

CRITICAL REFLECTIONS

CART360

Martin Hanses

Our Symbiotic Life: An Exploration of Interspecies Relations

This paper, written by Katja Budinger and Frank Heidmann, hopes to answer or at the very least speculate an answer for one fundamental question - how could our connection to nature develop? Less dry than many typical academic papers, the work presents a number of speculative approaches and scenarios by what is referred to as “design fiction”, in a conscious attempt to validate and utilise more artistic ideas and speculations to combat and subdue what the writers refer to as “wicked problems.” An aspect of this idea is to approach the issues with a perspective that is distinctly outside the box - a designer tackling biology and futurology.

The authors have chosen to create four of these potential future scenarios, but they are far from plucked out of nowhere; each problem has real roots and inspiration from actual trends in technology and socioeconomic developments, and similarly to how the development of computers was highly inspired by science fiction, the authors hope to tread new ground and open up the discussion regarding things such as a sustainable, symbiotic future with more outlandish or, some would say, interesting ideas. These futures are additionally influenced by the work of futurist Stuart Candy, who suggested there were four futures worth considering and distinguishing; the probable, the possible, the plausible, and the preferable. The reason these ideas are brought up are to lend believability and plausibility to the fictional ideas presented later on in the paper - the goal of using design fiction for the paper and the ideas presented therein is to use current trends and development as a springboard to reach higher, less restrictive ideas and solutions. Additionally, the speculative design approach is potentially far more approachable for a wider audience; a conscious step is taken to differentiate this research from the public perception of a scientist or researcher being the proverbial “little gray man” with a powerpoint presentation, and instead creating something more understandable and perhaps enjoyable.

The scenarios presented are based on four separate socio-economic pathways, hereafter referred to as SSPs. These are collaboration, struggle, consumerism, and divide. These concepts are then paired with what the authors consider to be correlational or appropriate people (demographics), types of plant life, technological developments, and finally, an artistic approach to the writing of the scenario itself, such as in the style of a blog post or a chat log.

The first scenario, written in the form of a series of comments, is titled “Harmony” and presents the idea of a type of autonomous plant that drives around cities, bringing greens and wildlife to urban areas. The second, titled “Invasion”, imagines a type of drone used to combat hostile pest plants and invasive floral species. “On Demand” is the third one, which suggests a kind of product that allows the consumer to grow plants and flowers on demand - a kind of organic 3D printing technique. The final scenario, “Bottle Garden”, refers to an imagined type of algae that produces electricity, allowing teenagers to utilise it as what is referred to as a “powerpet”, or a houseplant that functions as a battery.

While the scenarios presented are interesting, amusing and thought-provoking, the most appealing aspect of the paper is the approach itself: design fiction. I believe that the potential of this approach is incredibly underutilized, and I believe there is ample reason and empirical evidence to develop this into a branch of design that would work side by side with fields such as engineering. The Finnish researcher Mika Mannermaa outlines three paradigms in the field of future research, one of which is exactly what is presented in this paper; scenarios.¹ By this, Mannermaa means the idea that the future is not wholly predictable and allows for the construction of alternate futures. Further credibility is lent to this field by other research which points to how certain genres or styles of fiction influence and ideate real technology - Radio, TV and computers were all envisioned in fiction before the technology actually existed, and cyberpunk, an aesthetic and genre largely fixated on transhumanism, has had an undeniable impact on the development of virtual reality and digital technology.² Beyond ideation and fictional, non-functional blueprints, there is also untapped narrative potential in this proposed

¹ Mannermaa, M. “In search of an evolutionary paradigm for futures research”

² Bailenson, J.N., Yee, N., Kim, A., & Tecarro, J. Sciencepunk: The influence of informed science fiction on virtual reality research.

field. Studies have shown that narrative media has a direct effect on the experiencer that allows them to grasp concepts and ideas that otherwise seem far too technical.³

Our Symbiotic Life presents interesting and intriguing ideas in a manner that, if nothing else, demonstrates the potential and need for a deeper field of study into design fiction and its application in media and everyday life; it is undoubtedly valuable, and its potential for improving socioeconomic situations across the world, across all demographics, is outstanding.

MorphIO: Entirely Soft Sensing and Actuation Modules for Programming Shape Changes through Tangible Interaction

MorphIO, an entirely soft sensing and actuation module, is the focal artifact presented in this paper by Ryosuke Nakayama, Ryo Suzuki, Satoshi Nakamaru, Ryuma Niiyama, Yoshihiro Kawahara, and Yasuaki Kakehi. The product itself aims to create a bridge between physical demonstration and programming, by allowing a user to manipulate, bend and stretch the pneumatic “legs” of the object, record the motion, and play it back, using a pneumatic actuator with an elastic sponge sensor.

The idea itself is simple; allowing a user who is non-literate in engineering and/or coding to create the correct motions or movement needed for a prototype or design of their own - the authors refer to this as “soft” input and output. The idea itself is very appealing and incredibly interesting, but the main issue that sticks out is the limitations in shape and variety of the module, as well as their production costs and market price. The main module, while impressive in its use of bellows as well as its pure technological design, has a somewhat limited range of movement and is also fairly small. The idea, the authors suggest, is that the solution to this is the modular design itself. For a larger artifact, many modules can be combined and used to work in tandem. It is also suggested that the modules may vary in size and shape, but I personally believe the issue lies deeper than that.

³ Meaning Through Fiction: Science Fiction and Innovative Technologies. Markus Appel, Stefan Krause, Uli Gleich, & Martina Mara

While the technology is, as mentioned before, very impressive, its format is restrictive in both its design and commercial usage. MR-DFM, or minimally-restrictive design-for-manufacturing, is a concept that considers design problems in manufacturing and production, and aims to allow for minimum restrictions in design variables.⁴ This process lays out a mathematical framework to assist the process of design and manufacture from start to finish in an efficient and economical way. How does this apply to MorphIO? The modules are intended to work excellently in prototypes and small-scale projects, but for sustainable, functional designs, they are incredibly restrictive as a material. Applying the MR-DFM process to the MorphIO technology would require one major transformation - module into material. The article makes mention of a sheet version of the module, which is a step in a less restrictive direction, but for MorphIO to be successful as a versatile and genuinely useful material, it has to be accessible as something less shaped and designed.

It's difficult to imagine exactly how the MorphIO technology could be adapted into a material, but the aforementioned sheet version of the artifact is a good start. The main draw of that form is the potential for adaptability and customizability by the user. The article refers to the work of Henry Lieberman and his work on programming by demonstration⁵, and although the concept of this kind of direct, or soft, input and output certainly is on display in the design of the MorphIO, it is still severely limited compared to Lieberman's work, which of course benefits from being more free-form as it is focused on the software aspect of the idea. If the MorphIO could attain that characteristic of being free-form, either in the shape of a sheet, a putty or paste, the amount of freedom the material would offer would make it highly useful and more valuable in ideation and design.

Beyond the benefit a free-form MorphIO would have on manufacturing/design as well as customizability and utility, it would additionally open the material up to outside-the-box thinking. The MorphIO module as it now exists is rigid and very situational, and variation of size or length in that module still only informs a very particular usage - the article mentions robots or small designs that emulate life, for example, and while there is potential to use the module for purposes such as exoskeletons or machine-human integration, it would have to be

⁴ Patterson, A & Allison, J: Generation And Mapping Of Minimally-restrictive Manufacturability Constraints For Mechanical Design Problems

⁵ Lieberman, H: Your Wish is My Command: Programming By Example

manufactured for that particular purpose. Regardless, those applications are, again, informed by the current design of the module. The free-form version would allow for ideation in a potentially limitless amount of fields. According to philosopher Andy Clark, our perception is shaped by the way in which we explore the world, but our ability to interact with it is reinforced by innate knowledge of the materials of our body - bone, tendons and muscle, for example.⁶ This knowledge does not extend to tools; a stick is a stick, and an axe is an axe. For less innate restriction of design, the MorphIO must become less of a stick and more of a lump of clay.

Although the MorphIO module is fascinating technology, its utility right now is the domain of hobbyists and enthusiasts. For it to have a greater impact on technology, it needs to become a valid material or component that benefits manufacture, design, and utility.

Sensing Kirigami

Origami is the Japanese art of folding a single sheet of paper into a multitude of objects, creatures or shapes - Kirigami, however, involves cutting into that sheet of paper to create shapes, forms and art. In this paper, written by Clement Zheng, Hyunjoo Oh, Laura Devendorf and Ellen Yi-Luen Do, a type of carbon-coated paper is presented, along with its affordances and utility, to present a new way of looking at design and a material that has been around for centuries. Various properties of various types of paper are presented, as well as their electrical properties such as resistance and how that resistance is affected by folding and bending.

The most striking property of this sensory kirigami is its elegance and simplicity. Paper, when cut and folded into shapes and patterns, has a wonderful feel and elasticity to it that is immediately appealing, especially if one is kinesthetically inclined. A large part of the paper presents research going into how various folds, cuts and patterns, many of them traditional, affect currents and conductivity, and sensory input and output is demonstrated by manipulating these objects. The question then becomes where and how the benefit of sensing kirigami can be applied. Papercraft and paper art could certainly be elevated by sensory input, but I think the

⁶ Clark, A: Supersizing the Mind: Embodiment, Action, and Cognitive Extension

main draw of this material has more practical application. In order for it to be truly useful, three steps need to be taken; the material must become more environmentally friendly, it must become sturdier, and it must become more customizable.

Plastic usage and waste has increased exponentially in the past 10 years⁷, and a large part thereof is non-biodegradable. Although steps are being taken to decrease this, the digitization of the modern age brings with it myriad small, short-lived plastic electronics. The sensing kirigami outlined in this paper could potentially replace a large part of these minor electronics, and while the paper industry is no friend of the environment either, its impact is lesser and its product, for the most part, biodegradable. Should steps be taken to ensure that the sensing kirigami material is 100% recyclable and biodegradable, major steps could be taken to decrease the usage of short-term plastic electronics.

To further increase usability, and the potential of replacing plastics with paper, the material needs to be sturdier than what we typically associate with it. Resistance to water and tear are top priority, but a sturdier paper also means the potential of reusing it. Although plastic tends to be less biodegradable, paper, meaning its production and disposal process, is severely work-heavy.⁸ If the user themselves can reshape, reform and even press new sheets of paper using the old, the environmental impact will be massive. A printed, bought sheet of sensing kirigami paper needs to be more than a short-term material.

Production of the paper, as outlined in the work, requires a certain amount of printing tools and materials. If the circuitry and conductive paths of the paper could be designed and drawn onto the paper by the user with a pen specifically for that purpose, the material could not only be reused but also become highly customizable. This technology already exists⁹ - it is just a matter of making sure it is equally environmental as the paper needs to be.

Although the “electric paper” outlined in the work is exciting and promising, there are still major steps to be taken in order to ensure that its practical utility is valid and can outperform plastics in enough fields to become viable as a replacement.

⁷ The Compelling Facts about Plastic, PlasticsEurope (2009).

⁸ Strobel, C: Paper or Plastic? The Importance of Effective Environmental Review of Ordinances Regulating the Use of High Consumption Consumer Products.

⁹ Circuit Pen, https://media.digikey.com/pdf/data%20sheets/sparkfun%20pdfs/com-13254_web.pdf