Context-dependent and epistemic uses of attention for perceptual-demonstrative identification

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Institut Jean Nicod (CNRS/EHESS/ENS), 1 bis avenue de Lowendal, 75007 Paris, France
nicolas.bullot@college-de-france.fr

Abstract. Object identification via a perceptual-demonstrative mode of presentation has been studied in cognitive science as a particularly direct and context-dependent means of identifying objects. Several recent works in cognitive science have attempted to clarify the relation between attention, demonstrative identification and context exploration. Assuming a distinction between '(language-based) demonstrative reference' and '*perceptual*-demonstrative identification', this article aims at specifying the role of attention in the latter and in the linking of conceptual and non conceptual contents while exploring a spatial context. First, the analysis presents an argument to the effect that selection by overt and covert attention is needed for perceptual-demonstrative identification since overt/covert selective attention is required for the *situated cognitive access* to the target object. Second, it describes a hypothesis that makes explicit some of the roles of attention: the hypothesis of *identification by epistemic attention* via the control of perceptual routines.

1 Introduction

Demonstrative identification has been studied in philosophy as a particularly direct mode of identification of individual objects, since it requires direct perceptual discrimination. In spite of pioneering intuitions of Peirce [1], Russell [2] or Dretske [3], researches in the fields of the philosophy of demonstrative identification/reference and the psychology of attention have, until recently, evolved independently of each other. In contrast to this trend, several recent works [4-10] have attempted to clarify the relation between attention, demonstrative identification and context exploration. Within this collaborative tradition between philosophy and psychology, this article aims at specifying the role of attention in the preparation and performance of demonstrative identification while exploring a particular context. This analysis intends:

(i) To present an argument to the effect that attentional selection is needed for demonstrative identification since focal attention is required for the *situated cognitive access* to the target object in the explored context; in this approach, selective attention is required for mediating our relationships with any explored real context.

(ii) To describe a hypothesis that makes explicit some of the epistemic uses of attention, the hypothesis of *identification by epistemic attention* based on perceptual routines.

2 Perceptual-Demonstrative Identification by Means of Perceptual Selective Attention

According to a plausible assumption, the characteristics of demonstrative identification can be clarified and specified by studying the roles of focal/selective attention[1] during perceptual identification of objects in the currently explored context. One of the main arguments for this claim relates to the concept of cognitive access. It can be expressed by means of the following premises:

Premise 1. The perceptual-demonstrative identification of a token physical object *x* requires (necessarily) to have a situated and cognitive access to *x*'s properties.

Premise 2. To have a situated and cognitive access to the object *x*'s properties, any agent has to (2*i*) bring x into at least one of his or her sensory fields by overt movements (i.e., namely by *overt* attention) and (2*ii*) select *x* by *covert* attention to analyze its properties (and more generally to the cues to which *x* is related).

Conclusion. Hence, selecting *x* by one sensory system and by attention is necessarily required to identify *x* via a perceptual-demonstrative mode of presentation.

The justification for the first premise is derived from a classical (although not universally accepted) characterization of demonstrative identification, conceived of as perceptual-demonstrative identification. Classically, demonstrative identification of a token object indeed corresponds to the act of identification achieved (and which can only be achieved) at the time of the occurrence of the perception of the target object.[2] This act of identification is frequently achieved by, or is simultaneous to, its (egocentric) localization in a perceptual field [13], and in the peripheral space. For instance, I consider primary epistemic seeing in F. Dretske's [3: pp. 72-93] sense and object perceptual re-identification [12: pp. 31-36, 17] as paradigmatic cases of perceptual-demonstrative identification of object (which can occur in perception and thought, outside linguistic communication). This notion is distinct from the general concept of 'demonstrative reference' defined as any act of reference performed by the use during communication of a demonstrative term (cf. footnote 3). On this debatable issue, I will take for granted that perceptual modes of presentation are mandatory for perceptual (re-)identification, but not for all kinds of demonstrative reference in language and thought.[3]

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[1] The expression 'focal/selective attention' traditionally refers to the faculty which is responsible for the different types of selection operating in perception, such as in Treisman's sense [11]. The hypothesis below will propose a further specification of this concept.

[2] This is accepted in the tradition that studies 'knowledge by acquaintance', according to Russell's expression [2: pp. 127-74] – see e.g. P. F. Strawson [12: pp. 18-20], Evans' [13: pp. 143-203] notion of an 'information-link' with an object, Peacocke [14], McDowell [15], Millikan [16: pp. 239-56], Clark [6: pp. 130-63] and Campbell [4: pp. 84-113].

[3] A reviewer of an earlier draft of this article raised the objection that the evaluation of the argument was rendered difficult because of the notion of 'demonstrative identification'. This reviewer remarked that the phrase 'demonstrative identification' could not be equated with the notion of 'demonstrative reference' as understood in semantics and in Kaplan's tradition [18-21]. This difficulty is clarified by the distinction between 'demonstrative reference' and

By definition, the act of perceptual-demonstrative identification cannot thus be effective in the absence of the genuine perception of the target object. In addition, to perceive an object in a veridical or correct way – keeping in view the classical analysis of the concept of veridical perception – requires a perceptual access to the categorical (or causal, intrinsic) properties of the object. This perceptual access (founded on an act of identification) has a *cognitive value* in the sense that it is linked to the cognitive significance of the representation of the object [e.g. 4: pp. 84-113].

The perceptual access is thus at the service of the agent's *epistemic* objectives, such as queries or inferences relating to the target object. Moreover, such an access is *situated* because to preserve the informational connection with the object (so that certain cues or properties dependent on the object are presented in the receiving fields of the agent's perceptual system), the agent must be roughly located in the same spatio-temporal *context* as the object (e.g. the same room or landscape at the same moment), so as to ensure an informational connection. According to this usual type of analysis, demonstrative identification of an object thus requires a cognitive and situated access to the properties of the object.

Premise 2 is more problematic and essential for our assumption. It relates to the problem of explaining the situated and cognitive access or tracking of the object. This problem is studied by several groups of theories, which are often conflicting. The *conceptualist* theories [15, 23-26] and *intentional* theories [27, 28] mainly concentrate on the concept-related and intention-related conditions of the cognitive relation to the object – for example the role of the sortal concepts and speaker intentions in spatio-temporal delineation of the referents. Another class of theories [5, 6, 29-31] favor the study of the *non-conceptual* conditions of the relation to the object – like the non-conceptual contents and the peripheral mechanisms providing sensorimotor access (such as Pylyshyn's [5, 9, 29] visual indices). If an analysis of the cognitive access is completely unaware of the conditions studied by one or the other of these two classes of theories, it encounters the risk of leading to a circular analysis of the cognitive access (which is in this case conceived like a purely conceptual process or purely

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'perceptual-demonstrative identification'. In traditional semantic theory, the notion of 'demonstrative reference' is usually (explicitly or implicitly) defined as an act of reference performed by the use of a demonstrative (or indexical) expression (such as the noun phrase "this/that" and the complex demonstrative "this/that *F*"). As specified above, the notion of 'perceptual-demonstrative identification' refers primarily to the acts/procedures of perceptual/direct identification of objects, which can ground the linguistic use of perceptual demonstratives but cannot be explained (at least according to the present account) merely by referring to linguistic processes. Here I agree with those [4-6, 9, 10] who consider that puzzles about demonstrative contents may sometimes be resolved by a closer examination of perceptual and attentional abilities. The argument explained in the present article mainly intends to start specifying what Evans [13: pp. 143-151] described as an 'information-link' (after Russell's 'acquaintance relation') on the basis of a theory of the epistemic uses of overt/covert attention. Regarding '(language-based) demonstrative reference' in general, one may use a demonstrative or a complex demonstrative without being or having been in perceptual contact with the referent. For instance, as argued by King [22] (but see [21]), the use of the 'that' phrase in a sentence such as 'That guy who scored hundred out of hundred in the exam is a genius' introduces a use of 'that' which does not seem to require perceptual contact with the referent.

sensorimotor account). The interest of research in overt/covert attention is to connect the two types of capacities studied by these two classes of theories [4, 5: 160-61, 19], for there are reasons to postulate that attention is a *mediating* faculty whose function is precisely to articulate non-conceptual conditions (such as the control of eye saccades and sustained fixations [32, 33] and the construction of a visual object file [17, 34] of the target) and the conceptual conditions (such as the reasoning about the target) of cognitive access and perceptual tracking.

Premise 2 formulates this last assumption (mediating attention) by distinguishing *two types of access* relating to the faculty of attention: (2*i*) to bring the target into at least one sensory receiving field (by moving the body, the limbs and the sensory captors in space) – it is a question of motor preparation of the cognitive access; and (2*ii*) to select the target by covert (epistemic) attention to analyze its properties – it is a question of application of attentional analysis capacities to the properties of the object made available by selection. The next sections develop two complementary arguments, providing grounds for components 2*i* and 2*ii* of Premise 2.

3 Part 2*i* of Premise 2: Spatial Navigation, Motor Preparation and the Control of Perceptual Organ

The argument relating to the motor preparation assumes the following form: to have a perceptual access to a distal object, an agent must establish a sensory relationship to the properties of the object/agent or the cues depending relating to this object/agent. However, this relation continuously requires the displacement and the setting of parameter of the perceptual sensors in a manner which is adapted to the spatial and dynamic characteristics of the object (e.g. the occupied place, the shape of the object, its velocity, the type of tracks or clues left by the object) as well as of its context (e.g. the conditions of lighting, acoustic medium, load factor of the space configuration to which it belongs). Consequently, the cognitive access to an object requires us to have recourse to movements of approach which aim at including appropriately the object and its properties in the relevant sensory receiving fields (cf. 2*i*).

This argument is based on the need for the perceptual access (and the acts of identification that it allows) of various classes of body movements. They belong to the behavior directed towards the object, frequently named '*overt*' – i.e. publicly observable, as opposed to '*covert*'.[4] The representations of these movements can be classified according to the reference frames/systems[5] allowing their description.

The motor preparation of the perceptive and cognitive access sometimes requires displacements in space at long distances, which can be represented by reference frames known as allocentric or environmental. For example, an agent can move to go to seek a stationary token object being prompted by the episodic memory which he or she has of having handled it in another area of space than that which it occupies at present. In this case, the description of his or her movement in space is usually made according to allocentric reference frames – e.g. by means of a topographic

[4] Cf. e.g. Findlay & Gilchrist [33] and Spence [35: 232].
[5] Cf. e.g. Milner & Goodale [36: pp. 88-92].

representation mentioning salient landmarks, as in the case of cities' charts or crossed areas. The initial phase of his or her research corresponds to the movements of the bodies made to reach a still imperceptible target (especially if it is about an object which does not emit light). This class of movements unquestionably belongs to the motor preparation of the perceptual access to the target individual, because it corresponds to the combining of the sensory sensors (and effectors) of the target.

When the agent is sufficiently close to the place occupied by the target object, and has a perceptual access to the properties of this object, the representations of his or her body movements relate initially to an egocentric frame of reference. They are movements such as the capacity to move and adjust the orientation of the sensory sensors (e.g. the eyes, hands, ears) in order to scan/scrutinize the properties of the target object, as in the case of the saccades and ocular fixations. For example, the vision of human beings continuously uses more the mobility of the eyes as compared to the other parts of the body, so that the movements of repositioning of the visual axis occur several times in a second, by saccadic movements, in the majority of ordinary actions [32, 33, 37].

In addition to the initiation of certain movements, the motor preparation of the cognitive access rests moreover on the inhibition of certain movements (suspension of the locomotion, modification of breathing). This class of preparatory movements, related to the parameter setting of the sensory sensors relative to an egocentric reference frame, whose goal is to establish the informational connection with the target, depends on attentional capacities – like the ones that have been described since the end of the 19th century – since attentional selection has many motor implications (related as well to the selection of some gestures as to the inhibition of gestures without relevance). For example, James [38: pp. 434-38] supports that the attentional processes include "the accommodation and the adjustment of the sensors". This suit on the motor and overt (i.e., residing in publicly observable body movements) consequences of the attention is found in other authors from the end of the 19th century. In the same way, Sully [39: p. 82] describes attention as an active mode of consciousness that one can expect to find in certain motor process. Ribot [40: p. 3] writes that the mechanism of attention "is primarily motor, i.e. [*attention*] always acts on muscles, mainly in the form of a stop" [40: p. 3]. Among the contemporary theories of this tradition in the field of vision, one finds for example the motor (or pre-motor) theories of attention which analyze spatial covert attention as a process of (overt) movements of ocular saccades preparation [e.g. 41].

Various classes of movements, which are often *necessary* conditions of perception, thus prepare and optimize the perceptual and situated access to an object and consequently its perceptual-demonstrative identification. The component 2*i* of Premise 2 must thus be accepted. However, these motor conditions although necessary are not sufficient to explain cognitive access, because they do not account for the *epistemic* uses of attentional selection. This is why an analysis of the demonstrative identification must also consider the second side of the premise according to which the attentional *analysis* (epistemic) of indices is necessary (and even sufficient) for situated cognitive access.

4 Premise 2*ii* – Need for the Covert Attentional Selection (in Addition to the Overt Selection)

The second component of Premise 2 (maintains) states that (selection leading to) covert attentional analysis is necessary for *cognitive* access (the so-called selection 'for further processing'). This means that the covert attentional capacities (distinct from the overt behavior related to the orientation of the sensors) are selective and epistemic components also constitutive of the *access* to the target for its identification. In spite of the complementary nature of the two components – 2*i* and 2*ii* – it is necessary to distinguish them for the following reasons.

An argument is related to the fact that the presence of the object in a sensory field is a necessary but *not a sufficient* condition for identification. Contrary to the motor preparation via movements and overt attention (e.g. saccades and fixations) which can be partly carried out in the absence of the target, the achievement of perceptual-demonstrative identification requires accessing current information about the target object (and its causal/intrinsic properties) once it is included and tracked *in* a sensory field. One can account for this in a theory of visual attention by saying that one cannot demonstratively identify the target object as long as it is not *indeed* selected by covert attention for further processing. Conditions of stimulation such as presence of the object in the sensory field and supraliminal stimulations of the sensor, by themselves, are not enough to involve the perception and the identification of a token object/stimulus. Indeed, a sense organ can be directed very precisely towards a distal object (providing 'supra-liminal' stimulations) without this object consciously being noticed or identified, like in phenomena such as 'attentional blink' [42], 'change blindness' [43, 44], or 'inattentional blindness' [45] – which we will now consider.

The phenomenon of '*inattentional blindness*' [45], sometimes described as 'sighted blindness' [45: p. 61] refers to the failure to detect a theoretically entirely "visible" stimulus (for example a red square or a moving bar satisfying the sensory conditions of visual perception) when this stimulus is presented in the area of fixation (2° of visual arc). The expression 'inattentional blindness' was selected because this failure seems to be a direct consequence of the fact that the subjects had not paid attention' to the stimulus. According to the authors, this phenomenon could indicate that there cannot be conscious perception without a preliminary selection by attention [45: p. 61]. This is actually the most radical interpretation of the phenomenon, and it remains a matter of debate and controversy [46]. The discovery of Mack and Rock rests on an experimental protocol whose principle consists in putting the observer in a position where he would not pay attention to, nor would he expect to see, the object concerned – called the 'critical stimulus' – but, at the same time, would look at the area inside where it would be presented (figure below).

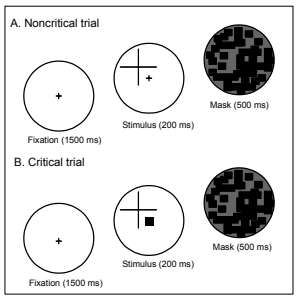

Fig. 1. The experimental protocol related to the discovery by Mack and Rock of inattentional blindness

The experiments within this paradigm rest on the realization of a non critical attentional task during several tests. This task consists in presenting to the subject a cross, one segment of which is longer than the others, and asking the subject to determine which is the longest segment. The cross is briefly presented, and it is either centered at the point of fixation, or in the parafoveal area (figure above). At the third or fourth performance of these tests (this is the critical test), the critical stimulus is presented without any prior indication along with the cross. If the cross is centered at the point of fixation, the stimulus appears in one or more quadrants of the cross and is in a parafoveal area. Conversely, if the cross is centered in the parafoveal area, the critical stimulus is presented at the point of fixation (figure above).

One of the experimental outcomes was interpreted as an effect characteristic of the phenomenon of inattentional blindness. If the critical stimulus was presented at the point of fixation and the cross was centered in one of the four parafoveal areas previously occupied by the critical stimulus (figure above), inattentional blindness increased considerably. For example, a colored spot, which is seen in approximately 75% of the cases when it is presented in a parafoveal way in a quadrant of the cross, is seen only in 35% of the cases or even lesser when it is presented at the point of fixation whereas the cross is located in the parafoveal area.

With other phenomena such as ‘change blindness’ and ‘attentional blink’, in addition to the classical experiments in ‘covert spatial orienting’ [47], inattentional blindness illustrates a case in which directing a sensory organ (in the above example, the eyes and the fovea) towards an object or a property does not imply conscious detection or identification of this object or this property (or more carefully expressed, does not imply the capacity to submit a verbal report on its identification). This relative independence indicates the need to arrive at the demonstrative identification, to have an additional component, which is called here *(focal) attention*.

This work on attention is relevant for the theory of demonstrative identification. It helps to clarify Premise 2 of the general argument, i.e. it helps to specify the nature of the necessary conditions for a *cognitive situated access* to any elements in a context containing several elements. In the example of the experiment in inattentional blindness stated above, the cognitive situated access mainly relates to the properties of the cross to the detriment of those of the critical stimulus. To have *x* in one of one’s sensory fields (*x* determining a supraliminal, durable and relatively stable stimulation) is thus not sufficient to have the benefit of a cognitive situated access to *x*.

Consequently, the presence of *x* in a sensory field cannot even be sufficient to identify *x* in a demonstrative way, since the demonstrative identification depends on the cognitive situated access.

5 A Procedural Theory of the Epistemic Uses of Attention: The Hypothesis of the Foundation of Epistemic Attention on the Control of Perceptual Routines

Here is a summary of the previous argument. To obtain a situated and cognitive access to the properties of the target object, an agent must (2*i*) introduce *x* into at least one of his or her sensor fields and (2*ii*) select *x* by focal attention (covert attention). The justification for 2*ii* relies namely on empirical arguments that relate to the distinction between overt attention and covert attention. A number of examples show that an overt attentional attitude – such as looking toward *x* – does not imply conscious noticing of this x or epistemic processing of *x*'s properties. However, this argument remains purely negative. To explain and justify the role of focal/selective attention in *x*'s perceptual-demonstrative identification, one needs to specify the nature of the epistemic uses of attentional analysis – for the essential characteristic of the perceptual-demonstrative identification is to contribute to the *knowledge* available to the agent of his/her spatial environment (and the individual objects displayed in space). Something that deserves to be called *epistemic attention* may constitute demonstrative identification, but it leaves us the task to make explicit what epistemic attention precisely is. (Here the adjective 'epistemic' is akin to Dretske's use, when he refers to 'primary epistemic seeing' [3] and 'epistemic/meaningful perception' [48] – although Dretske [3, 48] does not explicitly study the contribution of covert attention to epistemic perception.)

The theories that appear to me as being relevant for the study of epistemic attention are the 'procedural theories' – that is, the theories according to which attention is a system that controls the performance of cognitive *procedures* and strategies for exploring the peripheral spatial context. Among the class of procedural theories, I shall include namely works by Miller & Johnson-Laird [49], Ullman [50] on visual routines, by Land et al. [32, 51, 52] on eye movements, by Campbell [4] on attention and reference, and by Pylyshyn [5] on visual reference. In the context of research on attention, one can use the term 'procedural' for referring to the theories that view attentional capacities as being coincident with the exercise/use of epistemic procedures or pragmatic procedures that are dependent on a situation/context of use and a strategy to obtain context- and task-relevant information.

According to this type of analysis, attention uses strategic and exploratory operations that enable the agent to obtain information (typically) on a particular target object or cues related to one object (and often also to constitute a singular representation of this target object). One can give an account of this strategic structure by analyzing focal attention as being dependant on two main components: (i) a set of instructions for the control of bodily or mental events, which can be called *epistemic* queries and pragmatic queries – and (ii) a set of elementary operations called *routines* that allow, according to varied and context dependent combinations, to give an

answer to or to satisfy the epistemic and pragmatic queries. In this framework, the concept of epistemic query refers to the cognitive requests relating to objects (or contents) concerned with the problem which is currently under discussion. The concept of *pragmatic query* relates to the requests (of motor acts) relating to the objects concerned with the action under progress. An epistemic query aims thus at solving a particular problem (related to the action on token/individual objects or the knowledge about token objects), expressed in accordance with a particular spatio-temporal situation and particular goals (cognitive or pragmatic). The concept of *routine* refers to the perceptual or motor elementary procedures that can be used to satisfy or solve the queries (epistemic or pragmatic). I will present an analysis that suggests that attention, as a mediating faculty, seems to be the capacity that organizes the relations between conceptual and nonconceptual routines for identification.

Thus the central assumption of a procedural theory of epistemic attention is that attentional processes can (at least partly) be conceived of as a capacity for effecting epistemic routines, which can be expressed as follows:

Hypothesis of the foundation of epistemic attention on the control of perceptual routines: To select by (epistemic) attention a token physical object *x* implies carrying out epistemic and pragmatic routines that relate to *x*'s properties – i.e. to carry out strategic procedures analyzing cues (or properties) that relate to *x*.

According to this assumption, the theory of attention as routines (mental) effector connects the attentional systems to the control of cognitive operations, (operated) performed at the time of interactions with distal targets, or more precisely on the cues that the distal target offers. The assumption suggests that attentional strategies can be described as a combination of distinct cognitive routines (having a bearing on those cues). Lastly, routines and their combinations are assumed to be necessary in order to constitute a singular representation of the entity involved. (The expression "epistemic routines" refers to the accomplished mental operations starting from information obtained by the mediation of an informational link with the target entity.)

Although the discussion of this point is outside of the scope of the present article, this hypothesis may help build a mediation view [4, 7, 19] based on the reconciliation of the *contextualist* views [53, 54] and the *intentional* views [27, 28] of demonstrative reference. For (i) the (operations) performance of the perceptual and motor routines are strictly context-dependant and conducted for having a bearing on publicly accessible features/cues of the context and (ii) the agents' intentions play a central role for the constructing of attentional strategies, i.e. strategies that aim at tracking down and identifying the target.

In the next paragraphs I will try to show that the appealing character of this assumption comes from the possibility of describing in a coherent way, along with its contents or its predictions, particularly precise mental operations such as perceptual verifications and probing. These two points can be further explained by considering precise examples analyzed according to this assumption. I will consider the example of perceiving abstract and geometric diagrams.

Shimon Ullman [50] develops a procedural theory according to which spatial perception of one or several objects and of their spatial relationships among them and

their parts is achieved by sophisticated visual routines which are built up from more elementary operations, called 'primitive routines'. Ullman's discussion of visual routines focuses on the processes that might be used in analyzing complex properties of incoming visual information, but the concept can be easily extended to include the processes that operate on information provided by other sensory modalities or by memory systems. Ullman [50] suggests that the perception of shape and spatial relations among various parts is supported by sophisticated visual routines that are constructed from a set of primitive routines or elemental operations. These primitives, as well as useful sequences of them which are programmed into more complex routines, are stored in procedural visual memory and used in identifying objects and performing many other specific visual tasks. Ullman suggests five plausible elemental operations and gives a computational analysis of how they might be carried out:

Shifting the focus of processing [50: pp. 123-28]. This operation allows all visual routines to be applied to any location in the visual field simply by shifting the center of processing. It corresponds to changing the position of focal attention.

Indexing [50: pp. 129-35]. Indexing involves selection of a location where something is "different," as in visual pop-out and various pull cues that summon attention.

Bounded activation (or "coloring") [50: pp. 135-39]. Coloring is used to find the interior of a region by spreading activation within its boundaries.

Boundary tracing [50: pp. 139-46]. This operation is used to determine whether two locations are on the boundary of the same object.

Marking [50: pp. 146-52]. Marking a location is an operation that designates it as one to be remembered so that is can be accessed quickly at a later time.

Let us consider the problem 'Is the same curve a secant of two squares?' for the left part of Figure 2 (analyzed in the conceptual framework introduced by Ullman). The visual individuation of the six black squares (let us name them *a*, *b*, *c*, *d*, *e*, *f*) depends on primitive routines which segment salient elements. A complex routine is necessary to determine if a same curve is the secant of two black squares. This routine must make it possible to evaluate as true or false a property such as C_1-*Secant*(*e*, *f*), meaning that the curve c_1 is the secant of the elements *e* and *f*. For example, on the basis of the area occupied by an individual square, the complex routine can include the visual tracking and activation of the two opposite segments of the secant curve of this square. In this way, it is possible to determine if one meets or not a second square on the same curve. This operation of activation, whose latency is longer than that of the visual individualization of a square, is imposed by the density of the grid, the length and the tangle of the curves because these factors prevent the fast individualization of the individual lines and supports their confusion.

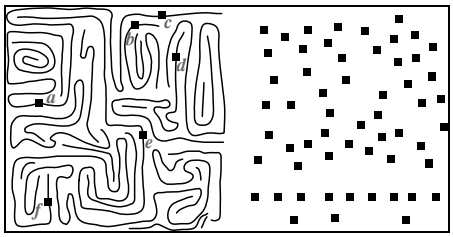

Fig. 2. Left part, Problem of the doubly secant curves: Is one and the same curve the secant of two black squares? Right part, To give a solution to the following epistemic query: How many black squares are being aligned?

These examples make it possible to specify why the study of epistemic attention – conceived as effector of perceptual routines (visual, auditory and others) – should contribute to the comprehension of the relation between the conceptual contents and the non-conceptual capacities and contents of perception during target demonstrative identification. Initially, there is no reason to doubt that the preceding epistemic queries can be expressed by conceptual contents, and can be communicated by linguistic statements like those stated above for presenting the problem. The understanding of the problem requires for example the possession of the concept of secant curve. The question under discussion relates to the status of the routines and contents which make it possible to check by visual experience of the image a predicate such as C_1-*Secant*(*e*, *f*). Let us accept for the sake of argument the description of the proto-propositional contents given by Peacocke [55: pp. 74-90]. Within the conceptual framework of Peacocke's theory [55], the assembled routine enabling us to evaluate the predicate C_1-*Secant*(*e*, *f*) is probably an operation constitutive of the proto-propositional contents of the visual experiment. Indeed, this routine requires the capacities consisting in tracking visually and continuously a curved line, to detect the distinctive properties of the squares and intersection between the line and a square (e.g. occlusion of the line by another form, presence of two 'T' junctions). This assembled routine thus seems able to take into account at the same time the difference between two specimens of individuals (this square here and this square there, this secant curve) and of the relevant properties to detect some of their relations (to be a square, to be black, to be a long curve, to be secant of) – the latter characteristics are specific to the proto-propositional contents of Peacocke's view [55].

Lastly, it is plausible to consider that this assembled routine operates by means of elementary routines which are not conceptual, as for example the routine which makes it possible to carry out the continuous tracking of a single curve without the error of 'sliding' onto another curve (this capacity is controlled by the spatial properties of a singular layout and the taking into account of such spatial properties does not depend on the possession of the general concept of curve). From the assumption of these hypotheses, the following conceptualization is thus plausible. The evaluation of the predicate C_1-*Secant*(*e*, *f*) requires that we make use of the non-conceptual routines which are at the service of the resolution of an epistemic query formulated (or capable of being formulated) conceptually. To explain how the

perceptual experience (or information processing performed by a perceptual system) gives a solution to a conceptual query, or verifies an observational proposition, is to understand how the conceptual query is articulated with non-conceptual routines which provide access to the relevant information to answer the query.

Similar analyses could be developed for the right part of Figure 2, from the moment when one seeks to solve the epistemic requests mentioned – to count aligned squares. The ability to count the collinear elements is supposed to determine if the property of colinearity applies to a class of elements selected at a given time. But to evaluate this property, the possession of the conceptual definition of colinearity as "located on the same line" is not enough, it is necessary in addition to lay out "see" and select the elements of which one seeks to know if they are located on the same line and for this reason it is necessary to plot by imagining a straight line or detect the totality of elements through which it can pass. Similar analyzes can also be developed for the perceptual analysis of spatial arrangements of 3D-objects. For instance, experimental researches on eye movements have been conducted with similar ideas by Ballard et al. [37] and Land et al. [32, 51, 52].

6 Conclusion

This article has described some of the epistemic uses of attention in the preparation and performance of context-exploration and perceptual-demonstrative identification. It has been shown that selective attention is required to obtain context-dependant knowledge about individuals. Attentional selection is needed for perceptual-demonstrative identification since selection by overt and covert attention is required for the situated cognitive access to the target object. In the present approach, selective attention is required for mediating our relationships with any explored context or situation – metaphorically, demonstrative identification seems to be based on the 'attentional navigation' through the spatial layout of physical objects. Finally, the procedural theories of perceptual and selective attention may be appropriate for the understanding of the epistemic uses of attention in context exploration.

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