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Imagination in Practice: The Manipulation of Objects in Mixed Reality through Eidetic Variation

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Abstract
This paper explores the application of the phenomenological method of eidetic variation, developed by Edmund Husserl, to mixed reality (MR). Initially, MR is defined within the Reality-Virtuality (RV) continuum developed by Milgram and others (1994) and revisited by Skarbez and others (2021). MR objects, situated within this spectrum, are analyzed phenomenologically as both perceptual and imaginative, constituted by a network of relations. The paper then focuses on Husserl's method of eidetic variation from *Experience and Judgement*, which involves arbitrary modification of object characteristics to grasp their essence. This method, though rooted in essentialism, is used by content designers in augmented reality (AR) and virtual reality (VR) to create objects and environments. Lastly, the paper suggests that MR reflects the externalization of imagination through digital technologies, proposing an Analogue-Digital (AD) continuum that integrates human bodily experience and MR technology, facilitating imaginative visualization and creation without searching for the essence of objects.

Keywords
Mixed Reality; Phenomenology; Eidetic Variation; Externalization; Imagination.

1. *Introduction*

In this paper, I aim to outline a key practice developed in theoretical phenomenology and apply it to mixed reality (MR). The practice in question is the method of eidetic variation, developed by Edmund Husserl in his work *Experience and Judgement* (Husserl 1973). I will explore this method in its original form as conceptualized by Husserl and in its practical application by content designers working with augmented reality (AR) and virtual reality (VR) environments.

To build my argument, I will start by defining MR as a spectrum within the Reality-Virtuality (RV) continuum. This concept was introduced by Milgram and colleagues (Milgram *et al.* 1994; Milgram & Kishino 1994) and later revisited by Skarbez, Smith,

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and Whitton (2021). MR objects are situated within this spectrum and can be examined from a phenomenological perspective (Husserl 2005), as they are both perceptual and imaginative. Additionally, these objects are constituted by a network of relations (Hui 2012, 2016).

Secondly, I will focus on Husserl's *Experience and Judgement* to describe the method of eidetic variation, which allows for the manipulation of MR objects. This method involves an arbitrary variation of certain characteristics of objects to grasp their essence (*eidos*) (Husserl 1973). Imaginative variation lies at the heart of eidetic seeing (*Wesenerschauung*) and develops through specific methodological stages (Zhok 2012; Jansen 2016; Lee 2023) within the human mind. While content designers may not fully embrace this essentialist view, they use eidetic variation to craft objects, characters, and backgrounds in AR and VR.

Finally, I will demonstrate how this practice arises from our tendency to "externalize" imagination through technologies, both analogue and digital. Galit Wellner (2018, 2020, 2022) suggests that digital technology offers many possibilities by engaging with various layers of reality (augmented or virtual). This idea fits within a framework of "carnal phenomenology." Inspired by Merleau-Ponty's idea of the flesh as a pluri-dimensional and multi-level common element (Merleau-Ponty 1968), we can view the MR spectrum as an amalgamation of the analogue and the digital, the human living body (*Leib*) and MR technology. Thus, a new version of the spectrum, defined as the Analogue-Digital (AD) continuum, is proposed. Within this framework, objects in AR or VR can be manipulated using eidetic variation without the pursuit of its essence, solely aiding imagination in the processes of visualization and creation.

2. *Perceptual Objects in Mixed Reality*

According to Milgram and Kishino's view of the RV continuum (Fig. 1), reality unfolds between the "real environment" – that is the analogue world where we currently live – and the "virtual environment" – commonly known as VR (Milgram *et al.* 1994, p. 283).

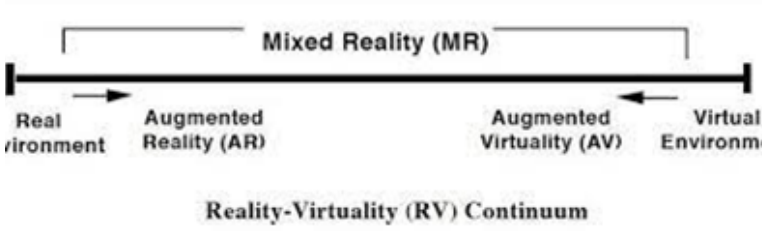

Fig. 1: RV Continuum (Milgram and Kishino)

We can immediately notice that, in the middle of this spectrum, there are two dimensions: Augmented Reality (AR), where, according to Gutiérrez and others, "computer graphics are superimposed over images of the real world" (Gutiérrez *et al.* 2008, p. 117), and Augmented Virtuality (AV), where "imaged portions of the real world are integrated within a virtual world" (Gutiérrez *et al.* 2008, p. 117). A significant part of the RV continuum is occupied by MR, which encompasses digital environments that refer to the analogue world (AR and AV). Milgram and Kishino's model offers a framework for understanding the interrelation between analogue and digital dimensions, especially because of the absence of distinct demarcations among dimensions.

This perspective has recently been revisited by Skarbez and others (2021), who have differently defined both VR and the MR spectrum.

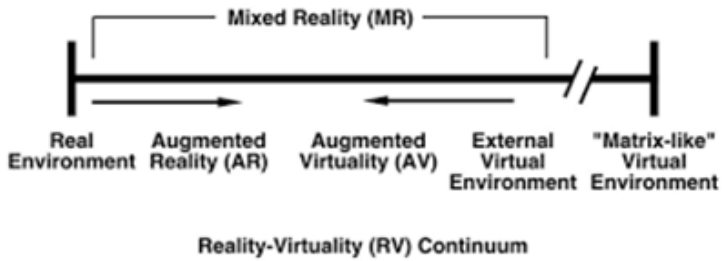

Fig. 2: Revised RV Continuum (Skarbez, Smith, and Whitton)

In this version, the MR spectrum includes also VR, which is defined as an "external virtual environment." Skarbez and others add another dimension, that is an entirely immersive VR setting (a "Matrix-like" virtual environment) (Skarbez *et al.*, 2021: 3). This realm has the same degree of immersivity than analogue reality and is indistinguishable from it. This "Matrix-like" VR must be considered as hypothetical, since nothing like this has been realized yet.

My view shares some points with both the original 1994 version of the RV continuum and its 2021 revisitation: the former theorizes a continuous spectrum of reality that bridges the analogue and virtual dimensions, while the latter encompasses VR within the MR spectrum. In contrast, I challenge the notion of a completely analogue dimension (the so-called "real world") and a completely digital one (an entirely immersive VR). According to Weiser's definition of "ubiquitous" or "pervasive computing" (Weiser 1991), digital devices are now increasingly invisible and computing influences our daily lives. The presence of smart objects and systems (smartphones, smartwatches, home automation, etc.) and the growth of the Internet of Things (IoT) testifies this tendency. Just as our analogue reality cannot be experienced without being intertwined with the digital, so we cannot experience a hypothetically immersive VR environment without referring to our embodied experiences rooted in analogue reality. From my perspective, the intertwining of the digital and the analogue is so intricate that each facet of reality should be viewed as a form of MR, albeit with distinct characteristics.

AR and VR objects, as belonging to this spectrum, are digital objects relating with both the digital and analogue dimensions. They can also be approached from a phenomenological standpoint: they are both perceptual objects that we can see, hear, manipulate, etc., and imaginative objects, since we do not find them in nature – as it happens with plants, animals, rocks, etc. – but originate from the mind of human creators. Digital objects are thus real objects, which are made of bits and are perceivable by us (Chalmers 2022). Phenomenologically speaking, their being made of bits is not sufficient to define them, exactly as the atomic nature of things does not help understanding how we perceive and conceive them (Hui 2012, p. 381). As Hui specifies, digital objects are better defined as being in a network of relations. Even analogue objects are related to each other and to the world, however, their transcendence is perceived by us as strong (they are difficult to destroy or modify). On the other hand, digital objects

are perceived as having a weaker form of transcendence (they can be easily modified or destroyed), but their relationality is more articulated and pervasive (Hui 2012, p. 394).

Moreover, digital objects have certain perceptual characteristics that make them differ from analogue objects (Ferro 2023). The aspect of interest here is that they originate from human phantasy, which represents non-existing objects. Phantasy is a form of quasi-perception (*Quasi-Wahrnehmung*), since the phantasized object is not an object experienced as itself present (Husserl 2005: 18). In Husserl's words: "If I make the shift into phantasy, I have the consciousness of passing over into a null world. What is re-presented does not exist: it neither exists now nor has existed nor will be coming into existence" (Husserl 2005, p. 360). This definition can be only partially applied to digital objects: when they are phantasized, they have not existed before and they do not exist yet, but they are supposed to come into existence in a digital dimension. The imaginative nature of digital objects applies only to the initial stage of their genesis, when they are in the mind of their creators. Once they are translated in bits and run by a program, they can be perceived by us.

3. *The Method of Eidetic Variation*

The double nature of digital objects, which are both perceptual and imaginative, makes them particularly suitable for eidetic variation. Husserl outlines this method in *Experience and Judgement* (Husserl 1973, Part III, Chap. II), with the purpose of searching for the *eidos*, the essence of the thing in its logical and invariable form. The *eidos* makes it possible to grasp what remains constant in a phenomenon apart from its variable manifestations. This method goes in search of a *pure generality* of the thing, not its *empirical generalities*. In order to obtain empirical generalities, it is sufficient to keep in mind one experienced object and then moving on to other experienced objects. In this way, it is possible to compare objects appearing in a finite closed experience and identify their common characteristics (Husserl 1973, § 82, pp. 327-328). For instance, I see a specific horse and compare it with other specific horses I have seen, represented, or imagined in the past. In this way, an empirical concept of horse is formed, which contains the commonalities of the few horses I have experienced. According to Alfred Schütz, empirical generalities derive from contingent similarities of factual individuals (Schütz 1959, p. 59).

Eidetic variation works differently. In Husserl's words:

> It is based on the modification of an experienced or imagined objectivity, turning it into an arbitrary example which, at the same time, receives the character of a guiding "model," a point of departure for the production of an infinitely open multiplicity of variants. It is based, therefore, on a *variation*. […] For this it is necessary that ever new similar images be obtained as copies, as images of the imagination, which are all concretely similar to the original image. Thus, by an act of volition we produce free variants, each of which, just like the total process of variation itself, occurs in the subjective mode of the "arbitrary" (Husserl 1973, § 87, pp. 340-341).

Unlike empirical generality, pure generality is not limited to previously experienced objects, but on arbitrary variation, allowing us to "test" what we consider as the essence of something, in such a way as to produce new examples of it again and again. At some point, there emerges that without which the object cannot be intuitively imagined as such. According to Husserl, we thus reach "the *eidos*, the *idea* in the Platonic sense, but apprehended in its purity and free from all metaphysical interpretations, therefore taken exactly as it is given to us immediately and intuitively in the vision of the idea which arises in this way" (Husserl 1973, § 87, p. 341). The eidetic seeing (*Wesenerschauung*) is possible only if we "hold" the entire plurality of arbitrary variations and find the boundaries of the concept we are looking for.

This operation is performed by active consciousness: we produce variations of features, test these features by imagining other application contexts, and discover the essential characteristics of the object by distinguishing them from marginal ones (Zhok 2016, p. 223). For instance, I think about a white horse, then I imaginatively vary the color of its coat, the size of its muzzle, the consistence of its mane and tail, the width and the length of its legs. At the end of these variations the main features of a horse are found and it is easier for me to understand what a horse is and not to confuse it with a donkey or a mule.

Even if this process is active, Husserl states that the pure generality of eidos "is *passively preconstituted* as such" (Husserl 1973, § 87, p. 343). This assertion can be better understood by analyzing the stages of ideation, which are the following:

> 1. The productive activity which consists in running through the multiplicity of variations.
> 2. The unitary linking in continuous coincidence,
> 3. The active identification which brings out the congruent over against the differences (Husserl 1973, § 87, pp. 346-347).

The first part of the process (free variation) is performed by the activity of our volition, through which we produce variants of the same example. On the contrary, the second stage of the method (the unitary linking in coincidence) emerges passively, thus making the third stage possible (the active identification of the *eidos*) (Jansen 2016). Processes of active and passive synthesis are both important in order to obtain the essence of something. Essence must be considered as the Platonic idea, but "free from all metaphysical interpretations" (Husserl 1973, § 87, p. 341): it means that the *eidos* is not a transcendent entity, existing independently from our world. Rather, the essence "merely prescribes the minimum requirements which must be satisfied if an object is to be *an object of this kind*" (Lee 2023, p. 188).

Experience is not completely abandoned, since eidetic variation starts from a contingent example, but its relevance is nonetheless "bracketed" through the *epoché*. "For a pure *eidos*, the factual actuality of the particular cases by means of which we progress in the variation is completely irrelevant" (Husserl 1973, § 89, p. 350). By putting our natural attitude in brackets, we are freed from all case realities. In this way, we do not grasp empirical generalities, but the pure essences of things.

In contemporary discourse, the pursuit of essences is rarely a concept shared by scientists or philosophers, although Husserl's essentialism differs significantly from a Platonic perspective. As it was previously noticed, Husserl does not posit abstract entities existing beyond our world, but contemplates the universal within the individual (Moran 2000, p. 134). Despite not sharing this essentialist framework, the first step of Husserl's ideation (free variation) is frequently used by content designers, who employ this method to craft objects, characters, and backgrounds in MR.

4. *Manipulating Objects in Mixed Reality*

Husserl never referred to technology, but only to the possibilities of our consciousness to produce quasi-objects through phantasy. Content designers, on their side, make a wide use of imagination and of the free variation conceptualized by Husserl through digital technology. This use expresses our tendency to "externalize" imagination through technologies, a tendency concerning both analogue and digital dimensions. I will now focus on the possibility of externalization of our phantasy in MR. There are many programs through which we can visualize variation of objects, including the

ones using generative Artificial Intelligence (AI). Wellner brings the recent example of "Sketch RNN" (Wellner 2022, p. 1446), a recurrent neural network that is able to produce multiple kind of sketches of the same object (i.e., a lighthouse or a sheep), starting with the first lines drawn by the human user. Something similar happens with common programs through which we can generate images, such as Canva or Dall-E: we only need to write the name of something and the AI produces images. When we use Canva, we can start with a simple object (i.e., by writing "horse") and then ask the program to change the coat (i.e., "white horse") or other aspects (i.e., "long tail"). We can also change the style (i.e., watercolour) and see what kind of alternatives AI suggests. If we are not satisfied, we can be more specific by extending our instructions (i.e., "a white horse with a long tail on a battlefield with many soldiers"). In this way, we can widen the possibilities of our imagination, not only by finding something corresponding to what we have in mind, but also receiving new variations we had not thought of before. Generative AI was preceded by other programs externalizing our imagination, such as Photoshop and CAD softwares, which follow our instructions and help us producing objects, images, plans, etc. They help us to visualize specifically what we are phantasizing, by producing alternatives strictly following our instructions (i.e., change of shape, color, etc.). Generative AI, on the other side, somehow "phantasizes" as well and increases the types and number of variations.

Wellner considers the possibilities of digital imagination and their application to the new "digital landscape", as Melinda Campbell (2022) rightly points out. Specifically, Wellner invokes "the layer paradigm [...] a dynamic mode of operation in which changes in the order of the layers can produce new meanings and eventually new imaginings" (Wellner 2018, pp. 60-61). This paradigm is based on the idea that digital technologies introduce new layers of information, thus allowing our imagination to be externalized and placed in these layers. Imagination is somehow relocated outside our capabilities and is not limited to humans only, but can be extended to AI, since some layers can be performed by AI itself (Wellner 2022). This causes not only a change in the perception of our environment, where new layers are added, but even changes ourselves deeply.

This kind of reflection is particularly suitable for interpreting the use of eidetic variation in MR environments. Following Wellner's postphenomenological suggestion (2020), digital technology offers many possibilities by engaging with various layers of reality (aug-

mented or virtual). This statement can be better specified by referring to the RV continuum, which was discussed in Section 2. Here an interpretation of the continuum situated within a framework of "carnal phenomenology" is developed and takes inspiration from Merleau-Ponty's idea of the flesh as a multi-layered element (Merleau-Ponty 1968; Ferro 2021). According to this view, the flesh is the common tissue of the world, its warp and weft, a dynamic element characterized by a chiasmatic dialectic between different poles.

In his Working Notes, the author writes: "This mediation through reversal, this chiasm, there is not simply a for-Oneself for-the-Other antithesis, there is Being as containing all that, first as sensible Being and then as Being without restriction" (Merleau-Ponty 1968, p. 215). The unique element of the flesh is the common ground where dialectic takes place, giving birth to a stratified Being. According to my interpretation of Merleau-Ponty's ontology in relation to MR, there are two main levels, the analogue and the digital, which dialectically relate to each other. From this dynamic movement and intertwining, other dimensions arise that present varying degrees of analogue or digital. The tissue of the flesh contains multiple layers and leaves (Merleau-Ponty 1968, pp. 117, 138, 158, 178), thus constituting a stratification that Merleau-Ponty defines as "dimensionality" (Merleau-Ponty 1968, pp. 178, 227). The author died in 1961, so he did not know the Digital Revolution and its effects. However, I believe that my interpretation fits well with his concept of flesh as a common body, which includes both the subject and the object. The human living body (*Leib*) and MR technology can be seen as poles of Being, giving rise to an intertwining of the analogue and the digital, that is the RV continuum. Even Merleau-Ponty's view of "verticality" (Merleau-Ponty 1968, pp. 178, 201, 203-204), which constitutes the dimensionality of Being, helps us understand the continuum: each layer of the flesh (AR, AV, VR, etc.) develops "horizontally", whereas the flesh cuts across these layers "vertically" and unifies them.

In this way, an ontological interpretation of the RV continuum, developed in 1994 and revisited in 2021, takes place. I define it as the Analogue-Digital (AD) continuum. Whereas the computer science representation of the continuum is characterized by flatness, a phenomenological representation needs to develop in depth[1], as in the following version:

[1] Martino Feyles also criticizes, from a phenomenological standpoint, the RV continuum, by highlighting that Milgram and Kishino's model is based on the description of technological devices but does not account for our experience of mixed environments (Feyles 2020, p. 101).

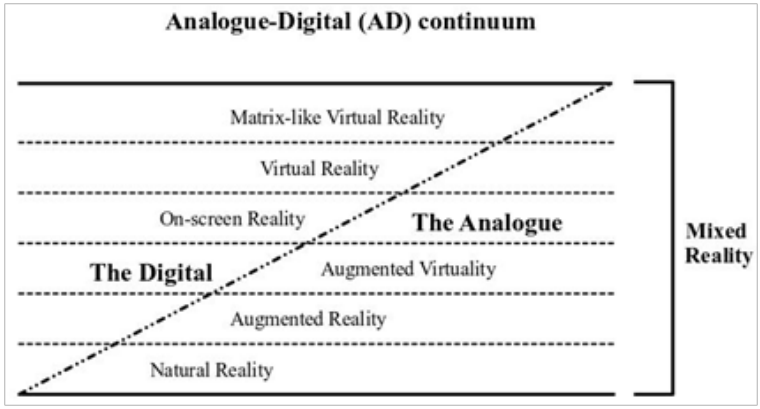

Fig. 3: The Analogue-Digital (AD) continuum

In this representation the real is constituted by *the analogue* and *the digital*, two different poles of the flesh which dynamically interact in a chiasmatic relation: they revert one into the other without annihilating the other pole. As evidenced by the dot-and-dash line, there are blurred boundaries between the poles, which give rise to multiple layers of MR. It means that the deep intertwining of reality produces different dimensions, ranging from natural reality to a hypothetical "Matrix-like" VR. Even these layers are separated by dot-and-dash lines. As in the revisited version of the RV continuum (Skarbez *et al.* 2021), AR, AV, and VR are included within the MR spectrum, but there is an additional level, namely on-screen reality (Carbone 2019). We have access to this dimension in multiple ways: for instance, by using laptops and mobile phones or by simply watching a smart TV, when we do not use augmented softwares. This level constitutes a non-immersive digital reality and is strangely missing from both 1994 and 2021 versions of the continuum. MR is constituted by all these layers, which show how hybrid our reality is.

In this way, Wellner's idea of the layer paradigm can be applied to the continuity of analogue and digital dimensions[2]. Our imagination is thus externalized in multiple ways, including, in the case

[2] Applying the layer paradigm does not imply a complete agreement with the postphenomenological approach adopted by Wellner. Despite multiple points of contact between my position and the postphenomenological one, the latter conceives mixed dimensions on the basis of mediation theory (Liberati 2024), whereas a Merleau-Pontian framework is adopted here and relies on the chiasmatic intertwining of human and technology.

of augmented or virtual environments, also the contribution of AI. Within this framework, an object can be manipulated, using MR technology, through the method of eidetic variation. This manipulation opens up the possibility of a hybrid imagination, since human phantasy is aided by both digital technology and AI suggestions in visualization and creation processes. Husserl's free variation can thus be employed without necessarily sharing an essentialist framework. However, it takes on a new meaning, if we reconfigure our ontology towards a posthuman idea, including the hybrid intertwining of human *Leib* and digital technology.

5. *Conclusion*

This study was mainly focused on eidetic variation and has tried to explore its relevance and performability within the domains of MR, especially in its augmented and virtual versions. First, the paper focused on the computer science theory of the RV continuum, analyzing it in its two best-known versions, respectively developed in 1994 (Milgram *et al.* 1994; Milgram & Kishino 1994) and 2021 (Skarbez *et al.* 2021). Strengths were identified in both versions, considering that the former theorizes a continuous spectrum of reality bridging analogue and virtual dimensions, while the latter includes VR within the MR spectrum. Also some weaknesses were found, since the idea of completely analogue (the "real world") and completely digital (a "Matrix-like" VR) dimensions that are not encompassed within the MR spectrum look actually difficult to sustain, because of the phenomenon of pervasive computing (Weiser, 1991) and the diffusion of IoT technologies.

After this short analysis of the MR spectrum, I have sought to focus on the phenomenological method of eidetic variation, as developed by Edmund Husserl in *Experience and Judgement*. From the exploration of the stages and the relevance of this method, which aims to obtain the *Wesenerschauung*, there emerges a different use that does not entail an essentialist framework. Eidetic variation, originally aimed at grasping the essence of objects through imaginative operations, finds a new life in the hands of content designers who phantasize, manipulate, and shape digital objects in MR dimensions. They particularly recur to the first stage of the method, that is free variation, rather than looking for essences and make use of the other two steps, which are unitary linking and active identification of congruences over differences (Husserl 1973, § 87, pp. 346-347).

Some examples of the use of free variation through both generative AI and traditional design programs have been given. The former results particularly interesting, since it can increase the types and number of possible variations by performing operations at some levels of the process. This aspect is particularly analyzed by Wellner, who refers to the layer paradigm, according to which we can externalize our imagination and relocate it outside our own capabilities, on different levels of information (Wellner 2022). Not only our visualization of free variation, but also the answers of generative AI to our prompts help us extend the possibilities of creation in digital environments. This changes ourselves deeply and opens up to a posthuman perspective on imagination.

Starting from these assumptions, the layer paradigm has been applied to the RV continuum according to a phenomenological reading of Merleau-Ponty's late thinking. Taking inspiration from his monist ontology, the flesh can be considered as the common element of the world and of the RV continuum. The flesh is considered as a multi-layered element (Merleau-Ponty 1968, pp. 117, 138, 158, 178), characterized by dimensionality and verticality. The flesh cuts across different layers, which are reconfigured according to a new representation of the RV continuum: it is defined as the AD continuum, since it takes place between the analogue and the digital, resulting from their intertwining. In this way, the amalgamation of digital technologies and the human living body (*Leib*) is acknowledged and underscores the interplay between our imagination and the digital environments in which we hybridize.

Ultimately, this convergence of phenomenology and MR technologies not only enhances our understanding of digital objects and their manipulation, but also reaffirms the potential of eidetic variation as a methodological tool. It allows us to externalize and refine our imaginative capabilities, leveraging the spectrum of reality in novel ways that resonate with our embodied experiences. As such, the method of eidetic variation goes beyond its original theoretical context, being put in practice during generative processes within augmented and virtual dimensions.

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