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Research Paper

The installation of the term "actual mental model" as a gnoseological category

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Resume
We are trying to constitute and introduce the concept of actual mental model (AMM), as it is arrived at by today's philosophical thinking when confronted with the phenomenon of virtual reality. We rely on a cursory outline of the quest for gnoseological certainties which has come to the finding of four barriers between the knowing subject and reality. These are the hiatus between the phenomenon and essence, between sensory sensations and reality, and limitedness to consciousness as well as to the logic forms of opinion. These barriers can be overcome only by the assumption that our thinking makes sense, because its main function is to reflect reality, assumption, which should be confirmed during the socially (scientifically) implemented cognitive circle process, and based on the evidence of the I realize fact coined by Descartes. Besides the AMM, it appears necessary to introduce also the concept of fixed mental model and thought-conceptual system. These three concepts should enable the description of the subject-object relation in such a way that the fact of the subject existence is adequately integrated into the scientific cognitive process.

Keywords
Actual mental model, fixed mental model, thought-conceptual system, momentalism, philosophy of assumptions

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I. Philosophical basis

One of the certainties that man is seeking is the certainty of knowledge. It is about knowing with certainty how things are in order to be able to orientate ourselves in the world and act accordingly.

When looking for a certain knowledge, man must first start thinking about the essence of the certainty of knowledge, what makes our knowledge certain, and what knowledge in general we can regard as certain.

These questions are of interest to philosophy. In the history of philosophy we can utilize the ideas of the Eleatics[1] as a starting point for reflections on the certainty of knowledge. Thanks to them, we realized that there is the perception of the world based on how the world appears to us is not certain. The Eleatics found out that the world appears to us differently from its essence and tried to find this essence behind phenomena. If it is true that the essence of reality is reflected in what reality seems to us, there is hope that we can progress from phenomena to essence. In any case, we have come across a divide between essence and phenomenon.

How difficult it is to overcome this divide was already realized by Plato, who came to the idea of a dark cave in which we observe, with back to reality, only its shadows.[2]

In order to transform these distorted shadows into the objects that cast them—that is the essence, the true nature of the world—Francis Bacon[3] tried to determine what deforms these shadows and how, and

1 *Zlomky předsokratovských myslitelů*. Trans. K. Svoboda. Praha: Státní pedagogické nakladatelství, 1989. 22–46.

2 Compare to Platón, *Ústava, 7. kniha.* Trans. E. Peroutka – Fr. Novotný. Praha: J. Laichter, 1921. 250.
Our statement is obviously made based on the knowledge that Plato used his metaphor to illustrate his own view of the world, its stratification into the realm of ideas and the realm of reality, and we claim that, mutatis mutandis, his metaphor *de facto* reflects something different, i.e. how the reflection of reality enters into our consciousness, how the reflection of reality is created in the consciousness. We understand it in the same way as F. Bacon in his category "Idols of the cave" (*Nové organon*. Trans. M. Zůna. Praha: Svoboda, 1990. 87).

3 Bacon, F., *Nové organon*. Trans. M. Zůna. Praha: Svoboda, 1990. 86–88.

classified these effects as idols.

The cave, into which man is closed, was described in a greater detail by George Berkeley.[4] He concluded that between man and the world there is a reservoir of senses and this reservoir is so impenetrable that we cannot say anything about what is behind the sensory signals. Although we may think that our senses divide us from reality, but also inform us about what it looks like, it only proves that we discovered another divide between reality and man: senses.

Led by the uncertainty of what is beyond the senses, René Descartes[5] started to search for at least some certainty and found the certainty of a particular human consciousness. Such security, however, leads to the finding of another enclosure, in which man is closed off from reality: everything we learn about reality is mere contents of consciousness, and it is possible to believe that nothing can be stated for certain beyond these contents of consciousness, unless we accept the assumption that it is through these contents of consciousness that reality enters into our consciousness. One way or another, we have to conclude that we have found a third divide between reality and man.

When we think about the contents of consciousness together with Ladislav Klíma,[6] we learn that we think in thoughts and that we cannot think otherwise. The essence of our consciousness—our thinking is chained by logic and we cannot get out of this cell. And this is the fourth divide between reality and man.

We have found four barriers between reality and man, which seem to make knowledge impossible. First of all, it is the divide between phenomenon and essence, secondly it is the impossibility to say anything for sure beyond sensory stimuli and, thirdly, beyond the contents of consciousness, and fourthly, it is the impossibility to reach out from the logical forms of thinking to the certainty that such forms of thinking are justified.

These four fundamental uncertainties have been found out as a certainty. But only as long as our reasoning makes sense, i.e. only if we can assume that the thought-conceptual and logical forms in which our thinking is closed are appropriate to reality, of which they speak. If this was not true, our situation would be hopeless. To be able to move on, we have no other option but to accept the unprovable proposition as a presumption, and assume that our reasoning makes sense, i.e. that the thought-conceptual and logical forms in which our thinking is closed enable our consciousness to be presented with reality, in its authentic form, such as it is.

This way we have crossed the innermost barrier between man and reality.

We thus got into the sphere of man's limitedness to consciousness, in which it is only possible to distinguish consciousness and its contents.

The certainty which was discovered by René Descartes is the certainty of consciousness, which is for every man evident, obvious.

Equally evident to man are three facts altogether: consciousness in itself, the I of man, which is the bearer of consciousness, and the contents of consciousness. This is because it is essentially about the evidence of the act of awareness, which can be expressed by the *I realize* statement affecting the aforementioned trinity of evidence (evidence of *realizing*, the one *who* realizes and *what* he/she realizes).

Of these three entities (or three certainties) consciousness is somehow empty, point-like (Edmund Husserl[7]) and is in itself just a stage for the contents; we do not realize anything else—what is behind it, is beyond its reach.

Similarly, the I of man is off the stage of consciousness, "sitting in the auditorium".

In contrast to consciousness and the I of man, the contents of consciousness are richly structured and we can concentrate on them.

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4 Berkeley, G., *Pojednání o základech lidského poznání, kde se zkoumají hlavní příčiny omylu a nesnází ve vědách, spolu s důvody skepticismu, ateismu a bezbožnosti*. Trans. J. Brdíčko. Praha: Svoboda, 1995. 62–63, 72, 83.

5 Descartes, R., *Rozprava o metodě, jak správně vésti svůj rozum a hledati pravdu ve vědách*. Trans. V. Szathmáryová-Vlčková. Praha: J. Laichter, 1947. 40.

6 Líznar, M., *Filosofická terminologie Ladislava Klímy. Diploma thesis.* Brno, Masaryk University in Brno, Faculty of Pedagogy, 2006. Compare mainly the explications of the terms "egosolismus" (egosolism) (27) and "metalogika" (metalogic) (31–32) and the statement on p. 51 in the chapter on evaluation of Klíma's work (Trans.): "Even if philosophy became science, it still would not go beyond human rationality and human vision of the world. We will never have the certainty that logic, this powerful tool of all science-oriented philosophers, is not valid only in the context of human rationality. We can never say with certainty that there can be a mind capable of thinking a logical inconsistency. Nor can we claim that there is not a world in which the laws of logic are invalid."

7 Macháček, J., Husserl Edmund. In: Kol. aut., *Stručný filosofický slovník.* Praha: Svoboda, 1966. 176.

The contents of consciousness, with all their diversity, form a sort of an organic whole, changing over time; it is formed as a sequence of present moments, is up-to-date and its essential feature is that it usually introduces to us a sensuously vivid picture of reality through our senses. Therefore, it seems appropriate to call this whole, these currently present contents of consciousness, the *actual mental model (AMM)*.

Let us try to explain this concept as intuitively as possible.

Imagine that we are sitting at a desk, writing. What will be the content of our consciousness in such a situation? For this is important: *everything we realize is the content of our consciousness*, it is the result of a complex analytic-synthetic work of our brain, which provides us with the content of consciousness at once, as a whole, though composed of several components: first, we realize that we are sitting at a desk, writing; then we realize that we are thinking about what we are writing; then we realize that our head is itchy and we are scratching it; then we realize that we can hear the buzz of the computer; then we look at the picture of our grandson and recall nice moments with him; and then we realize the pain in our thumb convulsively holding the pencil... and all this constitutes the content of our consciousness, as it tumbles and changes in the mind over time. The brain ceaselessly works, providing our consciousness with more and more contents; it stops only when we sleep and even then not quite—sometimes we dream, which is the result of the idling brain being deprived of the pressure of sensory stimuli, to which it is subjected in the state of vigilance. The content of our consciousness consists of the picture of reality around us as well as the way in which the reality affects us and what feelings it evokes in us: whether fear or disgust, whether pleasure or something we perceive as beautiful. Although we think it is all around us, it is, on the contrary, in our mind; it is just a reflection of reality around us; it is the result of the brain working in cooperation with sensory organs. Everything we realize is the content of our consciousness, and not reality itself, and we can call what we realize with the phrase *actual mental model*. This is because our brain actually introduces to our consciousness—in a sequence of present moments—an up-to-date model of reality, which is, unlike the normal use of this concept, specific to the human psyche. At the same time, the adjective "mental" explains to us the origin of this model, i.e. that it is a product of the mind (not that it displays psychic phenomena).

Thus we arrived at the term of the actual mental model, which is intended to indicate what we actually realize when we are awake, with eyes open. If you close your eyes, the actual mental model (AMM) disappears. (To be precise, we would still have to cover our ears, block our nose, get rid of touch and taste sensations, as well as of body sensations and stop thinking, or simply lose consciousness, for the AMM to completely disappear.)[8]

What is important about the AMM is its actuality, its fleetingness, the fact that what matters, is the presence; one AMM after another transform in front of our consciousness, seamlessly passing one into another, as the flow of presence, the flow of actual mental models. The previous AMMs create a context for the present AMM and, thanks to the memory, become the fixed mental model (FMM), on the background of which every AMM is perceived.

For me, AMM is—based on what I realize in introspection—a current, present, actual[9] content of individual consciousness. This content, however, varies depending on what the entity focuses its attention at, and disintegrates into relatively independent, or disparate constituents.

AMM may arise through a direct reception of reality and the content of consciousness is then the *AMM from sensation* (which also disintegrates into individual entities, things), that is what, for the most part, disappears when you close your eyes, what is largely substitutable by the apparatus constituting virtual reality, but what is also replaceable, to an even greater extent, by the perception of fixations[10] (by reading, or listening to a text, particularly an artistic one, watching movies, etc., when the AMM from fixation is generated).

When we prevent sensation, the AMM from sensation disappears. Sensation is the most common, but not the only source of AMM. Yet, AMM, in terms of sources, is complex, rarely constituted by a single source,

8 Compare the article titled "Mentální model" (Mental model) in Wikipedia (http://cs.wikipedia.org/wiki/). Our concept (see section 4) differs from theirs fundamentally. Closest to our concept is the first sentence of the definition by Jay W. Forrester, quoted in the article (trans.): "The picture of the world around us, which we carry in our heads, is a mere model." According to: Šusta, M. "Několik slov o systémové dynamice a systémovém myšlení." Proverbs, a. s., 2004. Web. 10 January 2009. Proverbs, a. s., 17 May 2015 not available any more.

9 Maybe, it would be more interesting to use, instead of AMM, the term *momentary mental model*, with a striking acronym "MMM". Mind trend having AMM at its foundation can be called *momentalism*. It is framed by a *philosophy of assumptions*. Cf. Kmuníček, V.: *Concepts of the Philosophy of Assumptions and its Theoretical Implications*. GNOSI: An Interdisciplinary Journal of Human Theory and Praxis. Volume 4, Issue 3, July-December, 2021.

10 Such as somehow recorded text, photography, film, etc.

though we can usually find a prevailing source for the current AMM.

In the AMM from sensation, the senses are applied and the AMM of the outer world is created. But we cannot ignore the internal body sensation, which is, however, in comparison with the external one, usually minimal (apart from our awareness of the body surface and the position of body parts, it complements the AMM from sensation, for example, with inner pain).

The AMM from sensation can be described as authentic, as opposed to the *AMM from fixation*. According to their type, the AMMs of fixation can be divided as follows: Almost at the level of sensation, the AMM arises in the perception of **fixations**, which are artefacts (a painting, sculpture, music and other reproduction artefacts) and technical fixations (a photography, film, or holography); in the case of which we speak about a partial quotation of reality. Vicariousness through the word and thought-conceptual system (TCS) is evident in the creation of the AMM from fixation, which arises from an audible word or text.

The contents of consciousness can thus be formed of the *visional AMM* (when either words evoke relevant visions and whole fantasy worlds in us, or we ourselves, based on our thoughts, move in these fantasy worlds, or possibly solve problems or create projects in our visions),

commemorative AMM (AMM form the fixed mental model (FMM), when the content of our consciousness arises from our memory records of previously perceived AMMs from sensation),

but mainly *thought AMM* (AMM from the thought-conceptual system (TCS)), in the implementation of which we are aware of and form our thoughts on a darkened background of the AMM from sensation, when we concentrate on the thinking and do not fully perceive the actually present reality,

and it can also be the *dreamy AMM*, when we either dream or recall our dreams.

Moreover, the contents of our consciousness can also consist of moods, feelings and emotions, which can be experienced, depending on the AMM from sensation, such as its colour and background, or which can be directly induced by the AMM from sensation. Included in the AMM are also our wants, desires, needs, intuitions and hunches. Among the types of AMM, we can also differentiate the working AMM, which can be further divided into the working AMM from thoughts (I think that…), the working AMM from visions (I imagine that…) and the working thought-image AMM (I combine mental images and thoughts).

In fact, as has already been mentioned, the AMM does not disintegrate this way, but is uniform. The AMM from sensation may be coloured by feelings and emotions, may be focused, emphasized by the FMM and TCS, or focused on a particular segment of reality through attention.

All these components of the content of consciousness (participating in varying degrees) form a *whole*, which is precisely the *present content of consciousness*, the AMM. (This whole is generated as a whole by the brain in moments when we are conscious, either awake or dreaming.) However, the situation is even more complex, since every AMM is a part of the AMM flow, in which one AMM transforms smoothly or disparately into another, thanks to which the AMM flow seemingly transcends the presence, is longer then the cut in the presence, which lacks the temporal dimension.[11]

The AMM thus incorporates everything we realize in a given moment, and every present content of consciousness as a whole is the actual mental model.

In the previous text, two new concepts were mentioned besides the AMM: *fixed mental model (FMM)* and *thought-conceptual system (TCS)*.

The realization of AMM occurs against the background of something, by which the AMM is transcended, into which the AMM is incorporated and by which the AMM is focused. This entity, this vision of reality independent of time, which forms the context of each AMM, enabling its understanding, is called the fixed mental model (FMM). In conventional terms, it is something like experience and the major carrier is memory, thanks to which FMM arises by generalizing the experience of the individual AMMs.

As the highest level of generalization of this experience, the thought-conceptual level, with internal logical arrangement, is created. This level of experience is called the thought-conceptual system (TCS). Its characteristic is that it focuses every AMM in a way that gives meaning to the contents from AMM. Within the TCS, it is possible to move, to a certain extent, autonomously, independently of the AMM (although it emerges as a generalization of the experience from the AMM and hence from the FMM) by logical derivation of thoughts. It is characteristic of the TCS that it can be pronounced, fixed by words.

The AMM, FMM and TCS can be regarded (if we ignore our intuitions, hunches, feelings and emotions) as the main tool of orientation in the world of knowledge since they create a model of reality in our consciousness. As we have no way of finding out what is behind this model, we have no choice but to accept another assumption: The contents of consciousness are organized in a way that provides us with the most faithful picture of reality.

11 For example, when we think, our thoughts are continuous, passing from a certain presence to another, without bothering or being reflected in any way: the form of opinion is a continuous flow of presence, which is enabled mainly by our memory.

As was already discovered by the Eleatics in their paradoxes, the TCS can get into a major conflict with the AMM. The aim of all cognitive activities is to reach compliance between the AMM and TCS. The point is to always find such an TCS, in which all AMMs—contents of consciousness are acceptable and explicable.

This framework also includes the assumptions accepted by us. They are a part of the TCS we are building, and we can claim them only if we do not reach, in the subsequent cognitive process, the AMM or certain statements that our assumptions do not deny, given that we should reach, at the same time, their confirmation, or the finding that they are an integral part of the TCS we are building. The pronounced TCS obtained this way is called the ontological model.

The AMM, FMM and TCS of a particular consciousness have their own origin and evolution, and, at some point, have their specific form, regardless of our will. They are created "by themselves", "automatically". Our consciousness claims something to us and we can only accept these postulates as the initial assumptions. (This is how we indeed started our reasoning, so that we could afford to include the classification of the content of consciousness—based on the author's current FMM and TCS). This applies to all statements of the "common sense"—thus we accept the assumption that the world is basically as we see it, that we have a body, which is a body in the world formed also of other material bodies, some of which are endowed with consciousness, just as we are, and are called beings, etc. This way, through an assumption—that is the assumption of validity of the imposing "common sense" propositions—we can step out of isolation into consciousness, or to the senses.

Individual beings communicate with each other using verbally objectivised TCS and together try to reach a unified *ontological model (OM)* which would explain all the AMMs of all these beings. This way it is possible to bridge the last gap that was left open, the gap between phenomenon and essence; where the phenomenon is the AMM, and the essence represents what reality really is, which should plausibly, with the greatest degree of certainty we can achieve, be comprised by the ontological model towards which our pan-human efforts are directed.

Obviously, our concept of ontological model got closer to the concept of *paradigm.* Is there any difference between them? Ontological model is apparently what the science purposefully builds, while paradigm represents basic patterns of thoughts prevailing at a specific time in a specific society. In this sense, the ontological model would represent a scientific paradigm.

II. Empirical anchoring of the term "actual mental model"

New times bring us empirical findings and sensory experiences which man has not encountered yet. Thanks to the invention of the telescope, we were able to explore the lunar surface with our own eyes, thanks to the construction of space vehicles, we could walk on the Moon and experience its six times less gravity. In the area of sensation, however, an absolute breakthrough is the phenomenon of virtual reality. It is so revolutionary that research into it seems to have philosophical consequences as well. While the theory has so far anticipated the practice (the Moon was assumed to be a cosmic body, and then we saw it as such, mapped it and visited it), virtual reality additionally shapes our ideas about the world by the surprising experience it evokes, by the sensual empiricism it mediates. How? That is what we will try to outline.

Probably the main source of discussion on the phenomenon of virtual reality is the publication *Silicon Mirage. The Art and Science of Virtual Reality* by Steve Aukstakalnis and David Blatner.[12]

The definition of virtual reality was formed in 1989 by a pioneer in the field of virtual reality, Jaron Lanier. According to him, it is "a computer-generated, interactive, three-dimensional environment in which a person is immersed".[13]

The real meaning of this generalizing abstract definition lies in the fact that man, in order to "find himself in virtual reality", needs sophisticated technical equipment (which now exists in a range of technological options and the optimal form of which is still being searched for). The principle of this device is based on a display inserted to the visual field of the subject, for each eye separately, on which a computer image is generated in a way that enables the spatial perception of the displayed reality to be created in the subject's consciousness. At the same time, sound stimuli are transmitted by computer to both ears of the subject in an effort to induce in the subject the impression of a spatial sound perception originating from the "reality" the subject sees. Thirdly, the subject is wearing special gloves that are able to simulate the impression of tactile perception of the "reality" the subject already sees and hears.

Equipped this way, the subject gets, in the activated device, the impression that he is in another world, another reality, different from the one in which he has been so far, i.e. in the virtual reality he can see, hear and touch.

Obviously, the creation of virtual reality is based on the understanding that it is possible, through an organized

12 Peachpit Press 1992. Our considerations are based on this publication, which is also quoted in our paper.

13 Peachpit Press 12.

stimulation of our senses (organized acting on the sensors), to create a relatively arbitrary perception of reality that is different from the actual reality in the consciousness of the recipient. As it was first mentioned in Lanier's definition, for the "perception of reality", it is essential that the recipient gets the impression that he/she is "immersed" in this reality. The authors' view of this concept is as follows: "Being immersed means being surrounded by something; everywhere you look, it's there."[14] And they continue: "Being surrounded by stimuli that trigger these sensations enables us to be constantly creating and updating mental models of our environment."[15]

The aforementioned definition of immersion expresses a revelatory finding, which is the fact that the sensory reception of reality creates in our consciousness such a model of reality surrounding the recipient that the recipient is immersed in it. Thanks to virtual reality technology, it is then possible to create in recipient's consciousness a relatively arbitrary model, i.e. a model independent of reality surrounding the recipient, in which the recipient will be immersed in the same way as he is normally in the model of surrounding reality.

In our considerations, the term "model" has appeared. The authors, in an attempt to grasp the problem, started to use it intuitively to describe the actual contents of consciousness. Sometimes it is obvious that they see it as a particular type of the content of consciousness, i.e. as an thought-conceptual, theoretical, cognitive model in the traditional sense (for example, compare "a model for how a company is organized"[16]), and sometimes they are already aware that the entire actual content of consciousness that arises from sensation, from the reception of reality, is also a model (see the quotation above from p. 27: "mental models of our environment").

As we mentioned earlier, the peculiarity of this model is the bearer's impression, which the authors describe using the term "immersion". At the same time, the term of immersion captures the characteristic which virtual reality shares with the real actual content of consciousness, with the model of reality in our consciousness. Compare: "If the movie is on television, the window is more like a small portal. The same is true of watching a computer screen. In a virtual environment, however, you no longer have the sense of looking into a different world, but rather of looking at that very world from within..."[17]

The phenomenon of immersion is also a major barrier preventing us from using the term "model" for the actual contents of consciousness arising from sensation, in their entirety. Only when we find ourselves *inside* an artificial model, in virtual reality, we begin to understand that even the reality in our minds, arising from natural reception, is also a model. Compare: "After an early virtual reality session, those elements of reality that we think are as solid as a rock start to blur slightly."[18]

At this point it is appropriate to summarize what we have arrived at.

We have learnt that as a result of perception, a model is created in our consciousness. To be able to distinguish it from cognitive models as we currently conceive them, let us call it the mental model. For it is characteristic of this model that it is defined by the presence (and changes over time), let us complement this phrase with another attribute to get the final form of the actual mental model (AMM) (which can also be supported by the following snippet: "… [it enables] us to be constantly creating and updating mental models of our environment..." in a quotation from p. 27). In order to distinguish the AMM we want to constitute conceptually from e.g. the dreamy AMM (as well as other types and kinds of AMMs), let us call it, according to its source, AMM from sensation (AMMS).

This AMMS, as we already know due to the discovery of the possibility of virtual reality, can arise either from the reception of reality—and then it is the real AMMS, or from the reception of artificially generated (e.g. by computer) stimuli—and then it is the virtual AMMS.

Let us add some more thoughts to this report on virtual reality.

As the authors realized, the existence of virtual reality has shaken the certainty of reality, in which we normally live, in its very essence. As they assert: "If we hear a dog in front of us and then *see* a dog in front of us, not only do we tend to think that the dog we see is the dog that made the sound, but also that both the dog and the sound are "real". Neither of these may be true.

Perhaps the key here is that instead of focusing on what reality *is*, we should think more about *what* is reality. That is, if we release ourselves from necessarily emphasizing that there is a reality out there, we are freed to look at what is relevant to us in reality."[19]

It is now up to us to try to outline the answer to this question, which the authors tried to avoid. In our opinion, the possibility of virtual reality paradoxically confirms the existence of something certain behind the sensory experiences: If we know that the real AMMS in our consciousness is replaceable with the virtual AMMS, and if

14 Peachpit Press 27.
15 Peachpit Press 27.
16 Peachpit Press 16.
17 Peachpit Press 26.
18 Peachpit Press 21.
19 Peachpit Press 20.

we know how *strong* the real AMMS has been until this moment (before the construction of virtual reality), we also know that the strength of the real AMMS must be given by something, it must have a bearer (as we know that the bearer of the virtual AMMS is a complex technical apparatus). And this bearer is reality. In other words: If the real AMMS exists in our consciousness, outside our consciousness, there is also reality, by the reception of which the real AMMS is created in our consciousness. Thus the uncertainty of the existence of reality has been overturned (by the fact of virtual reality) into its confirmation.

And there is another question which was left to philosophers by the authors: "What Is Reality?"[20] We think we should answer it, too, and we think that the answer could be: Reality is what creates the AMMS naturally, i.e. without any technical intermediary, in our consciousness.

III. Speculative deduction of other consequences of virtual reality construction

Modern times break the shackles, by which man has been locked up so far. Gradually, the chains of gravity have fallen off and man first took to the air, then flew to the space and tasted even the feeling of weightlessness. These were the ties about which we knew that they burden us ("Lion spirited, we beat against these bars"[21]); but disappearing are also the shackles whose burden we did not realize. And this is, for example, the case of virtual reality.

For millennia, it was commonplace for us to leave the reality for dreams at the end of the day, and to wake up after the night to the same reality as we left before the night. This reality was always here, we just needed to open our eyes and we could see it around us, as a constant background of all events. It was here as an immutable certainty. And look, today it is not true anymore: the burdening shackles of reality have fallen off. We can at will leave the reality and enter into another reality—artificial, virtual reality—which instantly supresses and substitutes the "real reality".

Virtual reality allows us to experience a very special state: "to be sane", and yet not to perceive the reality surrounding us as we are used to in such a state; but to perceive something different in the same way, as if it was the reality itself.

The experience of virtual reality has a great informative value. On one hand, it demonstrates that the current research in this area is based on the knowledge of how things are, but on the other hand, it also shows new views of how things are. For example, the studies of sensory deprivation are apparently confirmed. They state that the content of consciousness is shaped thanks to a continuous flow of sensory stimuli (if taken out from their pressure, consciousness loses its form, its shape, in the same way as the body of jellyfish pulled to the shore from depths). This is also evidenced by the shapeless jumble of dreams that is brought in front of our consciousness, when the pressure of sensory stimuli ceases in our sleep. Virtual reality has nevertheless developed procedures for the artificial generation of these flows of stimuli.

We found that the actual mental model from sensation (AMMS) is generated by the pressure of sensory stimuli in front of our consciousness. This finding appears to fall within the field of psychology. This raises the question of how far virtual reality can be, in the present moment, of inspiration for this field of science. Our considerations in this regard are as follows:

What new findings does virtual reality bring into the view of this area? Its major finding is that through a certain set of sensations, namely visual, auditory and tactile sensations, it is possible to create, in the consciousness of the subject, an artificial model of reality, which is comparable to the model of reality resulting from natural sensation. In this process, it is important that the incentives are complex (not isolated sensations) and that also the result, the model of reality, is complex. What is interesting about this model of reality is the fact that, despite being composed of several different sensational complexes, which can even be distinguished in this model (if any of these sensations is interrupted, the relevant part of the model disappears from consciousness—e.g. if you close your eyes), it is perceived as a monolithic whole, i.e. impulses are brought in front of our consciousness in harmony. If there is a discrepancy (caused, for example, by imperfect generation of stimuli), uncomfortable feelings or even trauma[22] are induced in the subject, and at the same time, the analytic-synthetic brain apparatus is activated, leading to the re-establishment of sensual coherence, sensual harmony. (As evidenced, for example, by attempts at writing which is controllable only by looking in a mirror, or with glasses turning the image over, to which the subject adapts over time.)

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20 Peachpit Press 20.

21 Neruda, J., *Písně kosmické*. Praha: Grégr and Dattel, 1878. 37.

22 Aukstakalnis, S. – Blatner, D., *Silicon Mirage*. Peachpit Press, 1992. 263. "Almost exactly opposite in cause from normal motion sickness, VIMS (Virtual nausea) occurs when there is a compelling sensation of self-motion without any corresponding visceral cues." Aukstakalnis 269. "What would happen if you hear a baby crying behind you, but when you turned to look, the baby wasn't where the sound was coming from? Or if you picked up a pencil but felt the sensation on the wrong fingers? First you'd probably think you were going crazy or had a neurological disorder; then you'd realize you were just in a poorly made virtual reality."

Thanks to virtual reality, we had the opportunity to graphically find out that it is through sensation that the actual mental model from sensation (AMMS) is generated in front of the subject's consciousness. Yet, it is important to emphasize that what gets in front of consciousness this way is not the sensation itself (we know, for example, that the visual sensors are able to register only three specific colours, while the colour we see, or realize, is something completely different, "complex"), but a construct resulting from complex analytic-synthetic work of the brain, which is based on a set of such sensations, where the result arises as a whole and its parts are defined, or determined, by its context. The AMMS is richly structured. We realize its individual entities of various types, while in the structuring of the visual field, an important role is played by tactile sensations, or by perception of the manipulation of the elements of reality.[23]

However, the AMMS is not only structured, perceived as complex and split into entities, but these entities are also perceived with added meaning—the subject realizes not only that he sees something, but also what he perceives. The AMMS is directed towards a sort of a structure of meanings. Routinely, we do not directly realize its bearer (just like the AMMS); it remains hidden behind our consciousness. Its existence is projected into our consciousness only as an understanding of the reality we perceive. This bearer is relatively independent of the actual perception, is relatively timeless, fixed (the bearer probably emerges as a memory fixation of individual AMMSs and as a result of their analytic-synthetic processing), and at the same time constitutes a sort of a unit that expresses, reflects the structure of reality; let us call it a fixed mental model (FMM).

It is obvious that the AMMS can be directly artificially generated (virtual reality, virtuality), while the FMM cannot; at the most, it can probably be modified by the experience of virtuality (through a prolonged perception of the virtual AMMS), which is in this case similar to the analogous functioning of natural sensation, normal experience.

The FMM seems to be a structure of visions with added meaning (where a vision to a large extent, a memory trace of what has been separated from the AMMS as a single entity) and their mutual relationships.

But the brain does not stop at this level of analytic-synthetic processing. It is able to move in the plane of mere meanings, i.e. concepts and thoughts. Based on the structure of FMM, the thought-conceptual system (TCS) is formed through relative separation of meanings, creation of their relative independence from visions and their conjunction with words. (Briefly: TCS is what we verbalize when asked for our opinion.) Thanks to this genetic connection, words both have the power to fix the TCS through its objectivization, uttering (through the construction of instrumental fixation, which is, for example, a text). At the same time words have also the power induce visions connected with concepts in front of our consciousness and generate the AMM from fixation (AMMF) (which is used, for example, in fiction to build a fantasy world, into which we can immerse almost in the same way as in the case of virtual reality[24]).

The AMM – FMM – TCS hierarchy attempts to capture and express the anchoring of all statements about the world in the individual experience of the subject. It tries to show that everything is based on a complex analytic-synthetic activity of the brain and that we, as sentient subjects, must rely on what it brings in front of our consciousness, whether it is a vision of reality (AMMS) and its meaning added through the FMM, or judgments and statements about reality—and even here we must rely on what comes to our mind. Although we can use our will to focus our attention on a certain problem, its solution is carried out on different levels, which are not subject to our will and present a result of a complex process directly in front of our consciousness, just like a computer screen or printer.[25]

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23 That is probably what the following quote speaks about. Aukstakalnis 27. "**Hands.** One of the first things people do in exploring a virtual reality is to orient to their own virtual body. And because this virtual body usually consists of only a hand, people become fascinated with this virtual hand. A gloved hand is raised up in front of their face in order to see the representation of the virtual hand inside the display device. Moving a finger moves a finger in the virtual space. You make a fist and your virtual hand makes one, too. The simple fact that the computer can follow your body movements and recreate them graphically is so exciting to some people that this alone evokes a gasp or a giggle."

24 There are at least two ways of creating an artificial AMM—from sensation of virtual reality and directly through ICS, which eliminates the problem of how to model the movement in virtual reality so that it is in line with the movement in the real world.

25 Vladimír Levi mentions the opinion of Gleb Anfilov that man does not think in one of his books popularizing psychology (*Myšlení, děj neznámý*. Praha: Mladá fronta, 1974. 128). Anfilov claims (Trans.): "... a machine thinks for him (...) The one in his brain." Levi is surprised by this statement, but is unable to interpret what the author wanted to say. In our opinion, Anfilov realized the simple fact that only the results of the work of the brain are brought front in front of our consciousness, and this work cannot be consciously affected directly through our will and we can only passively accept its results. (Which is not quite so: what is brought in front of our consciousness can be manipulated through our will.)

The introduced conception attempts to criticize the idea of "objective science" that is based on "facts" or "protocolar sentences", and wants to point to the fact that it is not possible to leave the subject out of consideration in science, that he must be wholly integrated, with everything, including the fact of analytic-synthetic work of the brain, in the conception of objective science.
We also want to indicate the roots of logic, which whether we like it or not, stems from individual empiricism, but becomes a system of "the rules of the game" thanks to the relative independence of ICS (L. Wittgenstein[26]). What the rules will be like depends on the route from AMM to FMM and TCS.[27]

IV. Conclusion (to the definition of AMM)

The central concept of this paper is the concept of the *actual mental model*, which we are trying to implement this way.

In the experience of every human subject endowed with consciousness, there is an empirically, introspectively accessible object, about which we are concerned, to which we want to point, and which we want to identify in our experience and name. It is a unit of the contents of consciousness perceived at present time, in all its forms.

In the state of vigilance, it is what we commonly call reality around us, the world, but de facto it is an optical image of reality, together with its conceptual focus, ideas and other sensory sensations of reality (auditory, tactile, olfactory, gustatory), body sensation, sense of balance, visions, emotions, feelings, moods, and dreams during a sleep.

As we have explained, these contents always form a whole and of this whole, which changes over time, we are aware at present time, currently. Let us call this whole the actual mental model (AMM). "Actual" because we are aware of the contents at present time. "Mental" because it is a product of our mind. "Model" because it is a reflection of reality. Any other conceptual connotations are misleading. We should understand this phrase as a symbol, which we want to use to point to the reality it names.

However difficult it is to point to the mentioned entity and name it, it is even more difficult to find the denotation, i.e. the object of this name. Therefore, it has probably not been identified in the literature yet, although everything is suddenly clear after gaining an insight into it. Then the following statements are also understandable.

The characteristics of individual AMMs is that they create a continuous flow of actual mental models in time, where one AMM passes seamlessly into another, etc. The flow of AMMs is generated by a systematic complex analytic-synthetic work of the brain in cooperation with the sensory organs.

The AMM disappears for the sentient subject, when he loses consciousness. In the state of vigilance, a substantial part of the AMM disappears for a sighted person when they close their eyes. The construction of virtual reality or virtuality is based on the significance of the participation of optical sensations in the creation of AMM: such artificial sensations are generated for the sight that the brain is able to produce from them the AMM, which is close to the AMM from direct sensation of reality and, at the moment of perception of artificial stimuli, substitutes reality with virtuality.

The particular AMMs differ from each other by focusing attention on different components of the contents of consciousness: the subject may, based on the situation, focus on sensory perception or on the perception with a specific sensor (and then the content of his consciousness is dominated by the image of reality), on ideas (through which he browses when thinking, without realizing the reality around him), on visions (overlapping any sensation), on experience, emotions and feelings (when the dominant content of consciousness becomes pain, joy, love, etc.), or, as we have seen, the sensory perception can be converted to the sensory perception of virtuality. But even those do not exhaust all the possibilities of generating the AMM. For example, art taught us to create virtual AMM from sensation of edited reality, be it paintings, sculptures, theatre or film; or you can realize how an AMM from reading is created: the perception of words activates conceptual and visional structures in our consciousness and even then, thanks to the "switch" of sensory perception to the decryption of the text, we find ourselves in virtuality.
The term of AMM goes through the whole article, the bases of which are anchored somewhere at Berkeley and

26 Wittgenstein, L., *Filosofická zkoumání*. Praha: Filozofický ústav AV ČR, 1993. 63. (Trans.) "But we talk about it [about the speech] in the same way as about chess pieces, when we are setting the relevant rules of the game […]. The question "What is the word?" is analogous to the question "What is a chess piece?"."

27 The mentioned notion of the roots of logic in the ICS, FMM, and AMM corresponds to von Neumann's intuition: "Mathematics is a secondary language, derived form a primary language, which is used by the central nervous system of the body." Neumann, J. von, *The Computer and the Brain.* New Haven: Yale University Press, 1958. 82. Quoted according to: Coveney, P. V. – Highfield R., *Mezi chaosem a řádem: hranice komplexity: hledání řádu v chaotickém světě*. Praha: Mladá fronta, 2003. 18.

Descartes and, like him (perhaps too unfashionably), aims to build a system of thought, anchored in the evidence *I think, therefore I am*. The basis for this effort is constituted by a desire to provide the subject with a certainty in a world where, seemingly, nothing is certain.[28]

Translated by Express Překlady, s. r. o., Dita Trčková and Jan Kmuníček
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28 The critical participation of Jaroslav Peregrin, Jiří Gabriel and Pavel Materna had also a great share in the attempt to clarify the treatise.