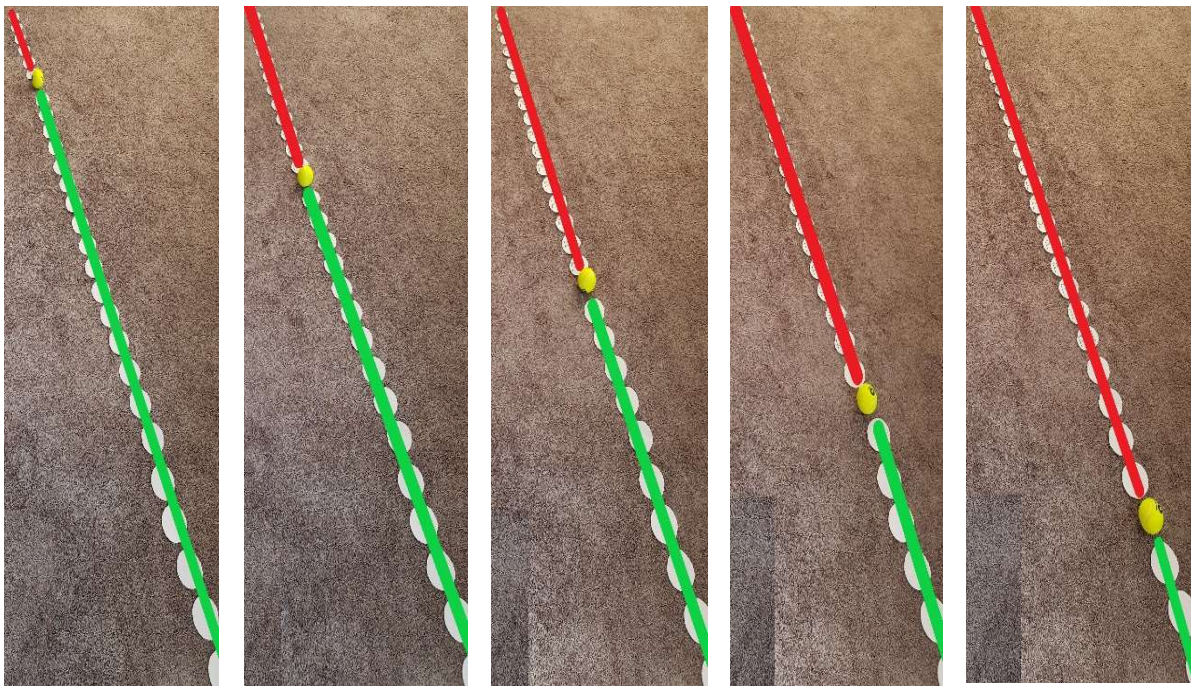# The perception of the sole actual position of an incoming ball solely gets its context within perceptual images of all manifest and latent positions P of the ball


Caught In A Line
The explanatory model of all motoric movement actions

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April 2021 ©

Introduction

The explanatory model of all motoric movement actions encompasses the clarification of all motoric and perception processes at the functional c.q. the behavioural level. The model has been revealed medio 2016 but is poorly understood within science. Due to the fact that the model comprises a complex system that is situated at a remote distance from current scientific mindsets. With a series of very short articles a new effort will be made to elucidate the most important principles of that complex system. This first article encompasses the complete explanation of all factual perception processes in relationship to an incoming smooth spheric ball. Incoming ball trajectory shapes are an essential part within many sports and within science many errors, misconceptions and omissions persevere to exist in relationship to the involved perception processes. Besides this aspect the clarification of an incoming ball trajectory shape will be held as an example for every motoric action because the explanatory model shows, with the strongest ecological argument[1], that any imaginable motoric action finds its origin within the perceiving of three foci which have the same universal objectives[2]. The clarification of the perception processes in relationship to an incoming ball trajectory shape solely encompasses the primary focus within each action which can be characterised as the catch action[3].
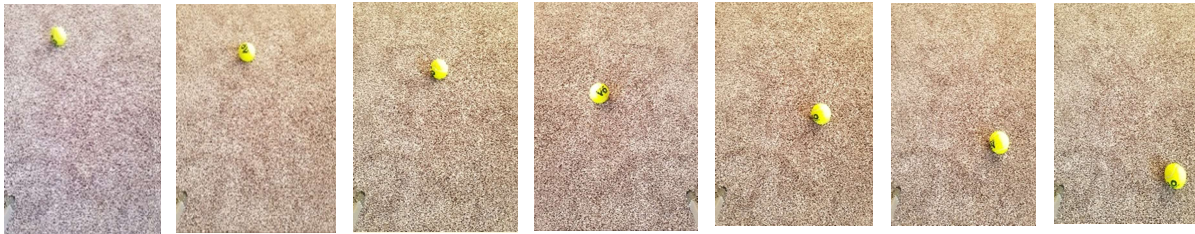
The incoming ball trajectory shape[4]

Within this article the perception processes in relationship to an incoming ball are revealed from the first moment that a ball is released and is autonomously going to fill a ball trajectory shape. It will factually show that the perception of the sole actual position of the ball will solely get its context in relationship to perceptual images of all manifest and future latent positions P of the ball. With other words the unprecedented proof is provided that on the one hand a ball factually takes the first position P within a perceptual image of the manifest ball trajectory shape. This compels already a novum but an even far more revolutionary revelation encompasses on the other hand the fact that the ball also needs to follow or will follow the perceptual image of the action trajectory shape of the still latent positions

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[1] This article shows for example that we are capable to construct a very gross perceptual image of the end of an incoming ball trajectory shape very early in the process and that we only have to adjust this image to more and more precise with each ongoing timeframe. Which fits perfectly in an ecological approach of being an ultimate form of *parsimony* (!). We only have to actually hit or catch a ball at the end of the incoming ball trajectory shape. So in the beginning the perceptual image is allowed to be very vague as long as it compellingly provides *global* direction to future actions. So due to solely this aspect we are capable to act very quickly and do we only have to work c.q. have to perceive more precise at the end of an action.

[2] In order to further emphasize the ecological argument a second article will be published as soon as possible which will be dedicated to the perception processes in relationship to an approaching car. It unfolds exactly conform the perception processes in relationship to an incoming ball trajectory shape and instantly reveals all perception processes involved within all traffic movements. Thereupon a third article will explain all perception processes in relationship to an incoming hand/foot, which also unfolds exactly conform the aforementioned actions, which instantly reveals all perception processes in relationship to all combat sports.

[3] Any imaginable motoric action encompasses a touching process as a consequence of perception processes within 1. a catch action of an environmental object and 2. a throw action sprouting from the animal itself. The catching demands one focus and the throwing demands two foci which leads to the universal conclusion that the execution of any motoric action always compels three attentional foci.

[4] The original videoclip belonging to the shown images: https://www.youtube.com/watch?v=Buws00zLCJI.

sprouting from the manifest part because we are factually capable to construct a perceptual image of that latent part.

Facts and factual consequences

Within the dimensions of our world it is a fact that every manifest or future latent position P of whatever environmental object will sprout c.q. arise out of each other[5]. So that will not be different when a ball is involved and the beginning of an incoming ball trajectory shape can therefore be displayed as follows.

So factually we only see the ball at the actual position P(0) but conversely our perception processes did visually perceive the ball at the manifest positions P (-1, -2, -3, -4, -5 etc.) and accordingly a perceptual image has factually been constructed of a line segment shape. Due to 1. that perceptual image of the manifest positions P of the ball and 2. on basis of cognitive knowledge in relationship to ballistic behaviour (inertia etc.) of a (tennis)ball we are factually capable to construct a perceptual image of the latent future positions P of the tennis ball.

We are capable to execute this by fictitious lengthening the manifest line segment shape because, as explained earlier, factually all manifest but also all future positions of an environmental object are obligatory connected c.q. will have to arise out of each other. Hence we are even capable to make *precise* statements about the *global* progression when a smooth round tennis ball[6] is involved. However a tennis ball can and will deviate randomly at any position P(x). That is shown in the middle of the next

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[5] In relationship to you as a whole human being this factual principle is maintained from the day you were born till the day you leave the world. Each and every step you make will always be connected.

[6] Conversely when an inflated balloon is set loose without being tied up all positions P of the balloon will of course be connected but we will never be capable to make *precise global* predictions of the end of balloon trajectory shape during the initial phase. Due to the fact that the fluctuation boarders of possible deviations are too broad. https://www.youtube.com/watch?v=pLfKxIlIZG4&t=121s

series of pictures with a magnified illustration. However the tennis ball is only capable to occupy very few limited future positions P(+1). Due to solely this reason we are capable to even make very secure predictions about the whole progression of all latent positions of this incoming ball trajectory shape and that is based on the fact of cognitive knowledge concerning ballistic behaviour of a tennis ball. Besides the position P (+1) also the positions P^I (+1) and P^{II} (+1) will be kept open within our visual perception and accordingly also the positions P^I (+2), P^{II} (+2), P^{III} (+2) etc., positions P^I (+3), P^{II} (+3), P^{III} (+3) etc., positions P^I (+4), P^{II} (+4), P^{III} (+4) etc., etc. etc. will be able to arise.

However in spite of the inevitable fact that the tennis ball will deviate from the perceptual image of the still latent positions P it is possible to construct a *precise global* perceptual image of the shape of all future latent positions P when a tennis ball is involved[7] as opposed to many other environmental objects. Within which it is important that you will have to start to see that the term *line segment shape* encompasses two autonomous entities. The exact line can factually never be revealed beforehand because it depends on *future* (!) movements of an autonomous environmental object. Conversely we are capable or we can just try to make a precise prediction of the (future) shape (of the line) within which the ball can and is going to deviate.


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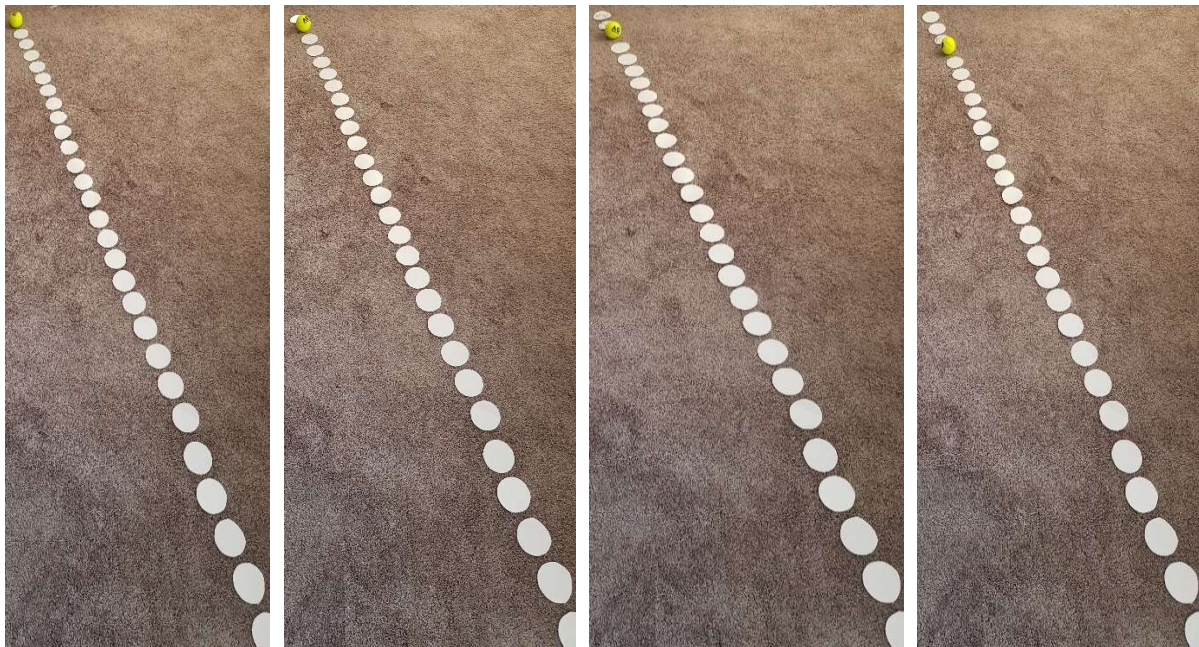
[7] The exact future positions of a tennis ball can never be predicted beforehand. But that is definitely not required. Our perception processes are capable of doing their job as long as the fluctuation boarders of the occurring deviations will remain between certain values. Ergo as long as we are capable to construct a perceptual image of the shape of the action trajectory then we are capable to cope c.q. then we will be able to process the inevitable deviations which will maintain to happen till the end of the action. The processing processes are executed by the cortical streams. N.J. Mol (2020) - (PDF) The cortical streams mediate the grasping of a coffee cup in the exact same way as they mediate the execution of the nerve spiral (researchgate.net)

The perception-action coupling[8]

The next nine images[9] also right away reveal the final explication in relationship to the perception-action dichotomy which still persists within science. You yourself are now capable to very plastically convince yourself that out of the manifest line segment shape a latent part arises perpetually and that the actual position c.q. the perception of the actual position of the ball always marks the exact division. In that way the ball becomes a part of a set marble run[10] of which the shape will remain similar in a *precise global* way and within which the actual position of the ball moves to the next adjacent latent position each ongoing time frame. Or to phrase it differently with each advancing position P of the tennis ball an extra perceptual image of a manifest place will be added and remains one latent position less. The perception-action coupling reveals within there crystal clear that a ball actually occupies the first position of the manifest ball trajectory shape but also that the ball will have to follow or will follow the perceptual image of the still latent positions of the action trajectory shape.

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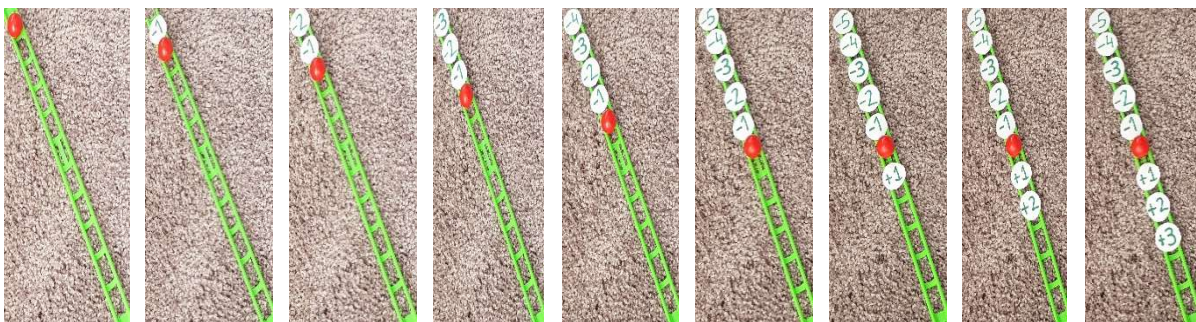
[8] (PDF) The perception-action coupling is an implicit fact sprouting from the way our perception processes observe each past and future actual (!) timeframe (researchgate.net)

[9] For the sake of brevity only 9 of the in total 27 images are shown in here.

[10] The marble-marble run relationship is assessed in many articles. F.e.: (PDF) Not 1, not 2, but 3 attentional foci need to be simultaneously present within the execution of any successful motoric action – The behavioural c.q. functional perception processes within the grasping of a coffee cup. (researchgate.net) and (PDF) The perception-action coupling theory - The Functioning Of The Dorsal And Ventral Stream Within The Marble-Marble Run Relationship (researchgate.net).

So beforehand the exact incoming ball trajectory shape can never be predicted. However if we were only capable to perceive a position of a ball if it actually occupies that space then we would never be able to plan future actions and would it neigh be impossible to play whatever ball sport. That is obviously not the case. In spite of the fact that each incoming ball will definitely create a unique trajectory shape and therefor each time anew will have to be perceived factually within an optimization process we are capable to *preliminary* (!) distill very essential aspects from the shape of the ball trajectory. Additionally two of those very important factual features belonging to the shape will be further assessed. They are of crucial importance in all ball sports.

The direction

The direction of the action trajectory shape already becomes obvious just after a few initial positions P (the initial phase) of the ball. The direction is a crucial feature within the shape of the line and is unveiled when some positions P of the ball become manifest.
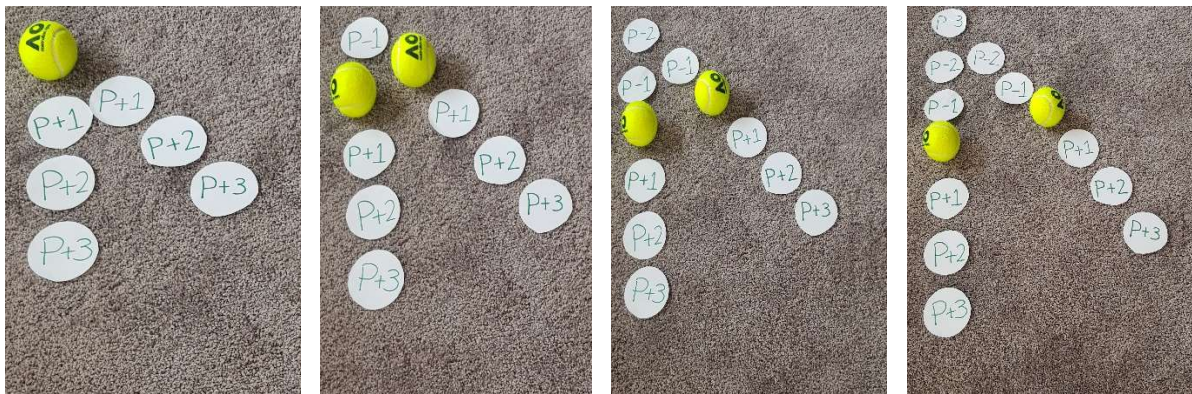
The images clearly show that Roger Federer is already capable to construct a *precise global* perceptual image in regard to the direction of the incoming ball trajectory shape just after three manifest positions Pof a tennis ball c.q. in a very early phase and accordingly this provides the final explication which perception processes are involved within that task. Solely on ground of this information Roger Federer decides whether he sprints to the backhand- or the forehand side because only then an actual intersection point of the incoming ball trajectory shape and the line segment shape of the racket head can be realised.

The *tau*-value c.q. the speed of the ball

The speed or the *tau*-value becomes also apparent very soon after just a few initial positions P (the initial phase) of the ball and if we add this fact to existing cognitive ballistic knowledge[11] in relationship to the specific surface at hand then we are also capable to make a *precise global* estimation of the moment when the ball will arrive at the end of the incoming ball trajectory shape[12]. If you perceive how fast a ball fills the first part of an action trajectory you have developed a sound grip on how the ball will fill the remaining latent part.
The perceiving of the ball actually reaching the end of the incoming ball trajectory shape is enormously important if we want to hit or catch it in that final position P. So in spite of the fact that a lot can be distilled from the initial phase we therefor need to perceive the progression of the ball till the

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[11] Even when a completely unknown surface is involved one is capable to make precise predictions about the deceleration behaviour of the ball after on average three throws.

[12] Roger Federer possesses broad cognitive knowledge about the average speed with which a tennis ball fills an initial phase. With that cognitive knowledge he will approach the initial phase of the next incoming ball trajectory shape and will he be able to *precise global* estimate how he will have to approach the *end* (!) of this next incoming ball trajectory shape.

final end of the incoming ball trajectory shape. The perception of the movement within the initial phase is only capable to provide huge guidance but will never be sufficient in itself.

We perceive the *tau*-value of the incoming ball trajectory shape in two distinct ways. The first type encompasses the perception of how the manifest ball trajectory shape fills the *whole* (!) action trajectory shape. The next images clearly show this phenomenon in which the red line fills the green trajectory. This mainly compels the perception of the manifest part and emphasizes the addition of an extra manifest position of the ball each added timeframe.
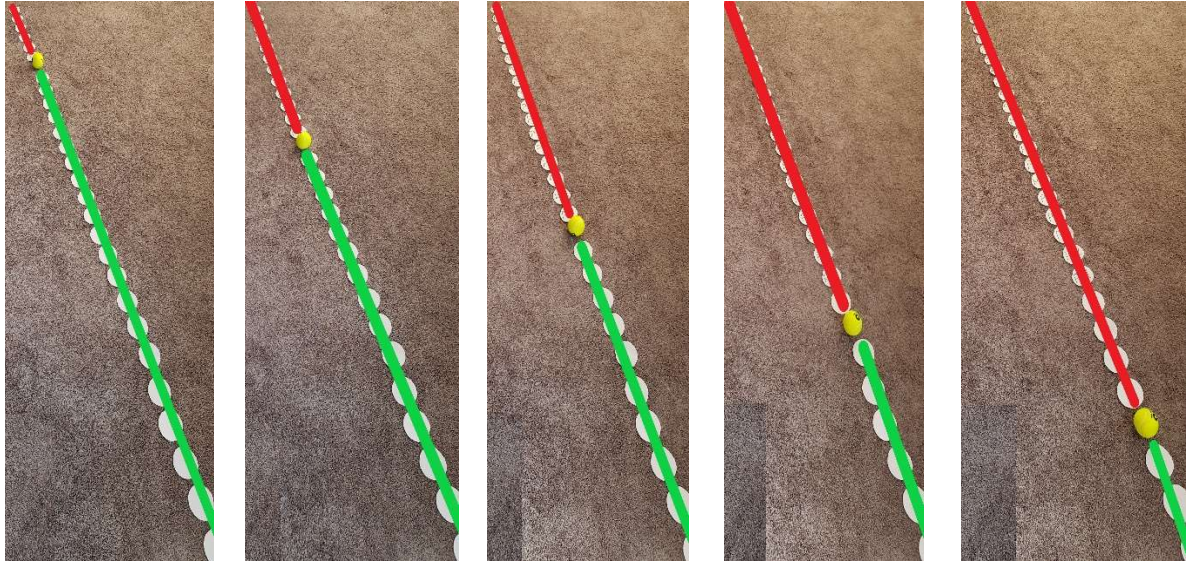
The second type conversely is occupied with the perception of the latent positions P. Within here we mainly perceive how the latent part of the ball trajectory shape disappears. Within the next images the green line dissolves each added timeframe. D.N. Lee called this the disappearing of the gap and it is very obvious that this gap and the according *tau*-value finally dissolves c.q. becomes zero.