Anonymity and Evolutionary Art

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ABSTRACT

Human artists typically have a personal signature, by which their individual authorship can be recognized. Modernist artists tried to avoid such idiosyncracies, focussing on abstract structure instead–and welcomed computers, accordingly. But even those computer artists who have deliberately tried to lose their signature have not managed to do so. Perhaps evolutionary methods might help? Reasons are discussed both for believing and for doubting that evolutionary art could be wholly free from personal signatures.

Categories and Subject Descriptors

J.5 [**Arts and Humanities**]:

General Terms

Algorithms, Design

Keywords

Evolutionary Art

1. THE QUEST FOR ANONYMITY IN ART

Artworks are typically attributable, by art historians and connoisseurs, to a particular person. Indeed, Romantic views of art value the fact that the individual artist's 'personal signature' enables one to recognize the authorship of the work. This personal signature is not literally a signature. Rather, it is a set of subtle features of the work, of which the actual artist may not even be consciously aware [4].

Modernist artists, reacting against Romanticism, downplayed the role of the individual person in art. They stressed formal (often minimalist) structure, not perceptible idiosyncracies. Typically, the art-object was no longer celebrated as a unique artefact, nor the human artist as an individual person.

This attitude was epitomized in an influential statement by the modernist Sol LeWitt: "the idea becomes a machine that makes the art, [where] all of the planning and decisions are made beforehand and the execution is a perfunctory affair" [8, pag. 824]. Once the plan has been chosen, LeWitt said, "The artist's will is secondary to the [artmaking] process he initiates from idea to completion" [9, item 7]. Indeed, he produced many 'remote' artworks, where he faxed instructions intended to be followed by anonymous people who, by following these instructions, would make the work using standard off-the-shelf materials such as 2-inch by 2-inch wooden strips. The Romantic ideal, of art as the expression of human individuality, had been abandoned.

2. THE IMPERSONALITY OF COMPUTERS

It's not surprising, given the sentiments quoted above, that when computers appeared on the scene many artists with modernist sympathies welcomed them specifically for their impersonal, non-human, nature. (Romantics, by contrast, recoiled from them in horror.)

At base, the reason for the existence of personal signatures lies in factors concerning the economy of information processing in human minds [4]. Computers are only indirectly affected by such factors. And, of course, they are immune to the motor habits of the programmer, and normally cannot develop any motor habits of their own. (As we'll see in Section 3, certain sorts of robot may be exceptions to that.) The psychological basis for the personal signature therefore disappears. Or, more accurately, it is pushed into the background. The aims and imagination (and programming skills) of the computer artist will always have idiosyncratic features, which may or may not be reflected in the computer output. But for those mid-century artists who already wished to obscure, or even escape from, their human individuality, it seemed that the very *impersonality* of computers might help.

Today, that is still a very natural assumption. So much so, that three leading computer artists have recently felt the need to reassure newcomers to the genre that *if* they want to set their individual stamp on the computer's behaviour, then they can. As they put it: "As a designer working with generative processes [i.e. computer art/design] one may still wish to leave a recognizable mark on a creation. This may be achieved statically using fixed components with a trademark style.

A more interesting way to achieve this is to ensure either that the organization of the artefact bears the stamp of its designer, or that its behaviour falls within the gamut of work typically produced by the designer. Of course the designer may not be interested in producing a recognizable style, however the utilization of generative techniques does not preclude this option" [10, 6.1]. We'll return to the issue of "the organization of the artefact [bearing] the stamp of its designer" in Section 4.

One of the first artists to welcome computers for their very impersonality was the young Paul Brown. Visiting the "Cybernetic Serendipity" exhibition in London in 1969, he was inspired by the hope that this new methodology would enable him to do something he was already trying to do: namely, to lose his personal signature. Now, some forty years later, he is an internationally known computer artist. But his artworks are still recognizable, to those familiar with his oeuvre, as Brown's. Even his very earliest pieces [5] have an evident visual kinship with his recent/current work. In other words, it turned out that losing his individual artistic stamp, as his modernist sympathies inclined him to do, was easier said than done.

One reason is that Brown himself, after forty years as a professional artist, still cannot say just what his personal signature is (i.e. just what needs to be avoided). In general, recognising a particular artist's signature and describing it explicitly are two very different things [4, sectn. iii]. Whatever it is in Brown's case, it certainly is not a matter of a specific mark (such as a particular form of ear-lobe) recurring in his work. It is more a matter of an overall stylistic 'feel' that he cannot pin down in words.

He had hoped as a young man that the clarity with which art-making has to be defined if computers are involved might help him both to identify his signature and (by changing the generative rules as a result) to lose it. Reasonable enough hopes, one might think. But no: his computer-generated work still betrays its human author's individual hand. And this, even though he has deliberately aimed for aesthetic anonymity.

It appears, then, that if someone wishes to use computers so as to lose their personal signature, deliberate self-effacement in the hands-on practice of one's art is not the way to do it. Can some other way of achieving self-effacement be found?

3. COULD ANONYMITY BE EVOLVED?

Recently, Brown has been using computers in a new way in trying to achieve his long-standing artistic goal. An interdisciplinary team, with Brown as a leading member, has tried to evolve line-drawing robots whose products are of some aesthetic interest (no more than that!), but which do not carry the telltale traces of a work by Brown himself.

In evolutionary art in general, the selection at each generation can be done interactively, by a human being making the comparisons, or automatically by the program itself. In this particular case, interactive selection is best avoided, because it is likely to carry the personal mark of the human artist. Even automatic selection, however, requires that a 'fitness function' be defined, which the program can use to make its selections. (The fitness function itself may evolve, again either interactively or automatically.) As we'll see in Section 4, this fact is the Achilles' heel of Brown's current research.

The first obvious question to ask about this project–which is named *Drawbots*– is "Why evolve line-drawing gizmos, as opposed to simply designing (programming/building) them?" The second is "Why use robots, as opposed to computer graphics (i.e. programs for drawing images on paper or virtual images in cyberspace)?"

The answer to the first question is that if the line-drawing computer system has been evolved then, thanks to the many random mutations that will have taken place, it has *not* been prespecified in detail by the artist-programmer. Accordingly, there may (sic) be a chance of avoiding that individual's personal signature. Whether that "may" can, in practice or even in principle, be replaced by a "will" is the key point at issue here.

As for the second question, the answer is that a robot, being a material object functioning in the physical world, can be affected not only by its program and/or internal design but also by unexpected–and perhaps serendipitous–events in the physical environment. Again, this offers a means by which the programmer's personal signature may be bypassed, or anyway diluted. (An early example of this sort of thing occurred in the 1970s, when the moving 'legs' of a kinetic sculpture–alias a robot–happened to scratch the wooden floor of London's Royal Academy. Although the RA was doubtless incensed, the sculptor, Darrell Viner, was intrigued. He was so "fascinated by the structure of the repetitive scratches and their relationship to cross-hatching" that he went on to make artworks produced by comparable, though simulated, means–[6, 283].

The "serendipity" in the physical events involved can even include cases where a radically new feature appears in the robot's behaviour. In a previous experiment done by a member of the *Drawbots* team, a population of robots evolved a new sensory capacity–not merely an improved sensory capacity–as a result of contingent, and previously unremarked, facts about the physical environment [1]. That suggests the possibility that a fundamentally transformative change in the *Drawbots'* drawing-style might occur. If so, then presumably the new style would not bear Brown's individual mark, even if the previous style had done so.

The Drawbots themselves are small wheeled vehicles carrying a retractable pen. And the task in the team's minds is line-drawing. By that is meant not drawing pictures that represent real things (as both stick-men and Renaissance cartoons do), nor even drawing geometrical designs, but simply drawing *lines* . . . which can curve, cross, stop, and approach each other in myriad ways–and which may sometimes change in thickness too. Brown's hope is that robots can be evolved which will draw aesthetically acceptable lines *that do not exhibit his personal signature*. In other words, the fitness function/s to be followed by the robot should guarantee aesthetic acceptability but should not be so 'rich' as to express his personal style.

In principle, that would not preclude there being a telltale identifier, or quasi-signature (one can hardly say a "personal" signature), *produced by an evolved robot itself*. This would be a pattern that distinguishes its drawings from those of its siblings and close cousins. The evolution of such patterns is in principle possible because new performance details will follow from random mutations, and these details can be perpetuated provided that they do not compromise fitness.

Such details could include drawn patterns or line-features discriminated by the gizmo's visual sensors. Indeed, a robot might even develop particular motor habits, driven by motor circuits conserved in its 'brain' (see Section 2). Suppose that a sudden movement, caused by a recently mutated motor circuit, led to a mark that was then selected (along with the rest of the drawing) by Brown. This might lead the motor circuit to endure, forming the basis of a future motor habit. That habit could be involved either in many different stylistic choices, or only in one (think of an overall stylistic 'feel' and of tell-tale ear-lobes, respectively). In short, the general style that is selected via the fitness function could allow for idiosyncratic expression (alias signatures) by different robots within the same generation or lineage.

If the fitness function were to include measures of computational economy, the different robots might even develop quasi-signatures for much the same (psychological) reasons that human beings do. However, it is hardly likely that such patterns would arise as a matter of course, as they do in the work of human artists. For the root of the personal signature, as remarked above (see also [4, sectn. iii]), is the need for economy in information processing within a highly complex system–a criterion that does not apply in robots as simple as those being considered here.

Whether it is actually possible for the drawbots to lose the stamp of Brown's individual artistry depends on a number of things. One is the extent to which Brown, or anyone else, can say just what his personal signature consists in. If he knew that, he would be in a much better position to try to avoid it. However, as explained in Section 2, he does not.

Possibly, the *Drawbots* research may help him towards a better–if still incomplete–understanding of this. For in examining the various drawings made by the drawbots, he will have to ask himself two questions: *Is it aesthetically acceptable?* and *Is it evidently a 'Brown'?* In answering that second question over and over again, as the drawing style mutates across the generations, and in posing it to colleagues with an appropriately practised critical eye, he may achieve a more explicit understanding of just what his own style is. (Then again, he may not.) But that could happen without his ever answering *No* to the second question. In that case, he still would not have 'lost' his signature, despite understanding it more deeply. Whether the increased understanding would enable him to dilute it, if not to shed it, in his (non-evolutionary) future work is an interesting question.

Another factor that will affect the likelihood of success in the project is the extent to which aesthetic acceptability can rest on relatively primitive visual features. "Primitive", here, means both *simple* and *naturally salient*. For example, shininess (of satin, silver, polished ivory, lurex, chromium . . .) is relatively simple to discriminate, and naturally salient too. That's so for good evolutionary reasons, involving the fitness-enhancing nature of reflective expanses of water [3, 8.iv.a]. In other words, it's no accident that shininess is aesthetically appealing to a very wide range of individuals and cultures. Are there any features of line-drawings such as those the drawbots could produce which are naturally attractive (and easily discriminable) in a comparable way?

For example, if the drawbots were able to change pens, might they evolve a preference for the shiny lines left by a silver-ink pen? They could do so, if their visual apparatus could discriminate shininess. To be sure, the robotics team would have to build reflectance into the fitness function: no robot 'naturally' prefers it. But reflectance is such an easily discriminable property, and so near-universally liked by human beings, that the team could not be accused of cheating were they to do that. (Some cultural groups positively avoid shininess, regarding it as vulgar; but that is irrelevant here, since this discriminatory attitude has developed *precisely because* the liking for shininess is so very common.) Nor would putting silveriness into the fitness function result in drawings that display Brown's personal signature, for that (whatever it is) is not a matter of shininess.

It's easy to see that Brown's authorial mark does not involve shininess. What it *does* involve is less clear. Suppose it were to turn out that all the perceptible features favoured (via the fitness function) by 'aesthetically competent' drawbots were relatively high-level and/or complex, with no 'natural' attractiveness for human beings in general. In that case, their drawings would probably be more specific to Brown's personal style. His project would have failed. However, "success" and "failure" here admit of several levels. In the language used above, Brown's signature may become more or less *diluted*, even if it cannot be entirely lost.

Among the naturally discriminable features that are already being considered by the *Drawbots* team are holes, line-crossings, and fractals (of varying complexity or depth). But why should one expect any of these things to be 'naturally' attractive?

Well, consider fractals, for instance. These are ubiquitous in Nature, both in living things and in environmental features such as rocks and coastlines. According to the 'biophilia' hypothesis [16], *Homo sapiens* has evolved to respond favourably not only to conspecifics and other aspects of our original ecological niche (the African Savannah) but also to living things and natural environments in general. If that's so, then fractals might well have some natural attraction for us. That's merely an argument for plausibility. But there is also some evidence that fractals of a certain kind are spontaneously favoured in art as in nature–and even, as William Congreve said of music, that they can soothe the savage breast. Richard Taylor claimed, in the late-1990s, that Jackson Pollock's canvasses, far from being random splashes of paint, have specific fractal properties to which most viewers respond in a positive way, and by which his paintings can be distinguished from fakes [13, 14]. Specifically, people prefer those Pollock paintings which have a fractal dimension of 1.5 (his later paintings reach 1.8+). By comparison, people asked to choose between natural images (or between simulated coastlines) prefer a fractal dimension of 1.3. Taylor's claim aroused huge interest (e.g. Spehar et al. 2003), and was later followed by experiments showing that viewing Pollock's images can actually reduce stress [15].

Taylor's early remarks about how to discriminate genuine Pollocks from fakes, have recently been challenged [7]. One aspect of that challenge is especially intriguing here: Katherine Jones-Smith reported that a careless doodle done by her showed the same fractal properties as those found in Pollock's work. She didn't ask whether the doodle had any aesthetic value. To the contrary, she implied that, being a thoughtless scribble, it did not. But if she had asked people whether they "liked" it, or whether they preferred it to some other mark (maybe one produced accidentally), she might have found that people ascribed some–albeit small– degree of aesthetic merit to it. If that were so, it suggests that a suitably fractal-favouring drawbot might make aesthetically acceptable ('natural') drawings that don't show anyone's individual mark: not hers, not Pollock's, and not Brown's either.

4. THE LIKELIHOOD OF SUCCESS–AND WHAT IT WOULD MEAN

The discussion in Section 3 suggested that it is *in principle* possible for Brown's personal signature to be lost by evolved robots (even though it is also possible for those robots to develop individual 'signatures' of their own). But what of the likelihood of this happening *in practice?* Are there any specific reasons (beyond those mentioned in Section 3) to suspect that the *Drawbots* project will succeed, or fail? And if it succeeds, would it follow that the creativity exhibited in the drawings of the newly-evolved drawbots must be attributed to the drawbots themselves, rather than to Brown? *'No signature, no creative authorship'*, perhaps?

As remarked above, the Achilles' heel of the project lies in the fitness function. This is true in two related senses, one philosophical and one psychological.

First, if it is Brown who is continually deciding on the fitness function as the research proceeds then perhaps it is *his* aesthetic judgement, and also *his* artistic creativity, which is really responsible for the final drawings? (For shorthand purposes, let's ignore the creative role of the other human beings on the team.) Many philosophers would say that there is no "perhaps" about it, that *of course* Brown's creativity lies behind whatever aesthetic interest the drawbots' drawings happen to have. For they believe that it is in principle absurd to ascribe creativity, or aesthetic judgment, to any computer system–no matter how superficially impressive its performance may be.

Their belief typically rests on assumptions about one or more of four highly controversial issues, including intentionality and consciousness [2, ch.11]. Accordingly, it can be challenged–though not definitively refuted. However, even if one were happy to reject their claim as a general philosophical position, that would not settle the question at issue here. For in the specific case of the *Drawbots* research, the largely human source of the fitness function is a distinct embarrassment for anyone wanting to grant all the creative credit to the computer.

This embarrassment would persist whether or not the project succeeded in its own terms–that is, irrespective of whether Brown's signature had been lost. For if the final fitness function were to exploit only what in Section 3 were called "primitive" aesthetic properties, so that Brown as an individual artist had become invisible in the final-stage drawings, it would still be true that the aesthetic decisions

involved in developing the fitness function were *such as are naturally made by human beings.* Brown's hand (judgment) would still be there–but functioning as the hand of a generic human being, not of a particular individual. (In other words, the fitness function would describe the general style, without imposing any detailed 'authorial' implementation.)

That argument would apply even if the robots' drawing style had shown a truly fundamental change: a new style (presumably, a 'non-Brown' style), as opposed to an improved style. We saw in Section 3 that the physical 'embodiment' of the drawbots makes it in principle possible for such serendipitous change to occur. By definition, the stylistic change would have been caused by some unconsidered and/or contingent feature of the robots' physical environment.

So Brown couldn't be credited with initiating it. But he could, perhaps, be credited with 'causing' it, since the incipient change will be maintained (and perhaps developed) only if it is approved/selected by his personal decision or by the fitness function already evolved under his direction. In such a case, Brown might be regarded as the creative spirit behind the final drawings *even though* he never foresaw them, and *even though* they are free of his personal mark.

What of the psychological question? Are there any psychological reasons to expect that Brown *will not* be able to decide on a fitness function that entirely avoids his personal signature?

One psychological consideration that is important in aesthetic judgments (see [4]: sectn. iii) is relevance–considered in terms of computational closeness and/or efficiency (Sperber and Wilson 1986). This issue is less obviously crucial here than it would be if Brown were trying to evolve robots capable of realistic representational drawings. If the drawbots were intended to draw human faces, for instance, they had better include depictions of eyes, mouth, and even (the relatively less relevant) ear-lobes. And they had better *not* add horns, or wings. But if a tinge of surrealism were to be favoured (by Brown), then a horn-like protuberance appearing in generation 1,000 might be selected and 'shaped' so that recognizable devilish/goat-like horns were visible at generation 9,000. The same might occur if Brown felt that familiar myths about the Devil were relevant to the 'topic' of the drawings. In either case, Brown's own judgements about relevance would be reflected in the robots' behaviour, and–to the extent that these are idiosyncratic–so would his personal mark.

In fact, Brown has always been an abstract artist, so is not aiming to evolve 'representational' robots. Even so, issues of relevance–or rather, issues of what he deems to be relevant– may arise.

Aesthetic acceptability depends in part on intelligibility. To be sure, intelligibility may be more or less easy to achieve in differing artistic styles. But utter chaos will satisfy nobody. In other words, one factor underlying judgments of aesthetic acceptability is the computational effort that is involved in comprehension. A 'messy' line-drawing (or doodle), for instance, may be unacceptable largely because its components *do not* appear to be mutually relevant. That is, they do not appear to be 'coherent', or to 'make sense'. (Perhaps there are no closed curves, suggesting bounded physical objects? And/or perhaps there are no T-junctions where one line stops as it meets another, suggesting occlusion of a line/edge by some other physical thing?)

These judgments are not usually conscious–and it may not be possible to make them fully conscious. It follows that it may not be possible for Brown to avoid them deliberately.

A closely related issue is the extent to which Brown can banish his own preferred schemas from the fitness function. (Compare: evolving robots to draw faces *without* eyes.) If he cannot, because these schemas are so deeply entrenched in his mind and experience, they will inevitably be reflected in the fitness function and therefore in the final drawings.

At that point, we come full circle to the issue discussed in Section 3 in terms of "simplicity" and "naturalness". The more that the features favoured in the fitness function are complex, culture-based, and idiosyncratic to Brown, the less will the final-generation drawbots be free of his personal stamp.

If the Brown signature is preserved, despite all his efforts, that will be because he has found it necessary to build relatively 'rich' criteria into the fitness function. As we've seen, it is still an open question as to how rich the final criteria of aesthetic fitness will need to be. If they are all relatively simple, then Brown's creative inspiration may seem less important. At most, the fact that he is a human being will be relevant, not the fact that he is Paul Brown. (Any idiosyncratic 'signature' visible in the drawings might be attributable to the evolutionary vicissitudes of the robots themselves, as explained above.)

What if, contrary to all his hopes, Brown's personal signature remains still visible to experts (dare we say connoisseurs?) looking at the robots' drawings? In such a case, and *even if* one were willing in principle to grant creativity to some computer systems, it would seem bizarre to attribute creativity to the drawbot. For the concept of the personal signature arose specifically in order to attribute a given work of art to one creative source–normally, one human individual–rather than another [4, sectn. ii]. The signature, in short, points to the person. This was recognized by the computer artists (quoted in Section 2) who spoke of "the organization of the artefact [bearing] the stamp of its designer". Whether that telltale organization were deliberately designed, as they were assuming, or gradually evolved, as in the *Drawbots* project ('failure' here being supposed), it would point to one person: Brown.

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