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COLOR INFLUENCES IDENTIFICATION OF THE MOVING OBJECTS MORE THAN SHAPE

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When people track moving objects, they concentrate on different characteristics. Recent results show that people more often concentrate on spatiotemporal than featural properties of the objects. In other words, location and direction of motion seem to be more informative properties than the stable featural characteristics. This finding contradicts some of our knowledge about cognitive system. Current research was done in attempt to specify the effect of featural characteristics, especially color and shape. In Experiment 1, subjects were asked to track four mobile targets presented with another four moving objects. After the motion has stopped, they had to mark the initial four targets. Our results have shown that participants pay more attention to the featural properties than to spatiotemporal characteristics. Since our task was more difficult than the tasks typically reported in the literature, the results might be interpreted as if the subjects relied mostly on attentional processes. The task in Experiment 2 was made even more difficult: the subjects were asked to direct attention on identity of every target. Consequently, the task demanded more complex cognitive processes and emphasizing effects of featural properties. Results suggest that color and shape does not have the same influences on multiple object tracking, but that color has more significant effect.

Key words*: attention, multiple object tracking, color, shape*

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INTRODUCTION

In everyday situations people often need to track several moving objects. For example, sport players follow positions and activities of all the players in their own team and all the players in the opposite team, drivers continuously pay attention to the other vehicles in traffic, a kindergarten teacher takes care of dozens of children at the same time. How does our cognitive system do such complex tasks? Experimental researches have demonstrated the different aspects of this phenomenon and have made several theoretical assumptions of the underlying mechanisms.

Pylyshyn and Storm (1988) developed an experimental paradigm for tracking moving objects – multiple object tracking (MOT), in an attempt to test their theoretical model known as FINST (Pylyshyn & Storm, 1988). This model is based on the assumption that the visual system allows connection between certain numbers of reference tokens or pointers and an equal number of objects in the visual field. They compared these reference tokens with fingers pointed at some object and named them FINST (FINgers of INSTantiation). FINST has two main purposes. The first one is to distinguish between visible objects so that each object is perceived individually and specifically, even if some have completely equal visual characteristics (i.e. only by position). The second purpose of FINST is to keep the identity of every perceived object in situations when objects are moving or changing (i.e. by trajectory). Indexed objects could be more easily accessed when multiple objects compete for attention (Pylyshyn, 1989, according to Sears & Pylyshyn, 2000). According to this model, there is an only limited number of FINST hence it is possible to track only 3 to 5 objects simultaneously (Pylyshyn, 2001, cf. Trick et al., 2006, Guindon & Vallis, 2006).

Yantis' model of perceptual grouping starts with the same process as FINST, but includes higher cognitive functions in the later stages (Yantis, 1992). According to this model, when people are tracking multiple objects they are spontaneously grouping separate elements in one single virtual object. Success is based on the participant's ability to maintain formed groups of elements during tracking. Object tracking has two phases: grouping of elements and maintaining the group. The group forming stage is governed by Gestalt laws and is based on preattentive processes, the very same processes that Pylyshyn assumed in his model. However, the second stage is driven by person's goals and efforts, and aims to maintain the group formed in the first stage (Yantis, 1992).

Kahneman and Treisman's "file model" (1984, cf. Oksama & Hyönä, 2004) points out that temporary memory representations are necessary when perceiving a changing visual scene. These representations (or object files) contain different information about objects (location, properties, etc.). The capacity of visuospatial memory limits the number of moving objects, which could be tracked successfully. Authors also assumed that the capacity of working memory is normally distributed in the population with an average value around 4 to 5 elements.

MOT developed by Pylyshyn and Storm (1988) has been used by many researchers. In the original paradigm, ten stationary pluses (+) appeared on the display and, depending on the experimental condition, 1 to 5 of them were marked as targets. After that, all ten pluses would start moving, and participants were asked to click on the button every time one of the targets lightened up. During this time participants were not allowed to move their eyes (Pylyshyn & Storm, 1988). Results have shown that people can track up to 5 moving objects (in which case the percentage of correct responses was 85.6 %).

Pylshyn (2004), using this MOT method, examined how well a person could memorize the identity of the objects while tracking them. Based on his earlier results, as well as on the hypothesis of the FINST model, he assumed that once all of the targets have been identified, it was possible to memorize each identity until the end of a trial. In his experiment, participants were asked to mark targets after they stopped as well as to recognize their identity (either through the recall of the first location of tracked objects or the recall of the number given to the target at the beginning of the task). Results showed that participants had a very poor recall of the identity marks, although they still had a high percentage of success in target-tracking.

After Pylyshyn and Storm (1988) found that people can simultaneously track 3-5 objects, other researchers took the “magical number” 4 as a limit (e.g. Scholl, Pylyshyn & Feldman, 2001; Oksama & Hyönä, 2004; Scholl, in press). However, Alvarez and Franconeri (2007) questioned the proposed limit. Simply by changing the speed of the moving targets, they were able to demonstrate the change in capacity for object tracking. They found that at low speed it was possible to track up to eight objects, but in very high speeds it was not possible to track more than one object.

Scholl, Pylyshyn and Franconeri (2004) were interested in the tracked targets characteristics that participants easily encode and pay attention to. The characteristics were divided into two categories: the spatiotemporal properties (location and direction of movement) and the featural properties (color and shape). The results suggested that participants could more easily register spatiotemporal than featural properties. This practically means that participants pay more attention to the positions of tracked objects than the appearance. A potential explanation for this finding was based on Pylylshyn’s assumption (Pylyshyn, 1989; according to Scholl et al., 2004) that the tracking of the targets was accomplished pre-conceptually. Thus, complex cognitive processes were necessary only for the encoding of the featural characteristics and preattentive processes were enough for the encoding of the spatiotemporal characteristics.

In the next experiment Pylyshyn and Annan (2006) changed the basic MOT paradigm. In the classical paradigm targets differed from the distractors only because they blinked several times at the trial onset. In the new paradigm, the targets were singled out by one of their own characteristics. In this case, it was assumed, the tracking would have required attentional processes. At the beginning of the trial every object was marked with a number from 1-8. The participants were informed which numbers were the targets. The task became much more difficult because of the inclusion of attentional processes, and as a result, the success of tracking was lower.

Some researchers noted that the original MOT procedure is missing some of the aspects of object's tracking found in everyday conditions. Horowitz and his collaborators (Horowitz, Klieger, Fencsik, Yang, Alvarez & Wolfe, 2007) noticed that people rarely track completely identical objects in real life (for example sports players and kindergarten teachers). Thus they decided to use a set of easily recognizable pictures of animals, making each object in their experiment completely different. The experiment started as a classical MOT task: the targets were separated from the distractors and subjects tracked them. However, the demonstration was not finished in the usual way, but the animals "disappeared" behind the occluders (pictures of cactuses, in this experiment). There were two answering possibilities: (a) a standard location of all objects-targets and (b) a specific location of one certain object from a group of targets (e.g. "Where is the Zebra?"). Results have shown that the percentage of correct responses was much higher when participants had to locate all targets compared to the task in which they had to locate one specific target. Horowitz and his collaborators assumed that there were two separate systems: one that retrieved information about positions and one with information about the identity of the objects.

Our research is based on the previously mentioned studies and uses the same basic methodology. Research has shown that people could easily register and memorize some of the characteristics of the objects while tracking them. However, Scholl and his collaborators (2004) found that participants more easily registered spatiotemporal characteristics of objects (the location and the direction of motion) than their featural properties (color and shape). They proposed a bigger involvement of preattentive processes than of complex cognitive processes. Conversely, in more difficult tasks, the exclusion of complex cognitive processes is not possible, and that is also noticeable in our examples from real life. A teacher who takes care of several children could name every child that had disappeared from her sight. We assume that the teacher cannot do that based on child's previous position, but based on featural properties, which determines the identity of a certain child. When we look at the problem from this perspective (knowing that a harder task cannot be done based only on preattentive processes) we wonder why, in the lab experiments, the subject rather registers spatiotemporal characteristics over stable featural properties. This contradicts our knowledge about the functioning of human perceptual and cognitive system. Our perceptual system recognizes objects based on constancies, not on the ever-changing information flow. Nevertheless the majority of recent findings support the results from Scholl's research (e.g. Horowitz et al., 2007; Pylyshyn & Annan, 2006). Even so it is not clear to us how to track one specific object without identifying that tracked object. Furthermore, how to identify one object without perceiving its featural characteristics? Thus, we designed our experiment to test the effect of featural characteristics on the success of tracking mobile objects, with a special emphasis on two characteristics: color and shape.

EXPERIMENT 1

In this experiment, observers were shown eight moving objects. In order to test the paradigm similar to the one used by Horowitz et al. (2007), presented objects were visually easily distinguishable. However our condition was different from the 2007 study since we controlled for visual appearance in more systematic way. We used eight different colors and eight different shapes in our conditions. In the study done by Horowitz, pictures of animals were used and although they were also easily distinguishable in shape they were often of the same color (brown monkey and brown donkey).

Out of eight presented object observers were asked to track four (targets) while other four (distractors) moved across the screen in exactly same manner, making task fairly difficult.

Apart from the condition in which all of the colors and shapes were different (and randomly pared in different trials) we introduced three more conditions. In order to test the contribution of each featural characteristic separately, there were conditions to test shape and to test color. In the "shape" trials all of the object were of different shape but presented in the same color (one of the eight colors randomly assigned). In the "color" trials objects were in different colors but of the same shape. Finally, to control for spatiotemporal characteristics, we introduced the trials with eight objects of the same shape and color (control condition).

Method

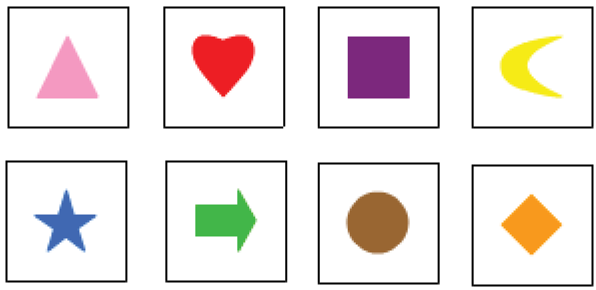
Participants

Thirty four psychology students at the University of Philosophy in Novi Sad participated in this research.

Stimuli

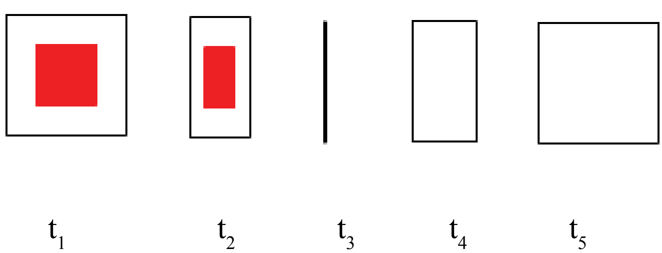
Stimuli were presented on a 15-inch monitor and were made in Macromedia Flash 7. There were eight moving objects in every experimental situation. The objects consisted of white squares, which had a specific shape of a specific color in the middle. The shapes used in the experiment were: a square, a circle, a rhombus, a triangle, a moon, a star, a hart and an arrow, and the colors used in the experiment were: red, blue, yellow, green, brown, purple, orange and pink (Figure 1, example of one possible coupling of shape and color). Colors and shapes were very distinct resulting in an easy recognition of each object. The background behind the squares was white.

Figure 1: Colors and shapes used in the experiment



At the beginning of a trial, the objects were randomly located in one of the 25 possible positions (on an invisible 5×5 matrix). Objects moved across the display subtended 30.4° x 23.3°. The size of every position was 6.2° x 4.7°, the dimensions of the squares were 2.3° x 2.3°, and the dimensions of the shapes were 1.2° x 1.2°. At the beginning, the objects were presented facing subjects, in the same position as depicted on Figure 1. Every object moved only to the position that was two places away, but the trajectories of the objects never crossed (although the objects could move in any direction). During a change of positions, the perceived three-dimensional object (a "card" which one side contained one of the shapes from the Figure 1) rotated 180 degrees around its vertical axis. Because of this, participants saw the white side of the objects half of the time (Figure 2). The speed at which the objects moved was 60 frames per second. These objects simultaneously changed 9 positions (in 14 seconds). At the end, all objects were positioned so that only the white squares were visible (i.e. blank back side of a three-dimensional "card").

Figure 2: Rotation of the perceived three-dimensional object



The experiment contained 4 conditions, and every condition had 8 trials[2]. In the first condition, there were trials which contained objects with different shapes and

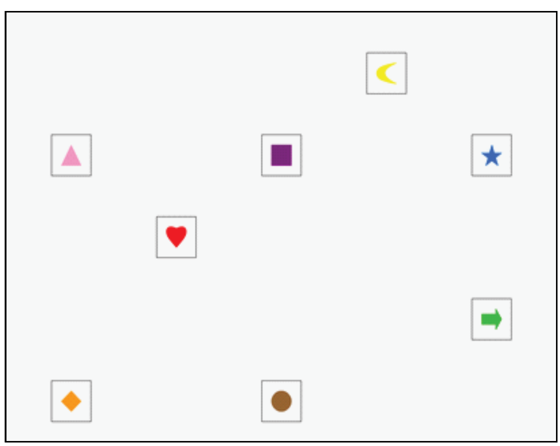
[2] In comparison to the literature this is fairly small number of trials. However, we had more observers than usually used. Consequently, our data points are derived from the same number of raw data.

different colors (in each trial different color would be assigned to a specific shape). The second condition contained trials in which the objects had the same shape, but different colors (for example eight triangles in different colors in the first trial, eight circles in the second and so on). In the third condition, the objects had different shapes, but the same color. In the last (control) condition there were no differences between the objects (same shape and same color). During the experiment, conditions were randomized and trials were randomized inside each condition.

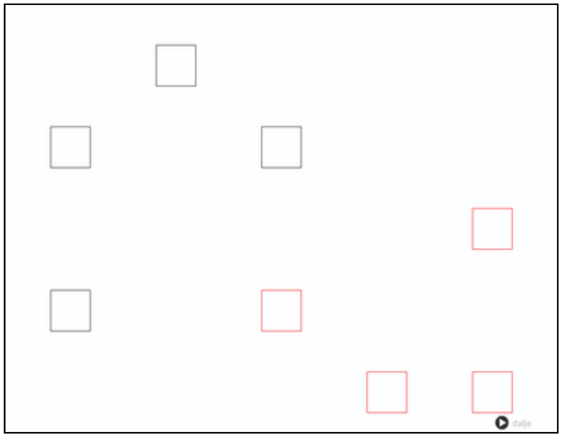
Procedure

The procedure in this experiment was similar to the procedure used by Pylyshyn and Storm (1988). Every experimental situation contained eight objects – four targets and four distractors. The chosen number of four targets was based on the previous findings (e.g. Pylyshyn & Storm, 1988; Oksama & Hyönä, 2004). At the beginning of each trial, four objects blinked, signifying that they were the targets (Figure 3a). During the motion, the objects were rotating, leaving the shape visible only half of the time. At the end of the trial a blank side was facing the participants (Figure 3b). The participants had to click on the four squares that they thought were the targets. After clicking, the black edge of the square turned into red and that was a sign that the object was marked. Participants were able to mark and demark objects until they were satisfied with their decision.

Figure 3: a) The first display of the trial; b) The last display of the trial Objects rotated between displays



a



b

After exactly four objects were marked, a button, which led to the next trial, appeared. No feedback was provided.

We measured the percentage of errors across all the trials. In each condition there was maximum of 32 correct answers (eight trials x four targets). Hence, percentage of error was different if the observer marked only one correct target as oppose to two, three or all four correct targets.

Results and discussion

In this experiment subjects were asked to track four targets presented together with a group of four distractors. There were three different experimental conditions in which we varied shapes and colors of the objects and one control condition in which all objects had the same color and shape.

We processed the results using analysis of variance with repeated measures (Type III Sum of Squares), and they showed that the difference is statistically significant $F(3,99)=5,4114$, $p<0.01$. Scheffe post-hoc test also showed significant differences between the conditions (Table 1).

There was a significant difference between these four conditions. In other words, results suggested that there was a difference in effect of shape and color on the tracking of moving objects.

Table 1: Sheffe post-hoc test

	color + shape	color	shape	control condition
color + shape		0.92016	**0.03073***	0.64777
color			**0.00426***	0.27247
shape				0.38407

* Statistically significant differences

Scheffe post-hoc test has shown that the there was a significant differences among the condition in which objects had different shape and color and the condition in which objects had only different shape, and also between the condition where only the colors of the objects were different and the condition in which only the shapes were different. Therefore it is significantly easier to solve the tracking task in the trials where objects are distinguishable by color.

The percentage of errors for each condition is given in the Table 2.

Table 2: The percentage of errors for each condition

Relevant characteristics	% error
color + shape	9.94
color	8.81
shape	14.72
control condition	11.94

It is noticeable that there are a smaller percentage of errors in situations in which the color is one of the relevant characteristics (first two conditions). Results have shown that there is statistically significant difference between situations in which objects had different colors and the situations in which all objects had the same color $t = 3.42$, $p = 0.001$.

These results could be interpreted as if more attention is paid to the featural characteristics (color and shape) than to the spatiotemporal characteristics (location and direction of moving). However Scheffe post-hoc test did not reach significance for the control condition (equal shape and color for all the targets and distractors). Such finding is in accordance with the published literature and contradicts our idea about the importance of featural characteristics.

On the other hand, the pattern of errors supports not only our idea about the importance of featural characteristics, but more precisely supports an important role of color. That is, two separate clusters based on the size of the errors could be isolated. There are a lower percentage of errors whenever it is possible to use color to distinguishing objects.

Since our results both contradict a significant portion of published data (e.g. Scholl et al, 2004), and do not provide a clear answer to our initial question, we conducted a second experiment in which we tried to emphasize the obtained differences. This was done using an even more demanding experimental task and the procedural change was inspired by previous findings. It was found that focusing on each target's identity makes the task more difficult (e.g. Horowitz et al., 2007). In Experiment 2 we used object identity, hoping that this task will confirm findings from Experiment 1 and that it will further distinguish the effect of shape and color.

EXPERIMENT 2

The methodology of this experiment is very similar to methodology of Experiment 1. The main difference was that the participants were asked to track several specific targets and locate only one of them. Participants had to pay attention to the identity of the objects as well as to their position and direction of motion. Previous researches have shown that such tasks were much more demanding, leading to more errors (Pylyshyn, 2004; Horowitz et al., 2007). The purpose of this experiment was to further examine the possible difference between shape and color on tracking objects.

Method

Participants

Twenty nine psychology students at the University of Philosophy in Novi Sad participated in this research.

Stimuli

Stimuli in this experiment were the same as in Experiment 1. The only difference was the exclusion of fourth condition. There three remaining conditions were: 1) the condition in which all the shapes and the colors were different; 2) the condition in which the colors were different, but the shapes were the same; and 3) the condition in which the colors were the same, but the shapes were different. We excluded the fourth control condition in which all shapes and colors were the same. This change was relevant to the procedure of this experiment (the task demanded identification of the objects so they could not be all the same).

Procedure

The procedure was very similar to Experiment 1. Subjects were asked to track four targets which moved (between four distractors) and rotated as described earlier. However, when the movement of the objects was over and they were all facing with the blank side, a question appeared on the top of the screen (e.g. Where is the blue circle?). In order to respond to the question, the subjects had to pay attention to the identity of every target. Subjects responded by clicking on one of the squares and then went on to the next trial.

Results and discussion

In this experiment we intended to confirm some results obtained in the first experiment but also to demonstrate more emphasized effects. The specific goal of the Experiment 2 was to examine effects of object's colors and shapes in the tracking task, performed in difficult conditions in which observers need to identify all of the targets. Therefore, we altered the task originally used in Experiment 1.

There were three experimental conditions in which we varied colors and shapes of moving objects.

Overall the percentage of errors appeared to be much higher than in Experiment 1 (Table 2), implying that this task was more difficult (Table 3). Still the pattern of errors for the varied featural characteristics remained the same in both experiments.

Table 3: The percentage of errors for each condition

Relevant characteristics	% error
color + shape	50
color	44.4
shape	60.78

We used one way analysis of variance for repeated measures (Type III Sum of Squares). The results showed that the difference in the number of correct responses in each condition was statistically significant ($F(2, 56)=9.048$, $p<0.001$). This difference is clarified by post-hoc tests.

There is a clear separation between the trials in which observers could use the color to distinguish objects. In the first two conditions (color and shape, and color) there is significantly smaller amount of errors in comparison to the third condition ($t=4.27$, $p<0.001$).

Scheffe post-hoc test showed significant differences between the conditions (Table 4).

Table 4: Sheffe post-hoc test

	color + shape	color	shape
color + shape		0.365487	**0.028593***
color			**0.000491***
shape			

* Statistically significant differences

Scheffe post-hoc test has shown two important differences. It is significantly easier to track the targets distinguishable by color than targets distinguishable by shape. Also, it is significantly easier to track the targets distinguishable by color and shape than only by shape. In other words, it was always easier to track the objects which had different colors. Based on our results we propose that colors have a stronger effect.

GENERAL DISCUSSION

There are many situations in which simultaneously moving objects need to be tracked. Substantial amount of research has been done aiming to clarify this phenomenon and its basic mechanisms. The paradigm created by Pylyshyn and Storm (1988) has become a standard for tracking object's research. Over time, it was noticed that a basic experimental task differs from real life conditions in many relevant characteristics. Consequently, some changes were made to make the experimental task closer to the everyday situations.

Changes made by Horowitz et al. (2007) were especially important for our research. They have noticed that people rarely find themselves tracking completely identical objects and they changed previously used experimental design. The objects in their experiment were pictures of different animals, with more or less different colors and shapes. The variation of those two variables was not controlled, so the amount of their individual effects remained unknown. This research has been done to clarify the status of these characteristics of stimulation.

We concluded two experiments with the purpose of establishing the effect of featural characteristics of moving objects (color and shape) and their separate effect on tracking mobile targets. In Experiment 1, participants were asked to track moving objects paying attention only to the trajectory objects took and the position in which they ended. Results showed that there were differences between situations in which colors and shapes were independently varied. Our findings do not fully correspond to the findings that spatiotemporal characteristics were more relevant during objects' tracking (Scholl et al., 2004). In our experiment, featural characteristics do play a role, leading to more (shape) or less (color) errors depending on the specific characteristic. However, these results were not significantly different from the tracking based on spatiotemporal characteristics alone (control trials with no shape and color difference). Hence we cannot conclude that the tracking is predominantly based on featural characteristics.

Our knowledge about the functioning of the cognitive system suggests that the recognition of objects depends on their characteristics such as size, shape and color, and it does not depend on the incidental position which certain object happen to occupy in the particular scene. Objects, which are closer to the observer, have a larger projection than objects that are further away; objects which are not perpendicular to the line of sight project into deformed 2D shapes, and the parts of objects that are in the shadow reflect less light. However, it seems that the system is insensitive to these changes in the scene and still performs object identification and recognition based on featural characteristics (like shape and color).

To a certain extent, the results of Experiment 1 showed that participants pay more attention on the featural properties of the objects than on the spatiotemporal characteristics. The reason we obtained somewhat different results from Scholl and his collaborators (Scholl et al., 2004) might be due to the differences in experimental tasks. We assumed that the task in our experiment was more difficult, and could not be achieved without involvement of the attentional processes. Hence, we were interested in effects that could be obtained only in even more difficult conditions, the conditions which would demand even more complex cognitive processes.

In Experiment 2, we made the task more difficult in comparison to the previous experiment. Those changes were created after the findings from earlier research (e.g. Pylyshyn, 2004). The procedures for both experiments were similar, but in Experiment 2 the subject had to pay attention to the characteristics of objects, and not only to the location and the direction of movement. Comparing the percentage of incorrect responses in both experiments, it is noticeable that those percentages are much higher in Experiment 2. This confirms the assumption that the changes in the second task made it more difficult, which also confirms some published findings (Pylyshyn, 2004; Horowitz et al., 2007; Pylyshyn & Annan, 2006).

Scholl and his collaborators (Scholl et al., 2004) proposed that better perception of spatiotemporal characteristics was a result of a greater involvement of preattentive processes. Tasks in our experiments were even more difficult which resulted in a bigger involvement of attentional processes. Use of attentional processes made featural characteristics more relevant.

Finally, we can confirm that more difficult tasks demand involvement of more complex cognitive processes. The cognitive system uses stable featural characteristics for identification and classification of objects. However, it must be said that all featural characteristics do not have the same relevancy. Results of this research suggest that color has a bigger effect on tracking of moving objects and has a bigger effect on visual identification and cognitive classification of objects.

This research made an attempt to better control visual appearance of the targets. Two featuaral characteristics were in our focus: shape and color. These two characteristics do not necessarily have the same treatment by visual system. Hence the eight levels for each of them might not be appropriate. Furthermore, the differences between the eight targets (either in shape or color) were not systematically varied, so we cannot say that the difference between the hart and the triangle is comparable to difference between the square and the arrow (same for green, blue and yellow).

Not only that shape and color have different status within visual system but they were also treated differently in our paradigm. During the “card rotation” shape was changing while the color remained unchanged. Such presentation might signal to the system that the color is a more important featural cue.

Despite all said our experiments suggest usage of featural characteristics as well as the difference in the treatment of those characteristics. Future research should solve the remaining questions and use more systematic stimulus variations.

REFERENCES

Alvarez, G. A., & Franconeri, S. L. (2007). How many objects can you track? Evidence for a resource-limited attentive tracking mechanism. *Journal of Vision*, *7*(13), 1–10.

Horowitz, T. S., Klieger, S. B., Fencsik, D. E., Yang, K. K., Alvarez, G. A., & Wolfe, J. M. (2007). Tracking unique objects. *Perception & Psychophysics*, *69*(2), 172-184.

Oksama, L. & Hyönä, J. (2004). Is multiple object tracking carried out automatically by an early vision mechanism independent of higher-order cognition? An individual difference approach. *Visual Cognition*, *11*(5), 631–671.

Pylyshyn, Z. W., & Storm, R. W. (1988). Tracking multiple independent targets: Evidence for a parallel tracking mechanism. *Spatial Vision*, *3*, 179–197.

Pylyshyn, Z. W., & Annan, V. (2006) Dynamics of target selection in Multiple Object Tracking (MOT). *Spatial Vision*, *19*(6), 485–504.

Pylyshyn, Z. W. (2004). Some puzzling findings in multiple object tracking: I. Tracking without keeping track of object identities. *Visual Cognition*, *11*(7), 801-822.

Scholl, B. J. (in press). What have we learned about attention from multiple object tracking (and vice versa)? In D. Dedrick & L. Trick (Eds.), *Computation, Cognition, and Pylyshyn*. Cambridge(MA): MIT Press.

Scholl, B. J., Pylyshyn, Z. W., & Feldman, J. (2001). What is a visual object? Evidence from target merging in multiple object tracking. *Cognition*, *80*, 159-177.

Scholl, B. J., Pylyshyn, Z. W., & Franconeri, S. L. (2004). The relationship between property-encoding and object-based attention: Evidence from multiple object tracking. *Manuscript submitted for publication.*

Sears, C. R., & Pylyshyn, Z. W. (2000). Multiple Object Tracking and Attentional Processing. *Canadian Journal of Experimental Psychology, 54*(1), 1-14.

Trick, L. M., Guindon, J., & Vallis, L. A. (2006). Sequential tapping interferes selectively with multiple-object tracking: Do finger-tapping and tracking share a common resource? *The Quarterly Journal of Experimental Psychology*, *59*(7), 1188–1195.

Yantis, S. (1992). Multielement visual tracking: Attention and perceptual organization. *Cognitive Psychology*, *24*, 295–340.

REZIME

UTICAJ BOJE I OBLIKA PRILIKOM IDENTIFIKACIJE POKRETNIH META

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Praćenje pokretnih objekata je fenomen sa kojim se susrećemo u svakodnevnom životu. Mnogobrojni eksperimenti su demonstrirali različite aspekte ovog fenomena. Jedno od pitanja na koje je pokušano odgovoriti je koje karakteristike objekata pospešuju uspešnost njihovog praćenja. Ranija istraživanja su ispitivala uticaj različitih karakteristika koje su podelili u dve kategorije: spaciotemparalne (lokacija i pravac kretanja) i fizičke karakteristike (boja i oblik). Rezultati dobijeni u tim istraživanjima su ukazivali na to da ljudi bolje reaguju na spaciotemporalne nego fizičke karakteristike. Drugim rečima, prilikom praćenja objekata više se oslanjaju na njegovu lokaciju i pravac kretanja, nego stabilne fizičke karakteristike. Međutim, postavlja se pitanje kako je moguće pratiti neki određeni objekat bez da se on identifikuje. U skladu sa tim, kako je moguće identifikovati objekat bez opažanja njegovih fizičkih osobina? Ovaj eksperiment je sproveden sa ciljem da se ispita efekat fizičkih osobina na uspešnost u praćenju objekata, sa posebnim osvrtom na dve osobine: boju i oblik. Sprovedena su dva eksperimenta. U Eksperimentu 1 se od ispitanika očekivalo da prati osam pokretnih objekata i da na kraju kretanja izdvoji 4 objekta koji su bili mete. Eksperiment je bio podeljen na četiri bloka: (1) objekti su različite boje i oblika; (2) objekti su različite boje i istog oblika; (3) objekti su iste boje i različitog oblika i (4) objekti su iste boje i oblika. Interesovalo nas je da li će ispitanici imati različit procenat tačnih odgovora u različitom bloku, što bi bilo pripisano nejednakim uticajima boje i oblika. Rezultati su pokazali da postoji razlika među ovim blokovim, što znači da boje i oblici nemaju podjednak uticaj na praćenje pokretnih objekata. Međutim, da bi naglasili ove razlike i jasnije ispitali efkat boje i oblika, sproveden je u Eksperiment 2. Zadatak u ovom eksperimentu je bio zahtevniji od prethodnog: ispitanici su trebali da prate 4 mete, a na kraju praćenja od njih je traženo da lociraju jednu specifičnu metu. Tačnije rečeno, tokom praćenja objekata bili su primorani da povedu računa i o identitetu objekta. Zahvaljujući tome što je zadatak otežan, dobijene su izraženije razlike. Oba sprovedena eksperimenta ukazuju na to da fizičke karakteristike imaju uticaj na identifikaciju pokretnih objekata. Osim toga, rezultati sugerišu da dve ispitivane osobine nemaju podjednak uticaj i da je boja ta koja ima izraženiji efekat na uspešnost praćenja pokretnih objekata.

Ključne reči*: pažnja, praćenje pokretnih objekata, boja, oblik*

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