Design ideation in virtual reality

AUTHOR:

Michal Jelínek[1*]

[1] *Slovak University of Technology in Bratislava, Faculty of Architecture and Design, Institute of Design*

*CORRESPONDING AUTHOR
E-mail: michal.jelinek@stuba.sk

ABSTRAKT:

Ideácia, zvlášť pri skicovaní, tvorí neoddeliteľnú súčasť procesu navrhovania. Fáza ideácie predstavuje proces formovania skúmanej a vizuálne komunikovanej myšlienky, resp. nápadu. Skicovanie sa však väčšinou spája s „analógovým" papierom a ceruzkou, zatiaľ čo pri realizácii dizajnu sa častejšie využívajú digitálne médiá. V poslednom čase sa vďaka oveľa lepšej dostupnosti okuliarových súprav na virtuálnu realitu (VR) radikálne mení úloha digitálnych médií v procese navrhovania, najmä vo fáze ideácie.

Článok približuje pozorovania a skúsenosti z rozličných podujatí, napríklad z kreatívnych workshopov s dizajnérmi a so študentmi dizajnu dopravných prostriedkov, z „live" navrhovania pomocou VR či z verejného predvádzania technológií a procesu navrhovania, ktoré boli určené najmä odborníkom z oblasti automobilového dizajnu. Hlavným cieľom článku je opísať a rozčleniť využitie VR pri tvorbe myšlienok či nápadov v kontexte dizajnu a opísať, akú úlohu pri tom zohrávajú gestá a ľudské telo vo všeobecnosti.

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KĽÚČOVÉ SLOVÁ:

ideácia, skicovanie, virtuálna realita (VR), zmyslové poznávanie, kreatívne poznávanie, dizajn, výskum

INTRODUCTION

The following text is a summary of observations made upon numerous occasions between 2017 and 2020. These occasions include onsite workshops at automotive design studios such as Volvo (April 2018), Volkswagen (November 2018), or Opel (July 2019), where I worked with professional designers from both vehicle interior and exterior departments. I also reached a broader and more diverse spectrum of participants during the demos and presentations held at conferences such as Splash, THU, FMX, or Auto-vision. The last group of participants were transportation design students at the STU in Bratislava, Slovakia, UMPRUM in Prague, and ZCU in Pilsen, Czechia, representing the academic segment. As mentioned above, the observations and conclusions focus mainly on transportation design; however, they might be relevant to other design fields.
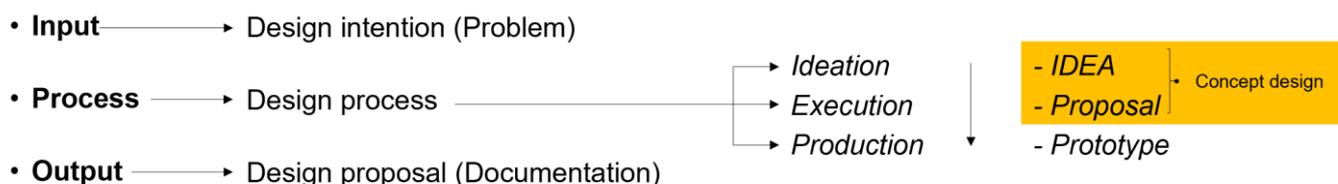

Figure 1: Design process. Source: author's archive

Ideation, especially in sketching, plays a natural role in forming and sharing an idea across virtually all fields of human activities. We accept the sketch's visual form as a critical component of the architectural design. It is generally present in the product design process. It can also be a distinctive discipline of fine art, but it does not stop there. Sketching is a

basic form of visual communication in everyday life; we share ideas and concepts. Although "sketch" may express initial intention in general, i.e., a record of a musical or performing art concept, essentially, it is its visual form that accompanies humanity across cultures and professions. It is also more than just an artifact; down to which it is often reduced. The sketch embodies a visual record of a developing idea, a reflection of the reasoning, and finally, an external manifestation of the human brain's ability to think at iconic and symbolic levels, at the level of abstraction. Barbara Tversky, a cognitive psychologist, classifies the act of sketching as an externalization of the thinking process. [1]

Hand-drawn sketches significantly support creativity: the lack of precision, the expressiveness of gestures, and strokes lead to a particular level of ambiguity. Such a drawing suggests the proposed solution rather than defines it. This ambiguity becomes the root of new discoveries, allows for multiple interpretations, even of opposite concepts. Unfortunately, it is mostly "analog" sketching that produces such an ambiguous representation. [2] Except for "analog" pencil and paper simulation, digital tools tend to be more oriented towards precision and clarity. Yet, there is an emerging digital technology that undoubtedly provides for the desired ambiguity. As Virtual Reality headsets and controllers can accurately track body movement, they allow users to express themselves with natural gestures and to interact naturally and directly with the digital content.

CATEGORIZATION OF VR IDEATION TYPES

It might seem that thinking as a process is indivisible, but observations suggest that it can be divided into four consecutive steps: *Mapping, Exploration, Explanation*, and *Persuasion*. In *Mapping*, we get familiar with the assignment and the context; in *Exploration*, we explore possible solutions. The *Explanation* is a stage for evaluation and clarification, and finally, *Persuasion*; when the idea is already formed, we present it further. The following text describes the observations regarding the work of designers in VR during these stages of ideation.

Mapping

Mapping sketches help designers orient themselves, analyse the context, and learn about the spatial relationship. These VR sketches typically lack any clarity, which is intentional, and they literary represent the map of relations, spatial configuration, ergonomics, the accessibility of specific areas, etc. At this stage, the role of the physical body appears to be very important. Although the mapping process is expressed in the form of lines, i.e. spatial curves in VR in our case, the source of their shape is the gestures and physical movements related to the object. The designers spatially connect the relevant elements, create marks in areas within the reach of their bodies, point out significant places, and literally map the space around themselves and in the context of the designed object.

The use of VR in the form of "room setup," where the designer can move freely around the object and thus perceive the space

in direct reference to his own physical body, has proven to be of a great advantage. Thanks to this, the mapping phase becomes very intuitive and, as a result, also efficient. For example, I would like to mention using an ordinary armchair or office chair, which will serve as a real and virtual prop and thus helps establish the necessary dimensions and spatial arrangement when designing a vehicle's interior. In this case, the designer begins by first outlining both the chair's contours and his/her body and arms. This seemingly banal act plays an important role: The human brain's cognitive functions are directly dependent on the surrounding world's gestural interaction. This simple trick brings the desired connection with the designed object. [3]
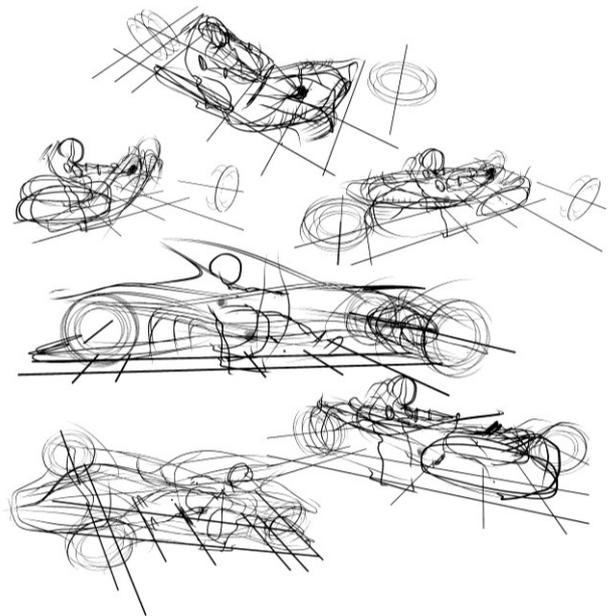

Figure 2: Mapping sketches with GravitySketch VR.
Source: author's archive – Trinity project, 2018

Figure 3: Use of physical props.
Photo: Michal Jelínek

As in the case of mapping sketches on paper, the visual result is, at first glance, very abstract and chaotic. Also, as already mentioned, this is not about producing a convincing piece of artwork but about gaining "awareness" of the designed object and its spatial arrangement.

Exploratory

The visual chaos of *Mapping* sketches is just the right source for the next step in the design process, which is the exploration sketching, where this expressive ambiguity is crucial for subsequent design decisions. In this phase, we examine our maps and assign them meanings, functions, or hierarchies.

Designers use ambiguities for different interpretations, which are then used to generate various alternative designs. Prof. Barbara Tversky **[4]** emphasizes the fact that our spatial interactions are a critical cognitive function of the human brain and they are essential for knowing the surrounding reality. I am also convinced that these spatial interactions are the key to creativity, i.e. they enable us to find new and unique solutions.
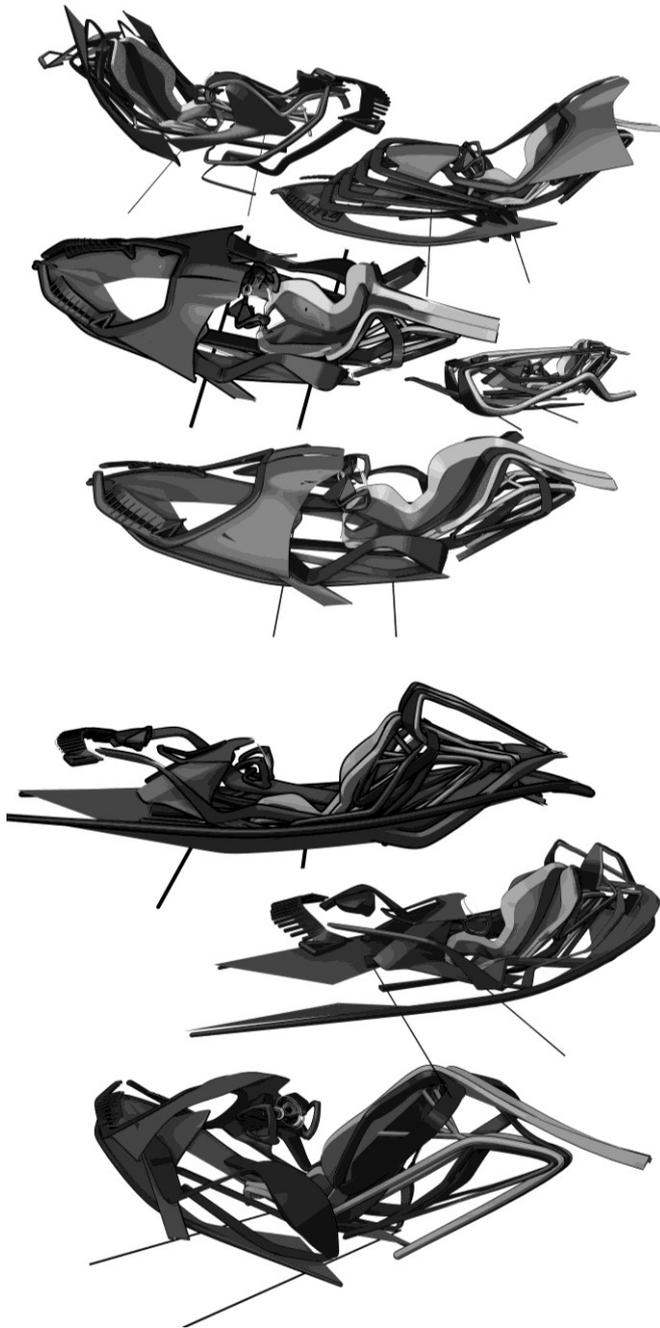
necessary to emphasize that even here, randomness and ambiguity are more critical than readability and artistic precision. As Bill Buxton, a legendary UX veteran, wrote in his book: *"… it suggests and explores, rather than confirms."* **[5]**

Explanatory

As the designers continued to experiment with form language and gradually refined the design, it was possible to observe frequently that their designs are accompanied by their spoken commentary. The designers thus use verbalization as a tool that helps them in shaping the design. This phenomenon is not surprising; after all, cognitive psychologists Barbara Tversky **[6]** and Vinod Goel also describe it in the context of 2D sketching, where both of them also mention frequent gestures observed in this context. **[7]** Interestingly, even in the case of using VR as a medium, where it is possible to convert a gesture into a curve or surface spontaneously, the need for motions does not entirely disappear. However, as a full-fledged digital medium, VR offers the possibility to supplement the artistic designs with text which can be placed directly in the corresponding space. Yet, these textual notes are rarely used for the subsequent presentation of the proposal to a third party, but they rather are a part of the creative process and hardly have any importance beyond the sketch's scope. Nevertheless, due to their digital nature, they are often used directly as design illustrations later in the process.
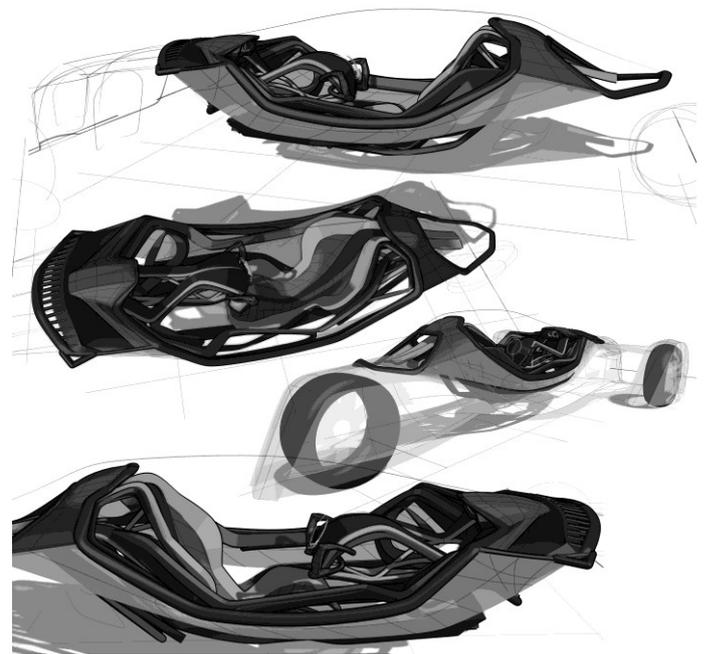

Figure 4: Exploratory sketches with GravitySketch VR.
Source: author's archive – Trinity project, 2018

Figure 5: Exploratory sketches with GravitySketch VR.
Source: author's archive – Trinity project, 2018

In this case, virtual reality helped significantly. The designers could grab, rotate, enlarge, and reposition any virtual object there, which they repeatedly did. And in a short time, they were able to create many original designs. Needless to say; however, many designers slided quickly to make a formal illustration, which immediately affected their ability to generate ideas. Therefore, it is necessary to keep in mind the ideation's goal: It's the idea, not the perfect artistic illustration. It is also

Persuasive

At this stage of the ideation process, the formation of the idea is usually over. The designer's last task is to convert these relatively unrestricted sketches into an art form in which clarity and legibility prevail. Although the design is still more of a concept at this stage, thanks to VR, digital data is fully 3D and can be used directly for further processing, e.g. for visualization

or prototype production. However, designers often stayed in the VR environment and created illustrations directly in it. They usually focused on emphasizing shapes or details, which they would otherwise be forced to present using a special illustration.

Figure 6: Persuasive illustration made with exported GravitySketch VR data.
Source: author's archive – Trinity project, 2018

DISCUSSION

Automotive design has a long tradition of using virtual reality, especially in the segments of simulation and evaluation; however, its direct deployment in the creative process is still in its infancy. Let's summarize the observations' results and list the pros and cons of using VR in design ideas.

A.   It is surprising how many designers took their habits gained when working with digital desktop tools, especially from interaction via a computer mouse, to virtual reality. Designers often worked with virtual instruments right in front of their faces, which led to a relatively early frustration with the whole creative experience. However, the positive finding was that after a short demonstration and explanation of the role of the physical body, almost all participants were able to adjust their initial, somewhat negative, attitude.
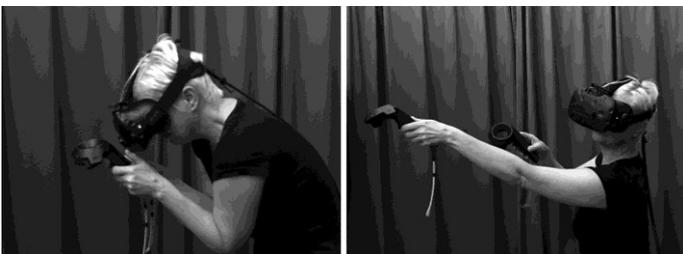

Figure 7: Posture influences the experience.
Photo: Michal Jelínek

B.   Current VR systems enable sitting mode, which is undoubtedly more suitable for design studios' office environment. However, standing mode, with enough space around the creator, remains the first choice.

C.   The combination of physical objects with their virtual representation proved to be very beneficial, especially in the first, *Mapping* phase of ideation. Designers adapted more quickly to the task at hand and went through this phase much

more effectively. Undoubtedly, it also helped in the *Persuasive* phase, when even this very simple prop helped the target person to dive into the design proposal faster and understand the designer's intention better.

D.   The expanded ability to interact with virtual objects appears to be essential. It even seems that it is perhaps more important than the accuracy of the drawing simulation itself in a virtual environment for ideation purposes. It was often observed that formally innovative designs were an outcome of designers' manipulating existing objects rather than redrawing them repeatedly.

CONCLUSION

Therefore, the contribution of VR in developing design ideas seems more than beneficial, and it is also more than gratifying that the observations have been consistent with the results of research in the field of cognitive psychology. Barbara Tversky refers to gestures as spatial actions that play a significant role in human cognition and analyses them in our given (creative) context, while observing architects performing simple design tasks, as they add gestures and verbal comments to their sketching act. [8] Her observations were also independently reproduced by Vinod Goel, who added digital tools in his experiments. [9] These findings also match the conclusions of leading experts such as Bill Buxton. [10] Finally, I would also like to say that putting these observations into the context of contemporary neuroscience has also gained significant support. [11]

Needless to say, although this correlation successfully indicates the link between the human ability to generate new concepts (to ideate) and spatial actions, we still need to continue with these observations and collect more evidence from all three angles: research on design, cognitive psychology, and neuroscience. Such a multidisciplinary approach appears to be a viable path to learning more about human creativity and describing it as a proper scientific subject.

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