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Taking the Second-Person Perspective

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SYSTEMS FOR THEORY-OF-MIND: TAKING THE SECOND-PERSON PERSPECTIVE

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Abstract

Apperly's and Butterfill's (2009) theory about belief reasoning is taken as a starting-point for a discussion of how we make sense of other people's actions in real time. More specifically, the focus lies on how we can understand others' actions in terms of their epistemic states on an implicit level of processing. First, the relevant parts of Apperly's and Butterfill's theory are summarized. Then, their account of implicit theory of mind in terms of registration ascription and perceptual encountering is discussed and rejected. While accepting Apperly's and Butterfill's general epistemic account of belief reasoning, I suggest that implicit theory of mind involves visuomotor, second-person pragmatic representations. Moreover, I emphasize the central place of interaction, claiming that perceptual intentions-to-interact are fundamental to social understanding. Via the mechanism of social attention, social intentions automatically prompt agents to share and exchange sensorimotor, pragmatic information.

Keywords: pragmatic representation, social intention, social attention, implicit theory of mind, registration ascription, embodiment, social understanding

I. APPERLY'S & BUTTERFILL'S TWO SYSTEMS FOR THEORY-OF-MIND

Apperly and Butterfill (2009) maintain that behavior manifests belief reasoning if it is beneficial to the agent in virtue of facts about the beliefs of other agents. They hold that there are two cognitive systems for processing others' epistemic states: the belief-ascription system and the registration-ascription system. The systems are individuated by function as opposed to levels, and exist side-by-side. They make different and complementary tradeoffs between flexibility and efficiency.

The belief-ascription system is characterized by flexibility. Flexible reasoning is what we expect from human adults who reflect about the contents of thought and can assign different psychological roles to a variety of mental states. Flexibility entails explicit processing that is subject to strategic control, and allows for abstraction and complexity. Such processing is costly, effortful, and slow.

The belief-ascription system enables the ascription of beliefs, desires, and intentions in propositional form. It enables prediction of future actions and explanation of past behavior by inferential reasoning about mental states. It yields reason-giving, normative explanations of action: A true explanation reveals how an agent's actions are reasonable, or rational, given her beliefs and desires. The system has a complex causal structure, and its processing relies on abduction and inference to the best explanation, which means that in principle there are no restrictions on what might be relevant to the best explanations.

The registration-ascription system is characterized by efficiency. The processing is implicit, and the processes unavailable for strategic control: They are cognitively impenetrable and informationally encapsulated (cf. Pylyshyn, 1999). The processing is fast, cheap, automatic, and robust.

The registration-ascription system ascribes registrations, i.e., representations of perceptual encounterings. An encountering consists in the conditions under which an object is

perceived, and relates the agent to an object and a location (A-O-L). Thus, registrations concern objects and their perceivable properties and location. Registrations are belief-like states in the sense that they make an agent's actions sensitive to information that no longer is present to the agent. They have correctness conditions that, in case what was seen no longer obtains, may not be achieved. Reasoning about registration is limited in ways that are arbitrary with respect to the nature of belief and inexplicable by variations in learning history or the capacity of general processing resources.

According to Apperly and Butterfill, registration-ascription allows for anticipating behavior and guides on-line social interaction and communication. It identifies the enabling conditions for action, viz. the conditions under which an object is perceived. Furthermore, it yields robust predictions. Thus, registration ascription allows an observer X to predict the action of agent Y based on Y's registration of what Y is seeing or has seen. However, it does not support Level 2 cognitive perspective taking between *what* object another agent represents and *how* that agent represents the object.

II. DOES REGISTRATION ASCRIPTION ENABLE EFFICIENT PREDICTION OF ACTION?

The question to which we now turn is whether registration ascription really can explain efficient theory of mind, given the conditions for efficiency and robustness that Apperly and Butterfill present. The information represented by a registration must be specific enough to enable accurate predictions and ensure robustness, but not more specific than the situation requires. If excess information cannot be avoided, efficiency will decrease. For similar reasons, to determine action and smoothly guide on-going interaction, the information needs to be unambiguous.

At first sight, it seems that generally, a great number of actions are possible for an agent relative to an object-at-a-location. Consider the following two examples:

(1) A man is standing at a platform at Paddington station while an incoming train is approaching. Why? Is he waiting for somebody to get off, getting on the train, going to kill himself, or perhaps train-spotting?

(2) A woman is having a glass of juice in a juice bar. Why? Is she thirsty, meeting somebody, just killing time, or perhaps waiting to pick up a man?

It does not seem that registering the encountering — the object and location that the agent is causally related to in the observed situation — helps us either predict or explain the observed behavior. This might lead one to think that these examples concern the wrong level of resolution. However, they seem to be on the same level as Apperly's and Butterfill's own examples. Their examples mostly concern the behavior of young (human) children and nonhuman animals. Yet, they concern pragmatic, instrumental actions of the same kind as those exemplified above, viz., simple everyday actions that are registered and grasped on-the-fly by observing the situation at hand.

In the above examples, there is no information to be had about the mental states of the agent. Is the reason why we cannot explain their behavior that this kind of behavior nevertheless requires the attribution of mental states like belief? On Apperly's and Butterfill's theory it might seem so: If registrations are not sufficient, reasoning about belief is what remains. In the examples, a representation of the mere perceptual encountering clearly does not suffice to do the job.

Yet, we encounter such situations all the time in daily life and directly perceive their meaning without having recourse to reasoning about hidden mental states (Gallagher, 2008). They just strike us as meaningful and we know how to react on them and predict what will happen next. This means that basically, social understanding is a skill. Below, I will

argue that normally we do not need to attribute mental states to agents to understand their behavior in everyday interaction, but situations such as in the two examples divulge a certain type of information that Apperly and Butterfill do not consider in their theory and that enables social understanding without mindreading.

Another factor that seems to play an important role in Apperly's and Butterfill's theory, but they do not explicitly take into account, concerns the nature and type of situation in which a given action takes place. Given that contexts of an action extend over time and consist in qualitatively rich environments, knowledge about the type of situation in which an action occurs effectively can help narrow down the number of alternative interpretations of the action. For instance, Apperly and Butterfill discuss the food caching behavior of scrub jays. A single action that can be identified as belonging to a heterogeneous category of action types such as food caching, and, in addition, occurs embedded in a series of actions over time of that same type, will be easier to grasp than one that is perceived out of context, as it were, from an external, third-person point of view.

In the flow of events that constitute everyday life, we seldom stop to ponder what other people are doing but react to their actions in passing. In the two examples above, the observer has access to the situation at a given point in time, not to a series of actions over time. He or she perceives a snapshot of a scene and that is the information available for responding (including avoiding to engage with the other agent). One way of explaining how perceivers disambiguate the observed action in such situations may be to consider the object of action as selected-for-action (Allport, 1987). Such an explanation would be compatible with Apperly's and Butterfills' account. It would mean identifying the object by external cues that relate to the agent's overall goal as observed in the physical context. Then the object itself might serve to predict the ensuing action.

Unfortunately, for an observer to identify the relevant cues of another agent requires knowing what cues to look for and how to look. The problem in the examples is exactly that the observer does not know the agent's goal, neither how to identify it. Having identified the object as such (the train, the glass of juice) is not sufficient. For instance, what in the observed situation seems salient to the observer may not be so to the agent, who, first, has another vantage point than the observer, and, second, does not even share the recent history with the observer. To conclude, it seems that in its present form the notion of registration ascription cannot explain action prediction in efficient systems, mainly because the information that registrations provide is too meagre.

III. A NON-COGNITIVIST ALTERNATIVE

de Bruin, Strijbos, and Slors (2011) present an interesting alternative to the theory of registration ascription that takes the theory of social understanding in a new direction. They argue that in view of the evidence about young infants' performance at false-belief tasks (cf. Onishi & Baillargeon, 2005), it is not clear that such performance requires the ability to process belief-like states with a mind-to-world direction of fit. Instead, they suggest re-conceiving 'encountering' in terms of sensitivity to the affordances of objects to other people. This would explain how infants understand the actions of others without having recourse to internal, belief-like representations.

We can think of affordances as actions that the object invites the perceiver of the object to perform and that are picked up directly by the perceiver while interacting with the object. To exemplify, an infant perceives the affordances of an object-at-a-location (e.g. a ball in a box) for an observed agent. This causes the implicit ascription of an array of possible actions to the observed agent, e.g., reaching, looking, pointing, touching. The set of actual

affordances is determined as a function of the location and the visual perspective of the agent — in terms of what the observed agent actually can see.

However, it is not clear that this suggestion resolves our problem. It seems that there still are too many options left for the observer to predict the action of another agent with efficiency. An object-at-a-location still may afford a range of actions, and which action affordance is at stake in a given situation cannot be determined by mere disengaged observation, even if the other agent's visual perspective is acknowledged.

Again, knowing the wider or extended context of action might help to determine whether the observed agent will, say, point to or grab the ball in the box. Gallagher and Marcel (1999) argue that contextualized actions or activities such as drinking at a meal or washing dishes involve a pragmatic significance or purpose relative to the agent. A socially contextualized action is one where the action has meanings defined by cultural categorizations and represent states of the self in regard to others. Very likely, contextualization facilitates explicit recognition of others' epistemic states and underlies informed or robust guesses about what other people believe. On the other hand, in the two examples we have been considering, contextualization is incomplete for the observer, in the sense that first, the observed action is not embedded in a series of actions over time, and second, the observer is not implicated in what the agent is doing.

de Bruin's et al. (2011) hypothesis is plausible for explaining action understanding in infants who have a limited experience of the world and a restricted understanding of what it may afford to others. The limited action repertoire of infants enables them to understand pertinent action types and simply neglect those they do not recognize. However, it is doubtful that de Bruin's et al. theory can replace Apperly's and Butterfill's explanation of implicit theory of mind, which is supposed to explain action understanding in adults too. In the examples above, that concern human adults in typical adult environments,

the alternative ascriptions of action rely on a wide context that the notion of affordance cannot determine with sufficient exactitude to satisfy the demands for efficient processing.

A drawback of de Bruin's et al. suggestion is that substituting registrations for affordances will not provide an explanation in terms of epistemic norms or correctness conditions. Affordances are properties of the environment. This means departing from the general framework of Apperly's and Butterfill's theory. An important issue concerns whether we can have a normative explanation while at the same time rejecting a cognitivist account of implicit theory of mind. I will claim that we can.

de Bruin et al. (2011) criticize Apperly and Butterfill for not acknowledging infants' intersubjectivity. They point out that modeling early social cognitive capacities in terms of associations between agents, objects, and locations reduces the infant's perception of other people to the perception of moving objects. Yet, infants do not treat other people as moving objects but as intentional systems in their own right. To accommodate this intuition de Bruin et al. articulate a notion of association that goes beyond merely perceiving spatial-temporal contiguity between agent and object, and propose that infants treat other people as minded beings in the sense of appropriate responders to affordances.

Although de Bruin et al.'s suggestion avoids their objection to Butterfill and Apperly's theory, it is not clear that it fully acknowledges infants' intersubjectivity. They still conceive of social understanding as essentially third personal and passive with regard to the agent. However, perception of affordances is by definition active (Gibson, 1979) and requires engagement with the target (agent) relative to whom the observer is tracking affordances. Affordances are picked up in interaction. It is a moot question whether the passive observation of another person relative to an object would allow for picking up the affordances of that object for that particular person. Moreover, it would seem that proper social

understanding would require the attribution of social intentions rather than instrumental ones. These matters are discussed further in the next section.

IV. INTENTIONS-TO-INTERACT ARE KEY TO EXPLAINING IMPLICIT THEORY OF MIND

Apperly's and Butterfill's theory has some surprising features for a theory of social cognition. Most notably, the belief-ascription and registration-ascription systems both take a third-person approach to other minds. The minds of other persons are represented from an observational, detached stance. Yet, engagement has been shown to be central to social cognition and communication in human adults as in infants (Brinck, 2008; Brinck & Liljenfors, 2013; de Jaegher & di Paolo, 2007; Reddy, 2008, Reddy & Morris, 2004; Schilbach et al., 2013).

Registering a perceptual encountering reminds of observing a painting hanging on a wall from a fixed vantage point: The representation the observer extracts from the world is static and kept at a distance. There is no on-going process in which the action or event is embedded, no interactive context in which it unfolds, just the object-at-the-location. By analogy to a snapshot with a low resolution, this causes a problem of impoverished information for the observer that makes it very hard to see how agents can act efficiently on information about other agents. We live in a dynamic world where action and perception takes place in real time. Consequently, the third-person approach appears wrong — at least, to fast and frugal, implicit cognition about other minds. Pragmatic everyday interaction is based in intersubjectivity.

Indeed, neuropsychological research provides evidence that social cognition is fundamentally different when interacting with others and when merely observing them (Becchio, Manera, Sartori, Cavallo, and Castiello, 2012; Schilbach et al., 2013). For instance, Becchio, Sartori, and Castiello (2010) review recent experimental studies testing whether it is

possible to differentiate the kinematics of an action performed by an agent acting in isolation from the kinematics of the very same action performed within a social context. The results indicate that social context shapes action planning and that in the context of a social interaction, flexible online adjustments take place between partners.

Counter to what Apperly and Butterfill maintain, it will be argued below that embodiment proves central to understanding other minds. The processing of others' epistemic states depends on information about face, body posture, movement, and physical action. Furthermore, the research suggests that modeling registration ascription as a form of social interaction, and not merely social action, can explain implicit theory of mind, in human adults as in infants and possibly nonhuman primates. For instance, bodily coordination, synchronization, alignment, and complementary action with others improve social understanding. Implicit and non-conscious interaction induces computation of others' mental states as responses to and predictions from one's own states and can enhance the direct perception of others' mental states.

Recent studies in neurophysiology and neuropsychology show that interaction based in sensorimotor processing enables agents to exchange pragmatic information that is not available or accessible in non-interactive contexts (cf. Becchio et al., 2012). In the absence of contextual information, intentions translate into differential kinematic patterns that reveal what the agent has in mind to do and determine how the observer should act in response.

Putting the emphasis on instrumental intention, i.e. the intention-to-act, imports a third-person perspective into the theory of social understanding. I suggest that social intention, or the intention-to-interact, based in sensorimotor processing, is key to explaining implicit understanding of others' behavior. Social intentions emerge through social attention (Schilbach et al., 2013). Agents start producing social information about their own behavior

and object of action when other agents direct their attention towards them, as manifested in, for instance, gaze, head turn and orientation, facial expression, body position and movement.

Interestingly, the observed agent does not have to be consciously aware of being the target of somebody else's attention to do so (Becchio et al., 2012). Social intention automatically makes otherwise inaccessible information accessible to the agent who is attending to somebody else, such as motor or pragmatic properties of an object via the other agent's movement relative to the object. Crucially, instrumental intention, or the intention-to-act, with the attention directed towards the object of action and not also at the other agent, does not result in these effects.

Social intention in the guise of other-directed attention has the effect that agents, without being aware of doing so, make themselves interpretable to others and get ready to interpret those who are attending to them. Mere coordination of gaze in parallel to a target activates brain areas geared to interpret other agents socially and inferentially-pragmatically (Gangopadhyay & Schilbach, 2012). This causes spontaneous computation of others' belief-like states. The presence of social agents who manifest their interest via attention suffices to trigger automatic online computations of others' beliefs based on what others are experiencing (Falck, Brinck, & Lindgren, in press). Thus, in a visual object detection task, participants' beliefs and the beliefs of an agent that were irrelevant to performing the task both modulated adults' reaction times and 7-month-old infants' looking times (Kovács, Téglás, & Endress, 2010).

Not only does the presence of cues to attention (gaze, head, body orientation) lead to spontaneous computation of what others see. The presence of other humans triggers spontaneous perspective taking, consisting in a change in the spatial coding of visual events and computation of how others see what they see (Becchio, Del Giudice, Dal Monte, Latini-Corazzini, & Pia, 2013). Böckler and Zwickel (2012) submit that when holding different

spatial perspectives, people may not merely represent that the other sees the object or scene differently, but also how the object/scene looks for the other, something that apparently takes the observer beyond Level 1 perspective taking.

In a series of three visual perspective-taking experiments, Samson, Apperly, Braithwaite, Andrews, and Bodley Scott (2010) asked adult participants to judge their own or someone else's visual perspective in situations where both perspectives were either the same or different. The participants had difficulties ignoring what someone else saw when making self-perspective judgments. This was observed even when they were required to take their own perspective only.

Thus, perceivable intentions-to-interact change the quality and the quantity of information flow between subjects. Social interaction influences action planning on the motor level and cause agents to make flexible online adjustments for the benefit of others (Becchio et al., 2010). The intentional processing of others' gaze influences object processing and imposes motor, affective, and status properties that the object does not carry intrinsically and go beyond its chemical or physical structure (Becchio, Bertone, & Castiello, 2008). Importantly, motor information conveyed by visual kinematics can provide a direct access to others' intentions. Movement and hand shape reveal what object will be grasped and why (for what purpose). This means that they reveal the agent's prior intention to act (Becchio et al., 2008; Becchio et al., 2012).

V. SECOND-PERSON PRAGMATIC REPRESENTATIONS

On the view defended here, because social attention automatically generates social information, the problem does not arise how observers can access the information needed to predict others' actions. Social information is rich and shared, directly accessible in real time. This explains how an observer can understand another person's actions without reasoning

about beliefs, in cases like the two examples above. Given that the agent registers that he or she is being observed, even if not consciously aware of being so, this will make him or her perform his or her actions in a manner that is tuned to the observer, to enhance the observer's understanding. Consequently, information about the agent's intentions automatically becomes available for others.

However, an important question remains to be dealt with: If we want to give an epistemic account of social understanding, how do we get from the present account of implicit theory-of-mind in terms of social attention and sensorimotor intentions-to-interact to an explanation in terms of belief-like epistemic states? Epistemic states need correction conditions and so, in some sense and to some extent, need to reflect information about the environment, viz. how the agent perceives its surroundings.

To this end, I suggest that we replace Apperly's and Butterfill's notion of an object-at-a-location by Jeannerod's (1994; 2003) notion of a pragmatic representation of an object relative to the agent. Pragmatic representations represent object attributes as affording specific motor patterns, in contrast to cues for a given perceptual category. Their functioning is implicit and they have an unconscious nature, relying on pragmatic processing in the early vision system. They do not require binding attributes to a single entity, but are dynamic, transient, and cheap.

The notion of pragmatic representation is richer than that of a perceptual encountering. Furthermore, it can be used to explain how interacting agents encode each other's action goals and so can predict each other's actions within the framework defended here. We can still talk about registrations, now thinking of them as second-person pragmatic representations the contents of which are adjusted to make them accessible for observers. Notice that the agents do not need to be engaged in joint action or be consciously aware of exchanging social information. It is sufficient that they attend to each other implicitly to

divulge the information necessary to enable second-person pragmatic representations, i.e., about another agent's motor intentions.

To summarize, one important difference between the present view and Apperly's and Butterfill's as well as de Bruin's et al. accounts concerns taking the second-person perspective. According to Apperly and Butterfill, the observer registers an object-at-a-location relative to another agent, whereas on de Bruin et al, the observer perceives the object affordances available to another agent. In contrast, the present view emphasizes that the observer registers the other agent's pragmatic representation, enhanced and tuned to the observer. This is Jeannerod with a twist: intersubjective pragmatic representations.

VI. CONCLUDING REMARKS

On the view defended here, registrations are pragmatic representations that have social content as a result of social attention's automatically triggering social intentions in agents who are attended to. Social intentions are other-regarding. Pragmatic representations encode both the properties of the visuomotor system that are used for optimization of the movement execution and properties of the object that are relevant to potential interactions with another agent, according to his intentions or needs such as shape and size, texture and estimated weight, location, and orientation with respect to the body (Jeannerod, 2003). Thus, the representation of object properties interacts with motor factors, such as the biomechanics of the arm, for defining the final pattern of the movement.

An important idea of Apperly's and Butterfill's account concerns the epistemic status of registrations — that they can be mistaken, at least in the sense that they make an agent's actions sensitive to what may no longer be the case. This means that they linger in the system after the visual scene has changed, and the agent acts on the registration instead of directly the external context. Because it makes use of the notion of representation, of a

fleeting kind that nevertheless can stay active or be re-activated although the external scene changes, the present view preserves Apperly's and Butterfill's idea that registrations are belief-like and have correctness conditions. de Bruin et al. (2011) seem to imply that representations only can have a mind-to-world direction of fit on a purely passive, observational and disengaged understanding of the notion of representation. We now see that this is wrong.

According to Apperly and Butterfill (2009), a correct prediction shows how an agent's action is enabled by the agent's registration of the conditions under which the target is or was seen. On the present account, a correct prediction shows how an agent's actions are enabled and reliably caused by his or her pragmatic representations. The observer makes sense of another agent's behavior by attributing pragmatic representations to him or her.

Social intentions are fundamental to social understanding, because via the mechanism of social attention they automatically prompt agents to share and exchange information. The notion of "making sense" of somebody else's action here is re-defined in terms of the practical ability to interact fluently in a particular situation (cf. De Jaegher and Di Paolo, 2007). Higher-level, intentional belief reasoning is modulated by but also influences second-person interaction that depends on sensorimotor processing and a dynamic perception-action mechanism operating on an implicit level of cognition (De Jaegher & Di Paolo, 2013).

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