

# Daisy-Chaining & Berry-Picking: Trajectories in “Planned” & Situated Wayfinding

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Analyses of the contexts of embodiment [2] may benefit from a perspective sensitized to “trajectory” [1] to accommodate interactions between moment-to-moment experience and issues emerging longitudinally during situated interactions with places. “Trajectory” is useful for describing aspects of activity and situated dependencies that emerge as activity associated with places progresses. The concept may also contribute to understandings of relations between pre- and post- situated and situated experience and/or interactions that may be obscured by a solely task-centric frame [e.g. 3]. Here, we first rationalise applying trajectories to the multi-faceted mosaic of situated interactions with information that occur during wayfinding. Then we describe two metaphors, derived from in situ data, that encapsulate important aspects of trajectories in wayfinding by referring to linear and non-linear relationships when people acquire and use information. So, we apply the concept of trajectory to evolving action and interactions emerging from traversal through physical space. We use the metaphors to interpret a diversity of temporally evolving interactions and dependencies bearing upon embodied interaction during wayfinding. We suggest the metaphors enable the application of the trajectory perspective to the design of systems supporting this activity and, specifically, enable researchers to transparently articulate their references between activities and the situations of embodiment.

Reflecting on the conceptual frame for analysing “couplings” between bodily movements, perceptions, conceptions and physical objects in wayfinding has value in contemplating embodied interaction since wayfinding is a pervasive activity in both familiar and unfamiliar places. The cognitive, behavioural and phenomenal roles of landmarks in enabling wayfinding [4,5,6] are a base for an embodied interaction perspective yet, successfully informing design with these understandings remains notoriously difficult. Gathering situated data is essential but enumerating and articulating all potential interactions is implausible. A trajectory perspective on wayfinding may enable accommodating interactions obscured by a task-centric frame and/or relations between pre- and post- situated and situated experience. People’s reality in the physical world reciprocally shape spatial relations communicated between people. For example, the meaning and salience in external representations has a dynamic, dependency with the information people encounter in an environment and their contextualisation of this by many goals associated with their wayfinding. Mutually, people’s situated wayfinding and interpretation of place is mediated by represented spatial relations. For example, users interpret the physical world in terms of the content and form of an assistive navigation device’s virtual representations [7]. Singularly task-centric approaches cannot address the paradox of linearity, when people plan navigation and communicate wayfinding information and, non-linearity when people accumulate information related to wayfinding with less explicit goal-orientation. Communication, parsimoniously, abstracts and linearises information experienced in the world. For example, when people plan navigation and communicate wayfinding information their route *descriptions* structure salient landmarks chronotopically. Like spatial *depictions* (e.g. maps) the temporal patterning of information becomes subsumed and they “*miss what was: the act itself of passing by*”... “*only a relic set in the nowhen of a surface of projection. Itself visible, it has the effect of making invisible the operation that made it possible. These fixations constitute procedures for forgetting. The trace left behind is substituted for the practice*” [8:97]. Thus, for example, maps and brochures influence “global” goals (e.g. sight-seeing) in terms of tourists’ destinations when exploring cities [9] and national parks [10]. Similarly, dependencies emerge for more temporally evolving, immanent goals embedded in wayfinding. Here we propose that analysis of finer granularities adds to previous application of trajectory which tends to be over extended periods with less emphasis on movement through physical space [11].

We derived two metaphors, indicative of trajectory, to address dichotomies arising in our empirical research on wayfinding in situ. In doing so we attempted to use the concept of trajectory within a design process to construct narratives. Here, we seek to explore how these metaphors capture and describe particular aspects of trajectory and speculate upon their applicability to wayfinding phenomena. The metaphors, elaborated elsewhere [12], relate to linearity in deliberately or serendipitously acquiring and using information. Trajectory captures the actions and interactions contributing a particular coherent sequence of goal-driven action and unfolding, situated actions and “plans” that contribute to a less explicitly goal-driven course of action. A metaphor of threading daisies together concerns experiences in the world and representations which yield a coherent planned and/or recalled sequence of information items salient to following a route. Differences between information described from memory and in situ (e.g. [13]) suggest that salience en route differs, qualitatively, from salience for recall. Daisies are strung purposively and linearly along chains which inherently omit spatial context tangential to a specific path. The pattern emerging in the chain reflects selecting daisies according to global or immanent goals in situ and dependencies between consecutive daisies. Thus, like the meta- and structural information contained in people’s route guidance [14], the pattern in a daisy chain expresses a navigation task. Daisy-chains compare with the “pragmatics of forgetting” [8] (or recounting) which omits

from a narrative those very things enlivening a journey in situ. However, simultaneous to acquiring information salient to a route people harvest information items that are tangential to the goals of their current path. We conceive of accumulating information from the myriad of spatial context arising in momentary experiences as plucking berries from bushes here and there, reactively and concomitantly, without purposeful linearity. Some of the berries are reflected upon (e.g. being aware of a sign-post to a place that is subordinate to landmarks more salient to a current route but relevant to another route at another time). Other berries arise in unreflective, “thrown” [e.g. 15] interactions which are invisible in contrast to the exceptions upon which people reflect (e.g. avoiding yet not attending to minor obstacles when walking).

Daisy-chaining and berry-picking were derived to depict: deliberate and serendipitous information gathering during wayfinding; coupling with situated communication and action; cumulative use in pursuing global goals; and, retrospective recall. For example, the recipient of guidance “turn left at the local shop” deliberately gathers environmental information which relates to their own experiences and interpretations of their informer’s experience to distinguish the shop. Simultaneously, they acquire information (e.g. spatial and social properties of the locality’s amenities) which may be later rationalized or shape wayfinding along this route (or another route), but are not intentionally linked to the current route at the point encountered in situ. The metaphors derived generalized patterns of interaction from empirical data from a mobile, distributed, collaborative problem solving experience. Wayfinders, starting from separate undisclosed locations, searched for and rendezvoused at an unfamiliar target, a small park in the bush city of Palmerston. The wayfinding activity was an evolving trajectory oriented to two global goals: i) Discovering the target’s location; and, ii) Facilitating rendezvous at the target. To achieve these wayfinders were guided only by a brief description of the target (Figure 2a) and their interactions with the physical environment and with each other. Wayfinders communicated with each other using Short Message Service (SMS) only, even if they were in sight of each other. Every SMS was broadcast to the other wayfinders and could be referred to repeatedly. By logging each SMS the system emphasized functionality to access social units of analysis (i.e. interactions via texting) and virgin spatial-relational couplings between situated experiences and their communication as near as possible unaltered by information presented by an artifact. To inform interpreting indexicality [16] between SMS content and environmental resources we simultaneously captured spatio-temporal data and observations and photographs about the environment and wayfinders’ actions in situ and additionally, post-activity reflective data. We systematically and meticulously analysed spatio-temporal and compositional relations in SMS, wayfinder’s goals, actions and experiences in situ. Patterns in the relationships between information items and wayfinders indicated particular couplings between perceptions and conceptions and actions in the world [see: 17]. Here we describe relations between information items in SMS and wayfinders’ evolving interactions with deliberately and serendipitously encountered information.



**Figure 1** Example of informational berries serendipitously encountered in SMSs (shaded boxes) and in the environment (inset photos) by wayfinders A (green), B (violet). In situ comments are shown in bubbles.

Wayfinders *Chained Informational Daisies* by aiming to purposefully associate specific destinations with immanent goals. SMS and situated actions illustrate couplings between landmarks and deliberate, information-seeking movements. Threads of spatial concepts and interactions were more contingent than task-oriented plans and can be interpreted as coherent sequences of cause and affect relations, or phases, influencing trajectory. Wayfinders first sought to establish each other’s locations to discover whether this would be informative of the target’s location. They used landmarks to share knowledge of starting points and concretise triangulating the target’s hypothesized location. Initial movements towards and subsequent SMS references to a central landmark, the watertower, suggested wayfinders needed a common physical reference for collaborative problem solving. Wayfinders headings illustrated that they aimed to purposefully link destinations with the global goal of identifying the target’s location. Their lack of familiarity with places in the area was limiting and their SMSs specifically named few places speculated as being the target. They draw upon associations with the target to purposefully check public or residential spaces where children might be. Wayfinders daisy chains varied as they made different associations between information items even when they exchanged these. A

detailed spatio-temporal and compositional analysis of SMS and actions yielded the example visualized in Figure 2 which suggests differences between wayfinders' participatory "schemes" [1:55] or evolving plans, as they headed to the central landmark of the watertower. Differences between wayfinders' purposeful associations between information items also affected their eventual identifying the target. Wayfinder *A* found the target after about 90 minutes. However, earlier another wayfinder *B* walked in view of it without noticing it because he approached it from an orientation which obscured the features that would match his construction of what the target would look like.

Wayfinders' actions and communications were coupled with information arising tangentially to purposeful routes as they *Picked Informational Berries*. This serendipitously encountered information influenced resolving the global goal of discovering the target's location. Wayfinders' actions and communications coupled some information that arose tangentially to purposeful routes. As a group, wayfinders intended to maintain distance between each other and drew on having seen each other or by combining SMS information with existing area knowledge to track each other. As shown in Figure 1, serendipitous information influenced an immanent goal of ascertaining starting locations and hypotheses about the target's location. *A* started at a bus stop and wondered whether all wayfinders' were starting at bus stops and were they allowed to travel by bus. Ten minutes later *B*, described his starting location as "at a bustop". Coincidentally, *B*'s SMS arrived when *A* sat in front of a sign: "Bus Interchange" which may have prompted him to ask *B* whether he was actually at the bus "terminal". Wayfinders often used information communicated in one context by the sender of an SMS in another context. Sometimes recipients reacted to this serendipitous information by generating immanent goals.

Individual wayfinders differed in acquiring and responding to berries and balancing this with deliberately seeking daisies. The strategy of *A*, favoured accumulating serendipitous information and adaptive decision-making. He was least familiar with the area yet he was unperturbed by being unable to head towards a known target. *A* paused little and efficiently investigated areas to "see other features". Despite his speed *A* referred to information that might be considered to arise in "thrown" interactions (e.g. when guiding *B* to the target he *A* referred to a gentle incline of which his accompanying observer was oblivious). *A* also clearly situated his guidance in another wayfinder's SMS, adjusting subsequent route instructions to their reported positions. *C*'s slower and less deviating movement suggested he favoured explicit purpose. He tended to ignore *A*'s initial instructions to guide him which he found difficult to understand relative to his position and instead adhered to his own plan to reach the landmark and deduce the target. *C* had better familiarity and possibly sought to limit his time en route by *a priori* route creation. Discrepancy arose between *C* and *A* due to differences in their berrypicking. *A* drew upon landmarks he had passed early in the activity to infer a route for *C* who found this confusing. This suggests he did not notice the landmarks despite also walking close by them.

The metaphors derived represent generalized patterns of interaction indicative of trajectory extracted from meticulously detailed data. Wayfinders' ongoing courses of action involved "*the interaction of multiple actors and contingencies that may be unanticipated and not entirely manageable*" [1:53] and these can only be understood in context [e.g. 17]. While we do not profess to account for all berries or daisies the patterns of picking and chaining we were able to observe are informative. Differing "schemes" [1:55] shaped wayfinder's daisy-chains and influenced trajectories. Our data suggests wayfinding schema may, importantly, differ between: individuals; in situ and recall; and individual and social construction. This may account for differences in interactions with mobile guides between individuals and in the use of landmarks for in situ and recalled routes (e.g. [12]). A particular daisy-chain's scheme in situ may have unanticipated or banal causes. For example, *A*, the only wayfinder wearing a hat in a tropical climate, spent less time seeking shade which might have motivated him to cover ground and see more serendipitous information. Situated and retrospective schema may also differ. Differences emerged between landmarks wayfinders used en route and recalled in post-activity narratives and conflicts between actions in situ and those rationalised post-hoc. Trajectory is influenced by differences between egocentric and shared actions and interactions (e.g. [19]). Dichotomies between individual and social schema mediated success in guiding the wayfinders to the target. More profoundly, daisy-chaining and berrypicking interact to influence trajectory. Berrypicking seems to have a particular "arc" spanning from the past with a "reciprocal impact" for future actions and interactions [1:56].

The metaphors denote envisaging embodied interaction involving intelligently manipulating objects and tactile experience. Describing trajectories with quite different emphases the metaphors suggest different design directions. Berry-picking is more descriptive of "lived" actions and interactions with a particular "arc" [1:56] while, daisy-chaining is more descriptive of an evolving "projection" and "schemes" [1:55]. The metaphors are intended promote awareness of theoretical sensitivity (e.g. [20]) in design approaches and may enable researchers to transparently articulate their references between situations and activities. For example, theoretical sensitivity towards constructivism may privilege purpose in subjectively, daisy-chaining environmental information. Alternatively, ecological sensitivity may privilege connecting berries to actions reactively. The metaphors enable accounting for the many goals embedded in users' "natural" trajectories. We further apply the trajectory approach to ethnographic data about tourists' destinations in Far North Queensland national parks and data from extended collaborative wayfinding in natural spaces.



**Figure 2 (a)** Given description of the target; **(b)** Three separate “chains” of informational “daisies”. Interpretative “chains” (arrows) connect the actions of wayfinders with content of selected SMSs (see key)

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