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Arguing for the Extended Mind

In the modern digital era, where the number of mobile devices exceeds the world population, it has become impossible to deny that humans rely on mechanisms external to their brains to amplify their ability to process information. Many of the tasks routinely performed by these devices, such as long division or storage of phone numbers, could indeed be performed by the human brain. However, the devices are faster, do not make errors, and have a more robust memory, which can hold information forever. The question is whether, because these tools perform functions on behalf of the brain, they can be considered a part of those brains? Proponents of the extended mind theory believe so. In this paper, I will argue in favor of the theory by 1) discussing the “Inga Otto” thought experiment, 2) presenting a case study of math, and 3) discussing implications of the extended mind to the Internet and Singularity.

I start by discussing David Chalmers and Andy Clark’s “Inga Otto” thought experiment, which goes as follows. Imagine two adults, Inga and Otto, who are trying to get to the local art museum. Both have visited the museum before. Inga recalls that it is on 53rd street, walks there, and goes into the museum. Otto, however, has Alzheimer’s disease and cannot remember the location of the museum. Instead, he pulls out a notebook, in which he wrote the address last time he visited the museum. He finds out that he wrote 53rd street and makes his way to the museum. Chalmers and Clark claim that “the [two] cases are entirely

analogous: the notebook plays for Otto the same role that memory plays for Inga.” [1, pg. 647] In this way, the notebook acts as part of Otto’s memory and is thus an extension of his own brain, especially if he consistently uses the notebook to recall information. This thought experiment is summarized in the following concise proof:

Premise 1. *Inga uses her memory to recall that the museum is on 53rd street.*

Premise 2. *Otto uses his notebook to recall that the museum is on 53rd street.*

Conclusion 1. *The notebook is equivalent to memory.*

Premise 3. *Memory is a part of the mind.*

Premise 4. *Any part of the mind not contained within the brain is part of the extended mind.*

Conclusion 2. *The notebook is part of Otto’s extended mind.*

It is hard to dispute any of these premises or conclusions and thus argue that the notebook is not part of Otto’s extended mind. There are, of course, some differences. One could argue that the notebook is vulnerable to the environment, i.e. someone can steal or break it. However, that is also true of Inga’s mind. The only difference is that we do not yet have the technology to read minds or destroy other people’s thoughts. One could then argue that, if such technology existed, it would be viewed as highly dangerous and illegal. While illegal, the act of stealing a notebook is not seen in this light. This, however, is more of a reflection of society’s failure to acknowledge the existence of the extended mind than a failure of the latter to exist. Most people would agree that there is little difference between stealing a phone number by sneaking into someone’s notebook or by reading their mind. The extended mind is, in fact, acknowledged by society in some instances, e.g. the time honored tradition that peaking into a friend’s diary is the ultimate betrayal of the friendship between two

people. This is because the diary contains the person's most "inner thoughts." Reading it is no different than wearing a mind reading device to peak into the person's innermost brain. In a TED talk, Chalmers takes this argument to the extreme, stating that the act of stealing someone's cell phone (the equivalent of Otto's notebook) is a form of mental assault. In summary, it is difficult to argue against the theory of extended mind.

On the other hand, there are plenty of examples of brain functionality that is seamlessly performed in and out of the human skull at different stages of human life. Consider, for example, the domain of math. Very few children are born with a natural intuition for numbers. Unsurprisingly, upon first learning how to count, many rely on their fingers as an aid. They associate numbers with the image of subsets of fingers being held up. This visual stimuli is relied upon until they have memorized the order and rules of counting. The children are so dependent upon their fingers that, if prohibited from using them, they are unable to count. However, as time progresses, the process is internalized and they can count all the way to 10,000 without a glance at their fingers. It is irrefutable that a once external process became an entirely mental process. Later in life, the opposite transformation takes place. As the kids begin taking higher level math classes, they are allowed to use calculators. In result, they start to forget how to do the simplest calculations, such as multiplication and division. A once mental process moves outside the brain, the calculator becomes part of the extended mind. As the kids get farther in their academic pursuits, the reliance on this extended mind becomes far greater and more sophisticated. In college, they use Wolfram Alpha to solve integrals that would be impossible to do by hand. Like the child that relies on fingers to count, Wolfram Alpha amplifies the brain, allowing it complete tasks that it would not be able to do by itself.

All of this, supports the theory of extended mind. What difference does it make if certain parts of the process, such as using fingers or calculators, are done outside the skull? Is the outcome any different because at certain points in life they are done inside the skull and at others they are done outside? Absolutely not! And does the counting by the child differ in any way from the counting by a high-schooler? Only in the style in which it is executed, not in the outcome! How is this any different from two people that solve the same mathematical equation in two different ways, e.g. $2 \times (3 + 1) = 2 \times 4 = 8$ vs. $2 \times (3 + 1) = 6 + 2 = 8$? Aren't they just using different tools, in this case mathematical? And what about the child that uses the fingers to aid in the execution of a more complicated task, such as adding or subtracting? Or the college student that relies on the calculator to help solve a differential equation? How can their brains be held responsible for the solution of the more complex task (addition, differential equations) if we do not believe that they are solving the intermediate tasks (counting, multiplying)? Does the child not know how to add? Does the college student not know how to solve the differential equation? In the absence of the theory of extended mind, the only possible answer is that they do not, because they could do not do it using only their brain cells. However, they have independently completed the task, which shows that they can indeed do it. In the absence of the theory of extended mind we have a paradox.

Having argued that the extended mind is a valid theory, I will next discuss some of its implications for the Singularity, or “the point in time at which machines become more intelligent than humans.” [2, pg. 147] So far, we have been thinking about external devices and mechanisms as extensions of the human mind. Our brains are performing the majority of the information processing and using things like calculators to do simple computations. However, at what point do these tools stop becoming extensions of our minds and do our

minds become extensions of these tools? With recent advances in deep learning achieving outstanding results (there are several classification tasks which computers can now perform more reliably than humans), it might not be far until computers are performing the majority of the information processing or doing processing that we are incapable of. How do we define what the mind is when intelligence becomes equally distributed inside and outside of the brain?

A prime example of this already exists: the Internet. Search engines, such as Google, allow us to connect to a massive assemblage of all of humanity's thoughts. People contribute to the WWW and make it more information rich. It seems unquestionable that more knowledge exists on the web than on any single person's head. Should we thus be considered as part of the extended mind of the Internet, rather than the other way around? If you believe this is a reasonable claim, there are deep implications with respect to the Singularity. The Internet has no physical expression and is not a threat to the survival of the human race. The same cannot, however, be said for physical robots. If these machines acquire super-intelligence, what will be the consequence for humanity? Will we eventually be so surpassed intellectually that we become totally useless to them and are simply wiped out? Or will we always be of use as part of their extended mind? For example, it seems that emotions are an important component of intelligence (emotional intelligence). It is also unclear that robots will ever be able to develop emotions. Could we, thus, always be needed as "emotional tools" to augment their purely rational minds? This could in fact be one of the keys to the question of whether or not super intelligent AI will kill off the human race. If humans can in any way be useful contributors to the extended mind of these machines, they will have good reason to keep us around. If not, however, they could easily wipe out humanity.

Throughout this paper, I argued for and explored the implications of the extended mind theory by introducing the “Inga Otto” case study, presenting a case study in math, and describing its applicability to the Singularity and Internet. While initially it may seem odd that part of the mind can exist outside the brain, the argument is very hard to dispute. We have discussed many reasons why. Assuming that the theory holds, the implications for humanity could be monumental. As technology progresses and we become even more closely attached to our devices, it is important to reassess the role of humans in the societies of the future. Are we to remain at the center of a (knowledge) universe where machines are simply tools that extend our minds? Or are we to become an extension of more powerful minds? Will such minds be able to leverage us to augment their capacity? Or are we to become the equivalent of today's monkeys, a once intellectually dominant species, which barely lost the evolutionary train and is now confined to the role of a protected species, simply for the sake of compassion, entertainment, and promotion of genetic diversity?

References

1. Clark A. and Chalmers D. The Extended Mind. *Analysis*, 58(1):7–19, Jan 1998.
2. Besson M. *AI*. Oxford University Press, 2016.