immersion by tightly binding the perceived images to bodily actions, in particular head turning.

In VR, subjects and objects appearing close to the viewer evoke a strong bodily reaction, such as arousal (fear, delight, eroticism, anger). The immediate reaction is often a physical step aside or a turning of the gaze away from the scenery. VR images bring this sphere of closeness and distance between the body in the image and living body to a new level of possibilities. Hence, this article discusses the changes of interpersonal distances and aesthetics regarding the representations of virtual persons[1] due to the use of close-ups in VR.

How do close-up images of virtual persons in VR affect the interpersonal distance-closeness experience? Further, which new aesthetical perspectives does VR offer on representations of virtual persons in close-ups?

At this point, the scope of this work only includes the appearances of filmed virtual persons and not animated characters, for whom different considerations may come into play. Further, when I refer to VR I mean virtual reality experienced with head-mounted displays which are just about to be released at the time of writing in Q1, 2016, the first users' versions of e.g. *Oculus Rift*, *Morpheus*, *HTC Vive* and so on. Further, I am discussing the use in 360-degree VR video, not fully interactive virtual worlds. 360-degree video differs from fully interactive virtual worlds as those allow the actor to move the "camera" position and thus adjust the distance by taking a step away. In 360-degree VR video, all you can do is turn your head away, but the distance towards the image cannot be increased by a step backwards. The recent developments in VR promises a new disruptive way of immersive experiences using 360-degree VR video as „it promises to bring audiences closer to a story than any previous platform" (Pitt 2015). But what are the consequences of bringing it closer than ever before?

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1 *Virtual persons* refer to real people, captured with 360° video and displayed in VR.

2. VR, virtual persons and the reality experiences of closeness

2.1. Real Illusions

> "Man shall not only know by hypothesis that the earth is not flat and still, but shall feel by sense and instinct that it is round and in flight. He shall come to know the earth as his own house, though he may never have escaped the narrow confines of his hamlet. The blurred narrow windows of his imagination may then become doorways wide and always open" (Scheffauer 1960 [1920]).

Herman Scheffauer made this statement when traditional cinematography was still only in its infancy. But it seems now, almost one hundred years later, technology is making one more step towards realizing his vision. Virtual environments can evoke a feeling as if being physically in this particular, virtual space (Sanchez-Vives and Slater 2005). Immersion in virtual environments occurs when it perceptually veils a person so far that he/she interacts with the virtual environment stronger than with the physical surrounding space. Immersive virtual reality technology supports this perception through sensorimotor contingencies (Noë 2004). Immersion "is the strong illusion of being in a place in spite of the sure knowledge that you are not there" (Slater 2009). When a person is immersed in VR, he or she starts to respond realistically to the sensory stimuli of the virtual surrounding space, including visceral reactions. This effect has been investigated in a range of studies (Bideau et al. 2006; Slater et al. 2006; Slater 2009 and many more).

Still, the situation of immersion, cannot be defined as binary as "there is not a simple relationship of 'either-or' between critical distance and immersion; the relations are multifaceted, closely intertwined, dialectical, in part contradictory, and certainly highly dependent on the disposition of the observer" (Grau 2003, 13).

People experience virtual events as if actual and react in a naturalistic way regarding their personal space, impact or interest (Bailenson et al. 2003). Details in the interaction of the encounter with a virtual person can thus have a strong impact on the reaction of a person. The bodily movements of such a virtual person can change the way we think, feel and react on them. One reason for that can be found in natural

communication: Besides spoken language, people are using a variety of different aspects to transfer meaning such as e.g. gestures, facial expressions or spatial interpersonal distances. Within a few moments, these visual aspects create a first impression about the other person.

Gestures are one way to create a personal space as gestures are always located in the surrounding space around the person's body (for an overview see: Chilton 2014). In their dynamics, gestures can be seen as an open window into the mental representation of individuals (McNeill 1992; Goldin-Meadow et al. 1993; Kendon 2007) and thus a meaningful element of human interaction. The bodily movements, such as gestures are, take an active role in the process of thinking. Besides gestures and postures of the body, also facial expressions are crucial for communication as they display emotional information and subtle clues around a message. Usually, we are able to recognize facial expression within a short personal distance.

2.2 Interpersonal distances

The human body with its sensory, perceptional receptors (in particular eyes and ears) is tightly connected to moving subjects and objects in the surrounding space. Behavioral reactions on such moving entities are processed in a second cognitive (mentally, somatic, embodied) stage. The person with their body occupies parts of the surrounding space: their own personal space.

The personal space is defined as "an area with invisible boundaries surrounding a person's body into which intruders may not come" (Sommerfeldt et al. 2014). The term personal space can already be traced back to the early twentieth century (Katz 1937). Animal behavior and their behavioral reaction differ regarding fight or flight distances. In later years, the term personal space has been criticized as the definition does not include the relation to another person (Hellbrück and Fischer 1999), based on the fact that the boundaries differ depending on social relations – a family member may come closer than a stranger. Therefore, the term of an interpersonal distance will be used as it describes also the space difference between a person to another subject or object (Aiello 1987; Roeder 2003b).

Proxemics[2] explore the implicit rules of distances between people has been investigated within virtual environments for approximately twenty years. Based on proxemics modes, presuppositions of bodily positions such as distance or angle are defined for multimodal communication (Kendon 1977). Additional studies investigated proxemics with head-mounted displays and virtual avatars[3] walking towards a person or the person walking in the direction of the avatar (Llobera et al. 2010; Bailenson et al. 2001). Empirical research of VR interpersonal distance reported that test subjects approach an avatar much closer when visible from the back (Bailenson et al. 2001). Notably, the interpersonal distance increases with mutual gaze. Besides that, various studies investigated a potential gender influence on different interpersonal distance behaviors with mixed results (Yee et al. 2007).

Physical distances between people are loaded within cultural and social behavioral conventions. Each culture has its unwritten understanding of the implications of distances between two people communicating with each other. This is a frequent source of discomfort in intercultural encounters, as the normal distance for talking to a person from one culture may be into your face whereas it is much distanced for another culture. Nevertheless, strangers almost never cross the physical border into an intimidating space (between 0-45cm, see Hall 1960) of interpersonal distance during natural communication. In most cultures, a typical personal distance would be around 45-120cm, which is like sitting in a classroom next to a person (Hall 1966). In a social distance, the person would be at a distance of 120-350cm, which is like watching an educator speak in a seminar.

2.3 Too close

Imagine an unfamiliar Person A approaching Person B towards an intimidating, close distance while also gazing straight into Person B's face: Person B would immediately try to step aside or backwards. If there

2 The *proxemics* research investigates the reaction on interaction and perception of surrounding spaces.

3 Virtual avatar refers to persons, displayed in a VR mode in the form of an animated character. The person can conduct the movements of the virtual avatar.

is no option to do so, Person B would typically compensate the inappropriate level of interpersonal immediacy by turning the head and avoiding the mutual gaze from Person A (Mehrabian and Ferris 1967). A mutual visual withdrawal can be a way of disengaging in a social encounter (Goodwin 1981; Goodwin 1986). A classical option one would be, that Person B averts his gaze to reduce the unwilling intimacy, creating the possibility to return into a state of equilibrium.[4] This reaction could also be described as a typical flight reaction. In a more threatening situation, e.g. Person A approaching faster and with both arms raised above the head, Person B might consequently push away Person A with full force of the hands and body. Option two would be a fight reaction. Both, fight or flight are – besides the differentiation of harmful or harmless – typical reactions to too much intimacy. Any extremely intimidating distance incident between two unfamiliar persons would happen in natural reality only for milliseconds until they increase their interpersonal distances urgently. Otherwise, it just would be too intense.

3. New aesthetic characteristics of interpersonal distances in VR close-ups

3.1. Classical Cinematography and the close-up

> "A head appears on screen and drama, now face to face, seems to address me personally and swells with an extraordinary intensity. I am hypnotized. Now the tragedy is anatomical. The décor of the fifth act is this corner of a cheek torn by a smile … The orography of the face vacillates. Seismic shocks begin. Capillary wrinkles try to split the fault. A wave carries them away. Crescendo. A muscle bridles. The lip is laced with tics like a theater curtain. Everything is movement, imbalance, crisis. Crack. The mouth gives way, like a ripe fruit splitting open. As if slit by a scalpel, a keyboard-like smile cuts laterally into the corner of the lips" (Epstein 1907).

4 For an overview of the equilibrium theory please see (Argyle 1988).

In this dynamically articulated writings of Epstein, describing the intensive experience of a movie, we can witness the intense effect of close-up images. Extreme closeness comes with intensity of detailed information. The changes of distance and closeness between the representation of a person in moving images and the observer is one of the unique medial features of moving images (Eder 2006). Established rules in the cadre of classical cinematography indicate that framing a person's face in a close-up offers a detailed, personal view on the displayed persons expression and emotions and thus helps to understand communicated language. A camera movement towards a person activates mental schemata of typical close behaviors – if somebody comes incredibly near to a person, like we do in a close-up, we get easily into a comfortable or unpleasant, tender or forcable state (Eder 2006). When we then see that face in such a small distance, it is possible to detect expressions of the face like never seen before: "… in the isolated close-up of the film we can see to the bottom of a soul by means of such tiny movements of facial muscles which even the most observant partner would never perceive" (Balázs 1985, 122). Needless to say, that when the close-up is watched in a head-mounted display, this effect gains intensity.

Recognizing such minimal facial expressions and subtle cues of the person can add more important value when in a context of a strong emotional state – which can be useful for multiple genres such as e.g. documentary, fiction or adventures. During the time of the discovery of different framing size for film, the use of close-up images of faces were (and are still today), a widely discussed topic.[5] The technique of close-up images has first been used 1908 by D.W. Griffith (Arnheim 1957, 48). In a more traditional interpersonal distance it would be difficult to depict such motions of the facial movements:

> "The close-up has inspired fascination, love, horror, empathy, pain, unease. It has been seen as the vehicle of the star, the privileged receptacle of affect, of passion, the guarantee of the cinema's status as a universal language, one of, if not the most recognizable units of cinematic discourse, yet simultaneously extraordinary difficult to define" (Doane 2003, 90).

5 Nowadays, the discourse about the close-up is again important, as video consumption shifts into another media format as people increasingly watch videos on the small displays of their smartphones.

3.2. Closeness angle and distorted bodily proportions

The resurrection of VR can benefit from the fast technological development.[6] As new standards right now heading towards 4K and more to come, the possibilities of alternative production styles increase and new camera models are already in development. Nowadays, videos in VR are commonly shot with fisheye lenses (e.g. using *Go-Pro* cameras with *Google Jump*) and thus display a wide-angle panoramic view on the scenery. As a matter of fact, an 8mm - 16mm lens captures a wide shot of the surrounding space but also distorts at the same time the proportions of close subjects or objects.

360-degree VR videos are either filmed in a monoscopic or steroscopic view. Subjects can appear much closer to the recipient than in non-VR settings. Various free apps published for VR experiences use a 360-degree video for VR glasses such as *Google Cardboard*, *Samsung VR Gear* or *Oculus Rift*. These videos are flat equirectangular, morphed into a circular sphere for VR glasses (Samsung 2015). Further, these 360-degree VR videos could be filmed either monoscopic, so that each picture displays the same image, or stereoscopic, which evokes a stronger perception of depth. Most of todays VR videos are monoscopic due to several reasons such as cost efficiency, availability or a lack of technical skills.

The point of view always stays with the same perspective point, in the middle of the image the viewer is watching - with that, it is not possible to display more perspectives than one at a time (Will 2015). The consequences are visible: the equirectangular-morphed image distorts each point of the image around the actual point of view. Such an effect can be compared with the anamorphosis of a picture within a picture, such as Hans Holbein's *The Ambassadors* from 1533 from the frontal perspective there is a distorted skull in the lower bottom center (Holbein 1533). When looking at the picture from below at a steep angle, the anamorphic skull is seen as accurately rendered. Nevertheless, in current 360-degree VR videos the viewer does not have that much freedom to

6 Resurrection, as the first bigger movement of VR can be traced back first to the 90ies, and even some very early developments of Sutherland's *ultimate display* in the 60ies (Sutherland 1965).

change the perspective, as the central point of view stays where the camera is positioned.

As an example: The short VR film *Catatonic* from *Vrse* (Shelmerdine 2015a), takes the viewer on a journey through a psychiatric clinic. The viewer is seated in a wheelchair and gets driven around. One can recognize an avatar body underneath, when turning the head down towards the own feet. At minute 03:45, the viewer suddenly gets surrounded by several virtual persons. If the point of view is directed to the left side of the avatar body, one can recognize a virtual person in a white shirt very close by as displayed in Image 1. The different views in Image 1 show three potential views on the virtual character.[7]

The head of the virtual person points directly towards the eye of the beholder – but since he is so close to the lens, his head appears oversized whereas his upper torso, hips and legs through the lens-curvature appear "dwarf-like". His whole bodily appearance gets deformed through the bending of the camera lens and the chosen perspective of the viewer. As *Catatonic* is a fictional (horror) VR film, one can argue that this helps to create a scary alienation of the virtual character. At the same time, this example shows one new type of aesthetic appearance of close-ups.

7 Notice: The three images of Image 1 are in the VR film not visible at the same time, but they show different, possible angles of the same freeze-frame (the decision lies with the viewer of the *head mounted display*).

Image 1: Film stills (desktop mode view) from the 360-degree VR video Catatonic from Guy Shelmerdine, Vrse, 2015. The three stills show three possible, but different point of views (vertical/up to down) on the same virtual person, at the same time (03:45).

In the VR music video Revolt from the band Muse, Vrse production (Shelmerdine 2015b), we can find a similar distortion of the body when they are too close to the camera lens. At 01:58min, a singer suddenly appears within a blurred transition (crossfade) of montage in the image, directly positioned in front of the viewer when turned towards this angle. The point of focus is set on the mouth and microphone of the singer. His head is leaning towards the camera, which increases the effect of oversaturated closeness. He gets so close, that the curvature of the image representation distorts his body proportions. The aesthetic angle of the camera creates distorted proportions, increasingly when the subjects are getting closer.

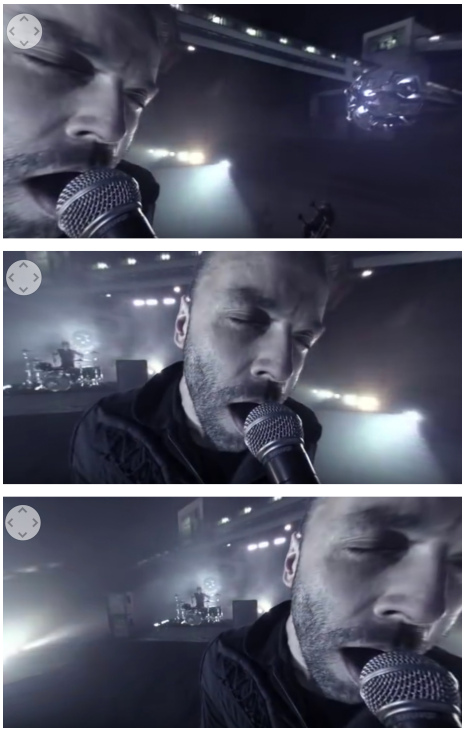

Image 2: Film stills (desktop mode view) from the 360-degree VR music video Muse: Revolt from Guy Shelmerdine, Vrse, 2015. The three stills show three possible, but different point of views (horizontal/left to right) on the same virtual person, at the same time (01:58).

3.3 Distorted close-up and motion sickness?

In VR environments, the sensorimotor system, including the proprioception, is altered.[8] Proprioception and vision are integrated with vestibular information such as head motion, balance and orientation. Discrepancy between the proprioceptive signals and the visual stimuli of a VR environment is known to alter the perception of the body (Gallagher 2001). Objects or subjects appearing close by often evoke a strong bodily reaction, either with a fast turn away from the scenery or a physical step aside. This also often results in a following misbalance and lost of orientation or motion sickness. In a 360-degree VR video, already slight lateral movements of the head can trigger motion sickness (Will 2015). Motion sickness in VR can be mostly traced back to video stitching problems: Due the multiple camera recordings, the images have to be stitched together. Although many 360-degree VR videos are already rendered automatically and thereby overlay each video in an appropriate order, a precise stitching of images is still rather sophisticated. Additionally, most of today's VR videos are not adjusted correctly to a positional head-tracking system; hence this effect is rather strong. „Because VR is tightly integrated with your sense of vision, bad experiences have a real, physical impact on users" (Will 2015).

It could be speculated, that distorted images of close-ups have an additional impact on the motion sickness as the warped view increases an unusual visual representation of the face.

3.4 Frameless & the transformation of montage

In a newspaper article from The Guardian, journalist Cardew reports a statement from Jake Silverstein, from the *New York Times Magazine*:

> "'Every other type of storytelling involves framing, whether the rectangular frame of a still photograph or the framing a journalist does writing a news story or feature,' he says. 'In VR, there is no frame. You can look wherever you want within the scene. The

8 Proprioception denotes the ability to sense the relative position and movements of the body.

> experience leads to a feeling of connection and empathy that is more powerful than traditional video"' (Silverstein in Cardew 2015).

As interesting this frameless view is, the scenery itself, what, when and why the REC bottom will be pushed and from what center the view will be presented in the end, underlies the same decision making processes as in traditional framing methods. Hence, also 360-degree VR videos are framed.

A small digression leads us to the question of montage in VR. The U2 and Muse music videos both apply blurred overlays and crossfades as montage. Thereby the images of different scenes smoothly melt into each other. The Muse video also uses fades-to-black and one hard cut (01:19min). *Catatonic* uses several montage techniques: crossfade (of the same scene, e.g. leaving the lift in the beginning), fast forward speed, fade-to-black, jump cuts and fade-to-white. Traditional montage techniques are a key element of storytelling.[9] The way we think montage will be changed through VR as the point of view. As an example: a common montage technique to portrait an interaction between two people is the use of shot-reverse-shot. If we take this concept into a 360-degree environment for VR, we can never be sure in which direction the viewer looks to at the moment of the cut. The position of the head has to be tracked so that a shot-reverse-shot[10] could be positioned individually at the current point of view. If not done properly, the result would always be a jump between the images (germ. *Bildsprung*). There certainly is big potential to develop new formats of montage for VR.

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9 Although montage is a key element, the recent film production, Victoria (Schipper 2015), a feature film (duration: 138min) showed successfully, that complex and highly engaging stories can be told without any montage and with Birdman (Iñárritu 2015) a major Hollywood production also made very limited, and almost invisible use of it.

10 *Shot-reverse-shot*: e.g. person A is depicted in the left side of the image, in a *shoulder close-up*. The next shot will show person B after on the right side of the image, again in a similar framing size.

3.5 Further thoughts – an outlook on educational VR videos

The recent developments in VR has not gone unnoticed in the developments of digital education. Besides the new thrilling paradigm shift, which VR evokes for the game industry, documentary or journalism, the advanced development of affordable VR models also fans the flames for educational content production.

In the last four years, the video production for educational courses including so called *Massive Open Online Courses* (MOOCs) have increased rapidly. Previous research suggested, that using short videos as a media for knowledge communication offers comparable learning results to traditional lectures (Glance et al. 2013). It is only a question of time, until the first VR educational courses will be published. Karutz & Bailenson (2015) already proposed "a new theoretical hybrid classroom model called the massive open online virtual environment (MOOVE)" (Karutz & Bailenson 2015).

In relation to potential VR productions for education purposes it is important to highlight, that further research should include a profound analysis of the role of the VR educator. Questions regarding the authenticity, authorship or authority of visible educators in MOOC videos have been neglected in current discussions. Some research highlights that the educator can build a connection when gazing into camera (Hansch et al. 2015). Still, this binding effect is not further explained, nor is the fact that a gaze into a camera lens with a close framing can be designed in almost infinite aesthetic (e.g. surrounding space, light settings) and performative (e.g. movements of the head, gaze intensity, facial expressions, body angle) variations. As an example, a gaze of a person can be impertinent, tender, demanding, captive or indulgent (Boehm 2014).[11] As such elements of a person in video or VR are valuable information for a delivered message, such aspects need to be integrated in the discussions about further developments of VR education.

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11 Original in German: „Indem wir dies tun [blicken], kommen wir auch schon als Person ins Spiel: wie schauen etwa neugierig hin oder peinlich berührt weg, wir sind blickend auf der Hut oder eröffnen uns staunend ein Feld der Betrachtung. Es gibt impertinente, zarte, fordernde, gefangene, nachsichtige Blicke" (Boehm 2014).

Nowadays, analogue learning spaces such as sitting in a traditional classroom (not lecture hall), listening to and watching an educator speak about the evolutionary development of frogs, are organized in standardized interpersonal distances (social distance) between the student and the educator. In the recent MOOC video productions, the educator is often displayed as a *Talking Head* in a close-up cadre. The reasons for the popularity of such close-up sceneries for educational purposes are still unclear. In an expert interview with the gesture researcher Sotaro Kita (2015) stated: „I felt like I'm standing too close to that person. Because when I teach, or when I'm learning something, you know, the teacher is not that close to me, usually. … And also, I wasn't sure that I wanted to see all the facial expressions. In some ways, that was a bit distracting from the content" (Kita 2015).[12]

If already a close-up of educators (authorities) view in classical moving images arise such impressions, the effect of closeness and distraction gets multiplied through head-mounted displays in VR. So, when the educator explains the evolution of frogs, the effect of closeness, such as a frog appearing directly in front of the students face, can probably be used in a positive sense: As closeness evokes arousal, this could be used to stimulate the attention focus. But when a talking educator appears directly in front of the student, he will distract from the actual topic. The content itself should arouse, but not the *Talking Head*. And when in the end a monster frog attacks the student, he or she will probably remember the lesson much better.

Hence, upcoming VR production with educational purposes should deeply reflect on the consequences of such nearness as unwise choices in this regard could negatively (educator) or positively (frog) influence the learning effect.

12 Notice: Kita's statement is given regarding "conventional" moving images, not VR videos.

4. Into your face – Four consequences of too close

Too much closeness evokes arousal. The closer a virtual person comes, the more physiological arousal is exhibited (Llobera et al. 2010). This hyper stimulation of social and physical stimuli acts like an information overload on the sensory perception.[13] The cognitive embodied processes followed after the arousal effect, are individual interpretations of the closeness experience (fear, delight, anger, eroticism). Hence, if an interpersonal distance is violated by a virtual person, its effect on the the person is not only determined by a standardized reaction but will be interpreted personally, culturally and emotionally from the eye, body and cognition of the beholder.

Still, there are some consequences independent from culturally and interpersonal distance influences:

(1) First, the lack of interpersonal distance transgression creates confusion. The closeness deflects from the content and confuses the senses through the visual overdose. "What the hell is this person doing so close to my face?"
(2) Second, on the one hand, a bodily reaction can result in a flight mode such as immediate gaze shift, head turn or step aside to reduce or avoid the confrontation. This can result in misbalance and loss of orientation, eventually followed by simulator sickness (Sadowsky and Massof 1994).
(3) Third, the aesthetically distorted representation of the face irritates, as the virtual person looks too "unreal". The distorted image creates a mental distance to the viewer as the immersion of the experience is reduced.
(4) Fourth, within an intimate distance zone, the sensory stimuli are intense and the vision can get blurred when something comes too near, as the eye cannot focus anymore.

Through the mental, emotional and motor-system responsible changes, it will not be feasible to understand the communicated message of the virtual person, as our embodied cognition is intensely occupied to solve the sensory overdose of visual stimuli and corresponding embodied

13 *Overload Theory*, see (Scott 1993).

processes. The person's face is too close to our sensory perception and occupies with their unfamiliar interpersonal distance our capabilities of processing the visual overload.

In each point, if a virtual person violates our communication conventions by stepping too close into our space, we are likely to have difficulties following the content of the message – for the same reasons as when a person in natural communication encounter. Following that, extreme closeness in VR images not only affects the visual and kinesthetic imagery, but also alters the way we think about, analyze and understand something or someone. The confusion through the intense stimuli stops and the image, the message and impression is just too close to be true. This effect can hamper learning and reception, unless the intense stimuli are consciously applied to strengthen the message of the 360-degree VR video.

This is not to say that it will always remain too close - today our perception is already very familiar with the illusions of classical cinema, and few people are found to run out of the screening room, as they did when the Lumière brothers presented their silent movie, *Arrival of the train at La Ciotat* (Lumière 1895). So maybe 90 years from now extreme closeness in virtual environments might be fully naturalized in our perception.

5. Summary

The sensation of immersion in VR changes the way the images are depicted. The bodily representations of a virtual person are different depending on the closeness and distances of the framing and will thus affect the way the images are cognitively embedded.

On the one hand, VR images of people can open up a wide spectrum of different aesthetic opportunities to frame a person e.g. an intense closeness that the virtual person almost touches the viewer. Further, regarding interactive VR, a virtual person can be surrounded by the viewer and the head-mounted display assimilates each movement. On the other hand, considering the socio-cultural normative behaviors in our natural conversations, an unconventional immersive close-up image

of a virtual person can also intimidate through the unfamiliar closeness. The interpersonal distance in VR underlies similar behavioral reactions as in natural human interactions. When a virtual person approaches too close, a state of arousal gets triggered by the viewer due an interpersonal distance transgression. The presence of the virtual person gets just too close to be true.

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