On Wayfaring in Social Machines

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ABSTRACT

In this paper, we concern ourselves with the ways in which humans inhabit social machines: the structures and techniques which allow the enmeshing of multiple life traces within the flow of online interaction. In particular, we explore the distinction between transport and journeying, between networks and meshworks, and the different attitudes and modes of being appropriate to each. By doing this, we hope to capture a part of the sociality of social machines, to build an understanding of the ways in which lived lives relate to digital structures, and the emergence of the communality of shared work. In order to illustrate these ideas, we look at several aspects of existing social machines, and tease apart the qualities which relate to the different modes of being. The distinctions and concepts outlined here provide another element in both the analysis and development of social machines, understanding how people may joyfully and directedly engage with collective activities on the web.

Categories and Subject Descriptors

H.4.m [**Information Systems Applications**]: Miscellaneous

Keywords

Social machines; design; wayfaring; co-creation; sociality

1. INTRODUCTION

Social machines [2] have emerged as a powerful constructive force for bringing together human activity on the web. The original intention was that by handing off coordination activities to computational systems, people are better able to engage with the kind of creative work which they wish to carry out.

In practice, the ways in which people approach the construction of social machines are not explained in this manner. There is talk of "programming the global brain"[3], of the incentives by which people can be made to do things, of how to assign tasks to volunteers, or computationally form ideal hybrid teams to carry out assigned tasks [6]. These are all valid system design questions, and absolutely relevant to the engineering task at hand. However, they tend to prioritise the designer's needs over the participants, efficiency over creativity, tasks completed over personal growth. If we are to spend increasing amounts of our lives engaged with one or another form of social machine, it makes sense to think about the kinds of social machines we want to be part of, in terms of what it is like to inhabit them, as well as what we want them to do.

Here we start by thinking about everyday life, and in particular the ways in which people move around as they go about their business, following de Certeau's notion that "everyday practises, 'ways of operating' or doing things no longer appear as merely the obscure background of social activity" but are an important part of the way in which systems are understood, analysed and constructed [5, p. xi]. In particular, we are interested in *going along*, the movements people make in their day to day existence which are tied into the environment, situated and close at hand. The central theme of this paper is an exploration of two modes of being: *transport*, where one uses a network to move over the world, going *across* whatever is there, focusing on destinations; and *wayfaring*, where one navigates through a landscape, *going along* the terrain by reading signs therein.

In order to develop this viewpoint, we discuss some background about lines, meshworks and wayfaring (Section 2), and then lay out some examples relating these to existing social machines (Section 3). This leads to a picture of social machines as landscapes (Section 4) and some suggestions for fertile approaches to designing and characterising systems (Section 5).

2. BACKGROUND

Lines of various types play a prominent role here. In particular, we are interested in: the abstract, straight lines representing edges in a graph, connecting nodes; the *life-lines* of humans, carrying their activity as they engage both online and off; and lines as traces left by humans *going along* their lives.

We also lean heavily on the distinction between networks and meshworks, and the related modalities of transport and wayfaring. A full and complete description of meshworks can be found in [10, Chapter 2] and [11, Part II], and of wayfaring in [10, Chapter 3]. Here we present a shortened version adapted to the subject matter at hand.

2.1 Meshworks and networks

Computer science has a longstanding love affair with graphs: the representation of systems as collections of nodes and edges is both simple and powerful. It allows the use of similar techniques across many areas of interest. The dominant tendency (although it is by no means an absolute) is to represent the objects of interest—people, states, data—as nodes, and draw links between them. Typ-

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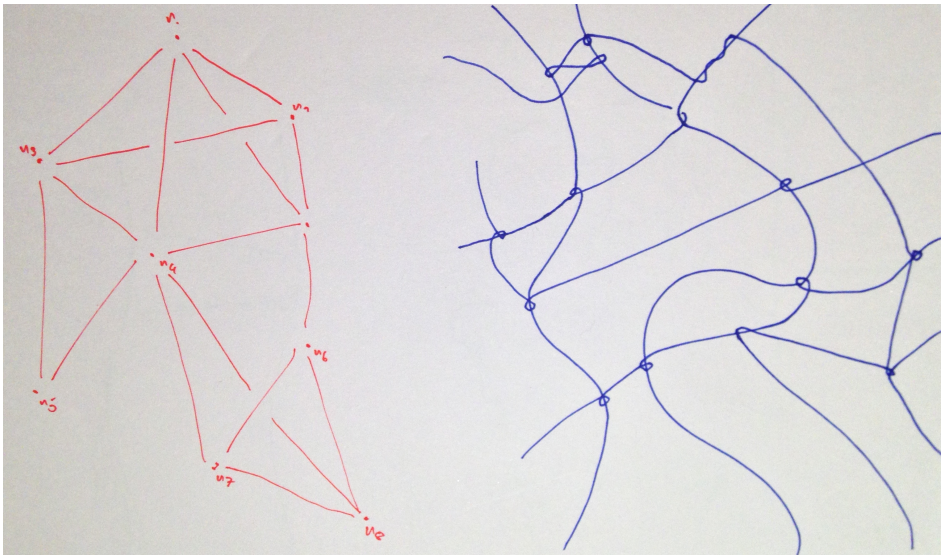

Figure 1: Diagramatic representation of a network (left) where edges connect nodes, and a meshwork, where threads entangle (after [10, Fig 3.1, p. 82])

ically, these edges are simple; often unlabelled, sometimes instantiations of a particular type. Their power comes from their simplicity, their abstraction and their amenability to categorisation. The edges, and the nodes which they join are not fundamentally spatial: distances can be applied and calculated in many different ways to project them into a space. More importantly here, the edges do not interact with each other; when two graph edges cross on a diagram, we are at pains to make it clear that they do not really touch, their crossing is simply a limitation of our representation. Edges are always ideal—straight lines, connecting without distance[1].

An alternate kind of structure is a *meshwork*. Here the threads of the mesh and the way in which they interact with each other are the fundamental structuring property. The threads have the ability to catch, to tangle, to bind, to become *enmeshed* and this ability gives them their power. Where networks tend to be unattainable idealisations, concepts to be applied, rather than things which are directly experienced, meshworks exist in the physical world, with strong links to action and movement.

All manner of weaving, knitting and even net-making work by knotting threads into meshworks in order to create surfaces. Similarly, the pathways which are created on open land by the journeying of people and animals as they go about their everyday lives form a meshwork: the trails (pre-existing or created by people on their journeys) meet and join, follow the contours of the landscape, loop and wind. The shapes that they take are important, and it is the affordance for people to *go along* them that provides value:

> Traversed now by pathways and patterned by networks[2], natural space changes: one might say that practical activity writes upon nature, albeit in a scrawling hand, and that this writing implies a particular representation of space. Places are marked, noted, named. Between them, within the 'holes in the net', are blank or marginal spaces. [13, p.117-118]

It is more difficult to find examples of meshwork in computer science, due to the prevalence of network-based representations; however meshworks are an important part of human life. People go along on paths, which entangle with others. We live in space, our meanderings are important; and no-one walks a truly straight line.

2.2 Transport and Wayfaring

By relating a network- or meshwork-based view of the world to movement (whether physically or by orienting one's attention digitally), another contrast emerges, between transport and wayfaring. A networked world lends itself to transport: journeys are constructed by observing a map of the structure available, and using the links to jump from node to node, across whatever is beneath the network. Journeys are planned, and the travel time is elided as far as possible. In a network, it makes little sense to be part way along an edge, rather one pays the cost to move from one node to another. In wayfaring view, on the other hand, a journeyer is situated in a landscape, with signs which can be read, and possible directions to explore. Rather than a top-down map of the world, on which routes can be meticulously planned out, navigation is local and responsive. The wayfarer is engaged in a constant exchange with their environment, deciphering, orienting and acting. This is supported by the meshwork of paths, which both offer signs to the journeyer and are records of their passage:

> Paths are more important than the traffic they bear, because they are what endures in the form of the reticular patterns left by animals, both wild and domestic, and by people ... Always distinct and clearly indicated, such traces embody the 'values' assigned to particular routes: danger, safety, waiting, promise. [13, p.117-118]

Paths and their traffic lead to two kinds of entanglement. Firstly, the paths themselves entangle, having points where they knot with each other, offering new ways forwards and along. Secondly, the people journeying along the paths can meet, encounter each other, and so entangle their lives in a variety of ways. The paths become part of memory, of the social knowledge of the community:

[1]Many problems include a cost associated with edges, which may well relate to physical distance. However, this property is associated with the edges, labelling and markup: it is not fundamental to the existence of the edges.

[2]Lefebvre is not making the same distinction between networks and meshworks here, but is drawing on the idea of an actual net with cross-linked threads

> The memory of the trail is entangled with individual and collective memory of previous trips, as well as with environmental information of different sorts and place names...[1]

Finally, these two modes of being are not entirely distinct: nothing is purely transport, or purely wayfaring. Rather, a given activity can be engaged in with a more transport-like or wayfaring-like attitude.

2.3 Application to Social Machines

Social machines provide landscapes for humans to navigate; the purposes of the machine can only be fulfilled if people can be persuaded to go along their pathways. One view on this is to look at the tasks people carry out, and understand which factors lead to more tasks being completed, or which incentives lead to the highest compliance. An alternative view is to look at the circumstances that support inhabitation: what features of the landscape lead a community to co-create a shared space. This inhabitation is supported by emphasising the wayfaring modus: by creating worlds where the process of journeying is rich and open, where the act of going along is engaging, where participants enmesh themselves in a net of entangled connections, a social fabric can be created which supports participation and exploration. To quote Latour:

> To say that something is a network is about as appealing as to say that someone will, from now on, eat only peas and green beans, or that you are condemned to reside in airport corridors: great for traveling, commuting, and connecting, but not to live.[12]

As an illustrative example, consider the relation between ant colony optimisation (ACO), and the real behaviour of foraging ants. ACO is the archetypal graph or network problem: virtual ants traverse the edges of a graph, incrementally building up cost and laying down pheromone as they do so. Ants foraging in the wild walk through a landscape; the trails are not pre-made as the network edges, but are constructed form the passage of many individual ants. As such, the pathways wiggle, they react to features in the landscape and the individual behaviour of the ants which lay them down. As well as the strength of pheromone, the shapes of the trails change over time, wiggles may be shortened or loops cut out. Ants engaged in this behaviour meet each other on the trails, they exchange information and carry out the phatic activities which maintain the social fabric of the colony. The point here is not that ACO is *wrong*. It is useful to be able to translate ideas from one domain to another. Rather, it is just to point out that the graph on which it relies is only part of the story. Our computational ants are, to some extent, wayfaring, as they go. However, they are wayfaring in a highly impoverished environment. Real ants use not just the pheromone trails but other landscape features, signs which they react to in their own ways. The things which make them journey are outside the optimisation problem, they have been disconnected from their context. There are many situations where this works. However, social machines are dependant on convincing humans to join in. While we can put computational ants on a bare network and watch them run because they have no choice, to convince people to join in, we must provide a richer landscape for their wanderings. To do this, building up a picture of the ways in which these digital wayfarers entangle the threads of their life-lines with those of others and with the landscape of the social machine enriches the analysis of their behaviour, and provides pointers for developing vibrant social machines.

3. CASE STUDIES

In order to develop the application of these concepts, we present four small case studies of how a wayfaring and meshwork based viewpoint can help to highlight the social qualities of certain social machines. We will use these case studies to refine our concepts in Section 4.

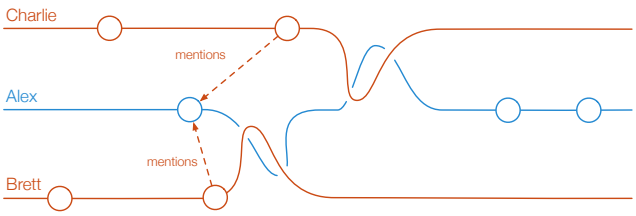

Figure 2: Webmentions as entanglement. As Brett and Charlie mention Alex's content, their respective servers negotiate to setup bidirectional links between the pieces of content.

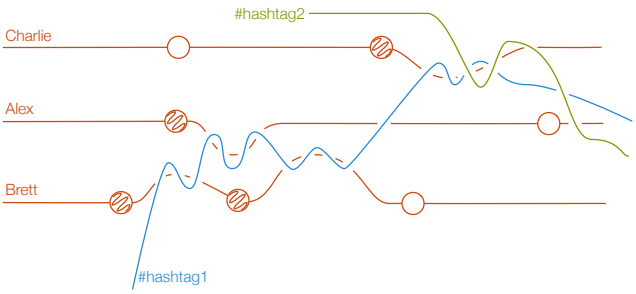

Figure 3: Knotting of hashtags. Here, two different hashtags entangle the twitter streams of three people.

3.1 Webmentions

As part of the IndieWeb effort to create a more decentralised version of the web, the Webmention standard[3] is emerging as a way to connect content without relying on centralised servers or complex technology. Using pure HTTP mechanisms, Webmention supersedes Pingback as a means of relating published content, especially blog posts. The general scheme is that when Brett posts some content which references a post on Alex's blog, their servers negotiate the creation of links between the posts. The thread of Alex's posting remains unbroken, but now the Webmention mechanism has entangled this thread with that of the others (Figure 2). Here, the entangling is done by largely mechanical means; the decentralised servers have momentarily united to become weaving machines, knotting together the disparate threads. This creates a place of connectivity, offering signposts to both the initial creators of the mesh, and those that follow along afterwards, of interesting directions to explore, new pathways to traverse.

3.2 Hashtags

Twitter users emit streams of content, which can then be organised in multiple ways. Hashtags are one such structuring principle: they provide a way to find all the posts on a particular topic, based on its identifier[4]. One point of view would be that a hashtag is a node in a graph, and functions simply through through edges connecting to all of the posts of interest. However,

[3] `http://indiewebcamp.com/Webmention`

[4] There are other uses of hashtags, such as reflexive irony and sarcasm disambiguation, but here we focus on their associative and conversational aspects.

this misses the dynamic, co-constructive nature of the activity of Twittering[5]. Hashtags here act as signposts, markers in the landscape, which allow those who follow along to discover new trails and connections. A hashtag is a line which extends, weaving multiple life-strands together, knotting around the trails left by users and other tags (Figure 3). A user, watching their feed—which is itself a gathering of other's threads—can use these tags as avenues of exploration. They do not map out what is, or give a top-down view of the world, rather they hint at the existence of trails into new areas, offering a new direction for journeying.

3.3 Wikipedia-ing

Wikipedia is a landscape produced by the continued exertion of its citizenry—a Taskscape [9]. A key activity for visitors is journeying: not the directed searching for information, but an open ended exploration of knowledge. Readers learn the signs which can guide them from place to place, the textual links, the info-boxes and so on. Writers read the signs on the talk page to understand the evolution of place, how a page is inhabited by its editors, the relation of the current block of information to its previous shapers and the wider community. From the point of view of the talk page, each page is an unfolding path. One aspect in particular relates to this notion of meshwork: the categorical links shown at the bottom of pages. Similarly, the categorical blocks at the bottom of pages weave together a selection of topics. While the pages grow along their own lines of becoming, the categorisation grows across them, binding them into a fabric. Textual links between pages serve a particular kind of connectedness, but the links themselves are abstract, simple. The categories that run across the pages' weft have shape and life, their membership grows and shrinks as the trail is modified, and meaning accretes around them. Above providing the myriad connections points to transport people from one place to another, they form a view onto the knowledge landscape, they form a pathway, a trail, which provides orientation and supports journeying.

3.4 Breadcrumbs on Forums

Online forums provide spaces for community and the exchange of information. In particular, specialist forums often remain the richest and most current source of mildly arcane knowledge. As an extreme example FetLife is a board for the discussion of non-mainstream sexual practices. Here, there is a strong need for important knowledge to be readily available, as poorly informed people can, and do, cause injury to themselves and others. Additionally, the members often have diverse yet particular interests. In response, the community has adopted a practice of "leaving breadcrumbs":

> Like in Hansel and Gretel, breadcrumbs is just the trail you leave in your feed for all your friends to follow ... Instead of crumbs of bread you leave behind a trail of thumbnail pictures ... When I click on those little thumbnails I am following [her] "Breadcrumbs". We also can follow the comments left in groups or on other people's writings to see what they have been saying or reading. (`https://fetlife.com/groups/48090/group_posts/3679853`, login needed)

Breadcrumbing becomes a purposeful activity; people are complimented on the trails they leave, the pathways forged through a morass of overwhelming and sometimes conflicting information. The journey is a creative act. The comments which simply read "breadcrumbs..." are bi-directional markers, allowing subsequent visitors to follow an individual's journey towards areas of interest, or to break away from a particular place, and understand how an individual came to be there, and where they went next.

[5]Twittering is used here to denote the practice of being on Twitter, reading and responding, building up one's life there, as opposed to Tweeting, which is simply posting a Tweet.

4. SOCIAL MACHINES AS LANDSCAPES

The case studies given above indicate some possibilities, but the descriptions so far are diffuse and somewhat contradictory. Is the meshwork separate from the network? Should we do away with networks entirely? What does it mean to entangle? Are paths the traces of movement, or the movements themselves? And how do we relate these to social machines?

At root, most of these systems are composed of structures that bear strong relations to graphs. On Wikipedia, pages are nodes, hyperlinks edges; Tweets can be nodes, hashtags other nodes, and edges to link them together. Similarly, users can be nodes, linked to the content they produce. These representations are undeniably present, and provide both a rich source of data, and the underpinnings of all activities carried out in the space.

This view of the world is somewhat distant from the ways in which humans experience the world. In a study of verbal descriptions of space, Linde and Labov isolated *map* based descriptions—"The girl's room is next to the kitchen"—from *tours*: "You turn right and come into the living room". They found that less than 3% accounts used map based descriptions; the rest gave descriptions of *how to enter each room* [14] (referenced in [5, p. 119]). Similarly, when engaging with a social machine, users do not experience a graph; they visit webpages, or the interface of an app. These interfaces convey information, and offer the potential for action. They are loaded with signs which the expert user can interpret: traces of other users, links to other places, context for making decisions and so on. In short, they find themselves on a landscape, through which they may navigate. Part of this network is derived from the graph which underlies the machine, but this does not tell the whole story. The topography is informed by the relations of the graph to the outside world, the socially constituted meanings which connect the nodes outwards; and it is informed by the presentation of the graph, the ways in which traces, structures, relations, edges and nodes are conveyed to the visitor and made ready to hand for their navigation. So, creators of a social machine use its architecture to modulate the underlying data into a landscape through which users may journey (Figure 4).

So far, the description could be applied to almost anything computational. There is little sociality, simply people and the activities they carry out. One of the key points of differentiation between social machines and the things which have gone before is the importance of the possibility of encounters, and the scale at which activity can be shared. The presence of other journeyers and their synergistic potential, mediated through this open landscape of potential actions, contextualises the activities of individuals into a greater whole. This contextualisation is the principle which drives the functioning of social machines.

Ingold introduces the notion of the taskscape to deal with the contextualisation of human labour. It is the interlocking field of activities which humans carry out:

> "Every task takes its meaning from its position within an ensemble of tasks, performed in series or in parallel, and usually by many people working together. [9]"

The taskscape comes into being only through movement, it must be continually constituted by people engaged in the activities of *dwelling*. This relates to de Certeau's notion of space as a practised place: "Thus the street geometrically defined by urban planning is transformed into a space by walkers." [5, p. 117]. These vital, continuously created spaces, or -scapes stand in contrast to the graphs produced by carrying out these acts, which remain—essentially permanently—as a monotonically increasing record of what has

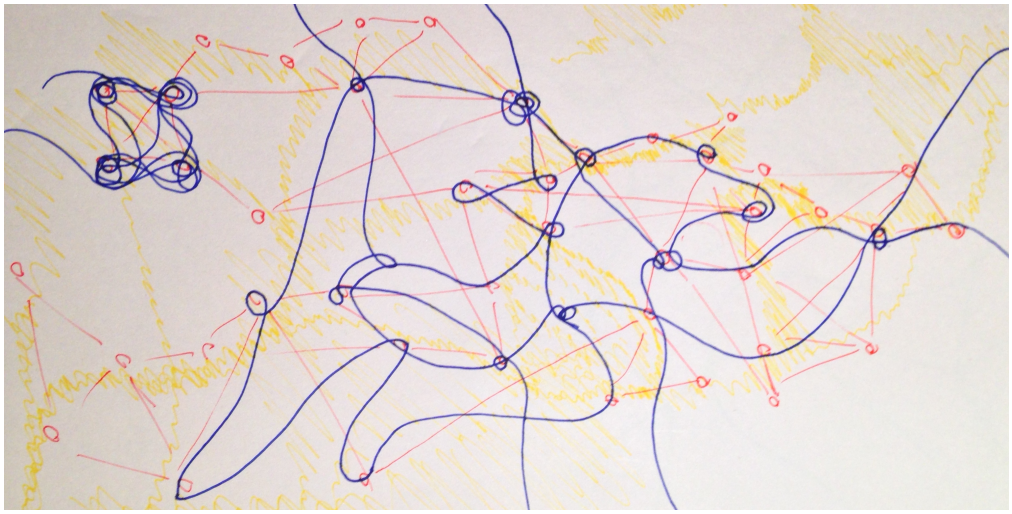

Figure 4: Constitution of the landscape of a social machine. The layer of red nodes and edges is the network representation, and the yellow markings indicate the topography of the created landscape. The blue traces are the pathways of journeyers over the landscape, entangling with each other, around nodes, and extending out beyond the boundaries of the datagraph.

happened. A healthy social machine must have an active taskscape, as sociality occurs in the mutual contextualisation of activity, the social time which arises from the rhythms of dwelling, not in the static traces left behind. The contextualisation of activity has been previously noted as a crucial component of various forms of crowdsourcing and distributed working [17, 22] especially as part of Malone's "Money, Love or Glory" motivations for participation in collective intelligence activities [16]. Much of the possibility for both love and glory is derived from the meaning conferred by dwelling, by living a portion of life somewhere, of shaping and being shaped by the place and the activities which take place there.

These tasks, this movement, through its enaction, inscribes the landscape with trails. As people modify the data contained in the social machine, the landscape changes; the history of peoples passage wears its pathways into the ground; the landscape is a constantly evolving co-creation. The computational architecture then transmutes these topographical changes into signs for future wayfarers to read. The traces become a meshwork of entangled pathways, built by movement and guiding future movement. As people *go along* these pathways, both following and creating, they navigate using the signs at hand, encounter others, and generally entangle the threads of their lives.

The threads of people's lives function differently to the underlying graph. They extend out beyond the system boundaries. They are continuous, without branches or nodes; rather, they knot around areas of interest or habit. To go through the same point again is not redundant, loops cannot be elided, there is the possibility of concentration, overlaying,

5. DESIGNING SOCIAL MACHINES

The controllers, designers, commissioners and creators of social machines are responsible for the way in which the landscape of the social machine is constituted. By their efforts, they can modulate the possibilities for encounters, the signs which are available to wayfarers, the effects of passage and action on the terrain. The intent of all of this discursive writing is to build up a perspective for looking at the world which can help with the creation and understanding of social machines.

5.1 Design for entanglement

Entangling is the process by which a collection of threads are joined into a meshwork, and how people's lives are linked together into a social fabric. As such, supporting entanglement supports community, and supports more open-ended, engaged usage. In the original Galaxy Zoo [8] setup, users were asked to do a relatively boring, repetitive task, which did not lead itself to entanglement. The existence of forums, however, of social spaces where people could enmesh their life-lines with those of others, catalysed both the discovery of new knowledge and became a compelling reason to return to the site [4]. At the other end of the scale, Mechanical Turk (AMT) explicitly prevents entanglement, with workers being kept as separate as possible. The desire to build a social fabric was strong enough that sites such as Turker Nation sprang up, in order to provide people with the possibilities of encounter which they desired. The more people can entangle, the more meaning they can co-create, and the stronger the social fabric becomes. This leads to more vibrant social machines, with a more engaged community.

5.2 Shaping the landscape

Trails on hillsides work because they reflect the passage of previous travellers, displaying knowledge of local features and distant directions. Alexander's 'pathways of desire' describes in architectural approach where surfaces are left unpaved initially . Supporting infrastructure is only added once the passage of many feet has left a trace the architect can read, indicating where people want to go. As well as in physical architecture, reading digital traces has been applied to human computer interaction [18]. These phenomena exist because we can read the passage of those that have gone before through their effect on the landscape. There are two sides to this: the impact of behaviour on the underlying data, and the way in which the data is presented to users as signs that they can use for navigation. This takes many forms, from the mechanically driven recommender systems prevalent in retail sites to the carefully, humanly constructed systems of annotation used on Wikipedia. Making visible and bringing to hand one's own traces instils a greater sense of participation and reputation, as in leaderboards showing the most images processed, or the desire to create a high quality trail of breadcrumbs. Making others'

traces available drives a sense of companionship, of going along with others. Together, this supports richness and vibrancy. It should, however be borne in mind that reading is different to being told; the ability to support multiple interpretations is an essential part of open systems [19]. The landscape is not an authoritative judgement on how things are, rather it is the *Umwelt* within which the participants act: "Every subject spins out, like the spider's threads, its relations to certain qualities of things and weaves them into a solid web, which carries its existence" [21]. Developing this to refer to digital spaces that contextualise people's actions, Ljunberg introduces the notion of *agential spaces*, where "agents are at once caught up transcending their immediate control and implicated in the effective exercise of their somatic, social agency"[15].

5.3 Transport versus wayfaring

The intended result of creating an open, modifiable, interactive landscape is to promote agency and engagement among the participants, and to move from a notion of transport over a network to wayfaring through a landscape. Even in solitary database applications, Feinberg et. al found that instilling a wayfaring mode of being "can serve to enhance user agency and re-imagine forms of user participation in meaning making" [7].

A designer can facilitate the emergence of a co-created order and functioning within the social machine , allowing participants to co-construct a meshwork and weave together a social fabric. Alternatively, the designer can impose lines, restrictions and grids in an attempt to achieve a desired structure or purpose. In the latter case, just as Mechanical Turk workers founded Turker Nation, the agency of participants will be turned towards resisting or desisting the imposed order, rather than being incorporated into a resource that the social machine may use to renew and deepen itself.

Meaning making can take many forms, but one of the key features of social machines is the narratives which run through them [20]. Telling a story about a set of discrete hops in a network is challenging—it is a different mode of being. Telling a story about a journey through a landscape, however comes naturally: wayfaring supports narratives, so encouraging wayfaring over transport leads to *thriving* social machines.

6. CONCLUSION

In this paper, we have discussed the concepts of transport and wayfaring as applied to digital spaces, and social machines in particular. Based on this, we have brought the concepts of meshworks and life-lines into the context of Social Machine design, and fleshed out the idea of social machines providing evolving co-created landscapes for journeying through.

We have pointed to three approaches to support participants in inhabiting social machines, increasing engagement and enriching their collaborative work. Firstly, systems should be designed which support entangling people's activities, crosslinking their life paths, leading to a meshwork of possibilities. Secondly, the landscape created by the infrastructure and data should be one which the participants can both change through their actions, and read as they roam over it. Putting these together, supporting users in wayfaring leads to new forms of participation, and underpins the ability to tell stories and create thriving social machines.

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