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Correlation Between Dominant Sensory Mechanisms During Interaction Processes With Virtual Products and Human Interaction Cycles

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ABSTRACT

Through the exploration of Human Behavior with the use of networks as well as the Tetrachoric Coefficient (TC), it was sought the relationship between the active Dominant Sensory Mechanisms (DSM) during the interaction processes with 3 Virtual Products in 3 groups of users., and the Human Interaction Cycles (HIC) performed by each user. The DSM of each user was obtained from the number of repetitions of each Sensory Mechanism (SM) registered in each network. Likewise, the HICs were determined based on the attention of the person in a certain factor of the Virtual Product (VP), its breakage was considered the end of the attentional process and the number of breaks of each attentional process was counted like a cycle. The results obtained suggest the existence of a varied dependency in the dichotomy: Dominant Sensory Mechanisms and the cycles of human interaction executed in each Virtual Product. Likewise, the results obtained from the Tetrachoric Coefficient (TC) show a directly proportional relationship between the DSM and the HIC in the first two groups of users. However, the results show an inversely proportional relationship in the third group of users. Likewise, the second and third User Groups were the ones that showed the greatest relationship between the DSM and the HICs. In this sense, the results of the second group of users show that the greater the dominance of DSM, the greater the HIC. In the case of the third group of users, it was shown that the greater the DSM, the lower the HIC.

Keywords: Human interaction, Dominant sensory mechanisms, Virtual products, Human interaction cycles

INTRODUCTION

Based on dynamic systems, which can be considered as an evolutionary structure with some characteristics like the dissolution of dynamic stability patterns (Smith and Thelen, 2003), behaviour develops when a person enters into relationship with the environment (Fogel, 1999). In this sense, human being can be seen as a dynamic system which has a variable dynamic stability and the organization of factors is dependent on the interaction

with external environment and its components. Previous studies detected the existence of dominant sensory mechanisms that tend to adapt based on the qualities of the object, and group together in Temporary Interaction Micro-Processes (Tejeda and Pineda, 2020). The present study aimed to investigate the existence of correlations linked to Dominant Sensory Mechanisms (DSMs) during the process of interaction with Virtual Products (VPs) and the Human Interaction Cycles (HIC). Based on these findings, we aimed to investigate the correlations between DSMs during interaction with VPs and the HICs that occur during this process with three groups of users. The HIC were determined from the selection of focal attention that a person delegates to a certain factor in the VP and the break of it to continue with a new cycle.

COMPLEX SYSTEMS: SOME APPROACHES

One of the fundamental factors of the dynamic approach is that organisms are complex systems composed of many individual elements embedded in and open to a complex environment. As with many other complex systems in nature, these systems are integrated by organized patterns. This self-organization suggests a relative stability or instability of their states (Smith and Thelen, 2003). In this sense, researchers such as Smith and Thelen, as well as biologists and psychologists such as Waddington, von Bertalanffy, Lewin, and Gesell, view human behavior and development as morphogenetic fields that unify multiple components. Based on this, human behavior originates when people come into contact with the environment or a certain object. In addition to these studies, the existence of dominant mechanisms in the exploration of certain VPs was detected. In more recent studies, we have focused on the interaction cycles that are present in a specific behavior, which are grouped into Interaction Temporary Micro-Processes (Pineda and Tejeda, 2021). Likewise, for the interaction process directly related to the object, at least 3 natural subsystems participate, which are enunciated below: the cognitive subsystem, the sensory mechanisms, and the attentional processes, which tend to develop cycles and break in the moment that attention is focused on another point. In relation to Virtual Products, at least two artificial systems are linked to a person: one related to the work system and one related to the media interface of the VP.

METHODOLOGY

The process was integrated by two phases. In the first phase, 3VPs were exposed in local environments with a general task assigned in 3 groups of mixed users: integrated by mixed sectors of Men and Women with an average age of 25.16 years. Each group was integrated with 12 persons without cognitive problems, comorbidity, visual problems, also without recent medication use. Group 1 was exposed to a personal Flat Screen Technology device with a VP that showed the highest demand for the spatial-fine location (G1). Group 2 was exposed to a non-personal Flat Screen device with a VP that showed the

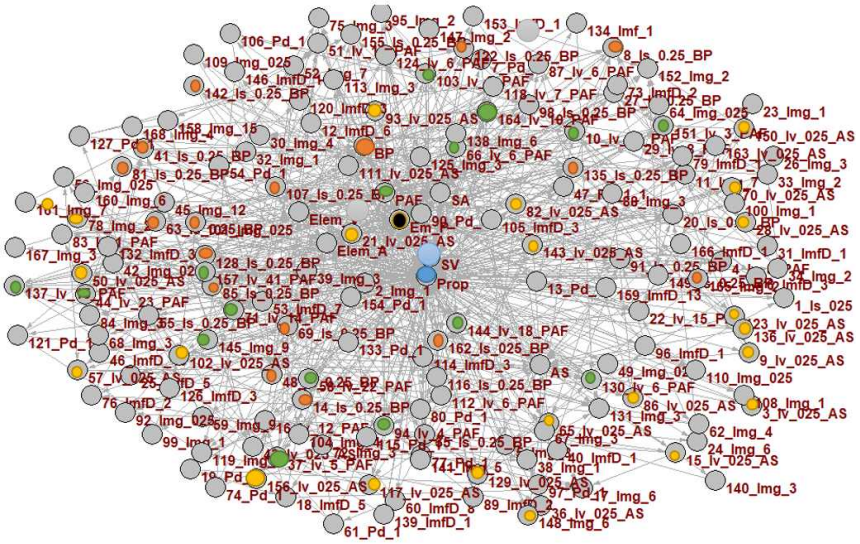
highest demand for the spatial-general location (G2). Group 3 was exposed to a work system considered as emerging technology and registered the longest time in focal attention (G3). The method used to obtain data -once the task was assigned- was non-participant observation, from which the observable factors of interaction were registered in a matrix and visualized in a program package of large networks. Data of interest were those related to obtaining the DSMs starting out with the registration of number of iterations generated by each SM in every user. Likewise, the Human Interaction Cycles were determined from the breakdown of Focal Attention, which was associated with the greatest times delegated to visual interaction. It is important to notice that all observable and non-observable factors in human interaction on this study can be described as control processes directly related to attention. In other words, there is a direct mental connection with the anatomical level of the individual according to studies carried out by Posner & Petersen (1990). Based on the research carried out by these authors, it was considered that mental factors (non-observable) as well as a controlled action (observable factor) are implicit in any movement executed by the user. The use of networks helped to visualize the correlations between SM as well as processes involved in the user's interaction.

In the second phase, data was analyzed from the tetrachoric coefficient in order to explore the relationship between the active DSMs during the interaction processes in the user groups with each VP, and the human interaction cycles of each user. It is important to notice that the processes of human interaction with VPs involve a diversity of Temporal Micro-Processes of Interaction (TMP-I). However, in these studies only the behavior in the relationship DSMs and Human Interaction cycles were observed. The exercise was carried out in Mexico within the context of a classroom in a public university. Participants, in turn, were classified within the young adult sector based on the National Institute of Statistics and Geography (INEGI) due to being in age ranges of 20 to 29 years old.

PROCESS DESCRIPTION

Network 1 shows an example of the correlation between sensory mechanisms (SM) during the interaction process with G3. The network allows us to observe a complex interrelation of temporary interaction microprocesses that exist between factors of human interaction with virtual products. In order to observe the SMs in detail, the network had to be fragmented. As a result, the SMs that were most active throughout the process were detected: gross motor interaction (Img) and visual interaction (Iv).

However, for these studies we focused on the detection of the SM with the highest number of recurrences considered as the most active during the process, as well as the number of cycles of human interaction considering the attentional breaks. Table 1 shows the DSMs for each group of users.



Net 1: Shows an example of the all process of interaction realized by one user. 300 secs. Normal vision. user:2. g3 (elaboration olmos p.l & gil t.j. 2022).

Table 1. Total time 300 secs. U=User; SM=Sensory Mechanism; G1=Group 1; G2=Group 2; G3=Group 3. (Elaboration Olmos P.L. & Gil T. J. 2022.)

G1				G2				G3			
U	SM	DSM	BP	U	SM	DSM	BP	U	SM	DSM	BP
1	Img	42	11	1	Iv	201	8	1	Iv	234	14
2	Iv	136	10	2	Img	247	12	2	Iv	472	23
3	Img	107	8	3	Img	212	8	3	Prop	117	4
4	Iv	69	11	4	Iv	160	8	4	Iv	726	30
5	Iv	128	6	5	Iv	249	13	5	Img	310	8
6	Img	68	6	6	Img	233	14	6	Iv	108	2
7	Iv	43	2	7	Img	291	17	7	Img	189	6
8	Iv	162	7	8	Img	219	12	8	Img	57	2
9	Img	65	10	9	Img	128	5	9	Iv	148	8
10	Iv	94	12	10	Img	244	10	10	Img	371	15
11	Iv	82	5	11	Img	143	8	11	Iv	484	21
12	Iv	113	6	12	Iv	308	18	12	Iv	528	23

The DSMs were very consistent with Img and Iv being the most recurrent in the 3VPs each with different qualities. However, fine differences were observed in relation to the domain of each SM by each group of users. In G1 and G3, the most dominant perceived was Iv; and in G2 Img; G1 presented -regardless of gender- a total of 827 correlations and G3 a total of 2700. However, despite the fact that in G2 the dominant SM was Img it was observed that Iv had a total of 902 correlations. This is relevant since the SM associated with the focal attention processes was the Iv, which indicates the dominance of a SM in a certain VP according to its characteristics as well

as the way in which the interaction was carried out. In case of G2 was performed in longer periods and G1 and G3 in shorter periods but with higher incidence in relation to attentional breaks, G3 was the one that presented the most cycles of human interaction with a total of 156 breaks in the group of users, G2 presented 133 breaks and G1 presented 94. This may also be associated with the exploration that each user performed on each media interface determined by the VP and its work system.

On the other hand, to analyze the tetrachoric coefficient (rt), the average of the dichotomy considered for this study was obtained for each group of users based on Guilford and Fruchter (1984), the results by G were: G1 Iv = 92.4166, BP = 7.83; G2 Img= 219.583, BP = 11-08; G3 Iv = 312 and BP = 13. According to Abascal and Grande (2014), data was displayed and shown in Table 2. This Table also shows variations in relation to the average time of Focal Attention Processes (PAFs) performed by each person. The VP that was most linked to the PAFs -that is with spatial-fine location processes- was the Website., While the VP that was least linked to the spatial-fine location processes was the PPT.

Based on these results and using the Abascal and Grande method, the rt for each group was obtained, the results were: G1 rt = 0; the G2 rt = 0.8660254; the G3 rt = −1. The results suggest the existence of a varied dependency on dichotomy: Dominant Sensory Mechanisms and the Human Interaction Cycles executed in each Virtual Product. Likewise, these results of the Tetrachoric Coefficient (rt) show a directly proportional relationship between the dominant SM and the HICs in the first two groups of users. Notwithstanding an inversely proportional relationship in the third group of users. In this sense, the results of the second group of users showed that the greater the dominance of a DSMs, the greater the HICs. In the case of the third group of users, it was shown that the greater the dominance of a DSMs, the lower the HICs. Likewise, the second and third user groups were the ones that showed the greatest relationship between the DSMs and the HICs

Table 2. Total time 300 secs. U=User; SM=Sensory Mechanism; G1=Group 1; G2=Group 2; G3=Group 3. (Elaboration Olmos P.L. & Gil T. J. 2022.)

G1				G2				G3			
U	MS	DSM	BP	U	MS	DSM	BP	U	MS	DSM	BP
1	Img	−	+	1	Iv	−	−	1	Iv	−	+
2	Iv	+	+	2	Img	+	+	2	Iv	+	+
3	Img	+	+	3	Img	−	-	3	Prop	−	−
4	Iv	−	+	4	Iv	-	-	4	Iv	+	+
5	Iv	+	−	5	Iv	+	+	5	Img	−	−
6	Img	−	−	6	Img	+	+	6	Iv	−	−
7	Iv	−	−	7	Img	+	+	7	Img	−	−
8	Iv	+	−	8	Img	−	+	8	Img	−	−
9	Img	−	+	9	Img	−	−	9	Iv	−	−
10	Iv	+	+	10	Img	+	−	10	Img	+	+
11	Iv	−	−	11	Img	−	−	11	Iv	+	+
12	Iv	+	−	12	Iv	+	+	12	Iv	+	+

CONCLUSION

From the exploration of the relationship between the activation of Dominant Sensory Mechanisms (DSMs) and the Human Interaction Cycles (HICs) carried out by users, five interesting findings were obtained.

A) It was shown that there is a multiple dependence among DSMs, HICs, and the qualities of the virtual products (VPs). Specifically, it was observed that the activation of SM varied according to the VP and its working system, which influenced the HIC.

B) At least two dominant sensory mechanisms were perceived in both male and female sectors, although there were differences in the number of activations described in the studies. In this case, it was observed that both sectors always kept at least 2 SMs active during task execution.

C) DSMs seem to have a high dependence on the qualities of the VP as well as the variations in time delegated to the interaction of each SM. Variability in the interaction with VPs was observed as a result of their qualities, according to the tetrachoric analysis. In the first two groups with flat-screen technology, it was observed that the greater the mastery of an SM in a given time, the sooner a breakdown occurred. In the third group, the more mastery of an SM, the more time was delegated to it, which is directly related to focal attention processes.

D) Breaks in attentional processes, which were linked to HICs, can provide relevant information in the exploration carried out by each person in a media interface. In this sense, breakdowns in HICs are directly related to the breakdown of focal attention that a user delegates to a certain VP.

E) The strongest correlation between the dichotomy of DSMs and HICs occurred in the virtual products that generated both the shortest times in attention (G2) and the longest times in attention (G3).

These findings were obtained in a local environment, which can be considered to some extent as controlled, such as a classroom in a university setting. However, it was also observed that in the case of G2, breakdowns in DSMs were caused by factors external to the VP. Therefore, these results are also influenced by contextual conditions and may have significant variations in less controlled contexts.

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