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Notes on the Pedagogical Role of Non-Human Actors

Introduction

In Peter Watts' short story titled *Malak*, the main character is a machine endowed with artificial intelligence (Watts 2013: 335–353). It is not, however, an anthropomorphic robot driven by its behaviour, way of communication, or intentions, towards a maximum resemblance to a human being. Azrael, as the machine is called, seems to be as alien to human beings as possible. It is not a kind-hearted imitator, but a self-activated fighter, armed to the teeth and designed solely for the purpose of precisely eliminating its targets. It feels no compassion towards its victims or the collateral casualties who are killed in uncontrolled explosions or caught in the crossfire. The only measure of success is the execution of the set task, as calculated by a fine-tuned script – a highly accurate inventory of mayhem and destruction. The turning point in the career of this quasi-conscious war machine comes when experimental "ethics software" is installed into the device. Its combat statistics are expanded to include collateral damage, i.e. civilian deaths, which for some reason should be avoided. However, Watts' perspective is quite pessimistic. The digitally enhanced machine reports time and time again to its human command that the predicted number of unintended casualties is too great for an attack to pay off. Each time it receives the same response, which is to repeal the "ethical" directive and continue its attack. Simple arithmetic produces only one answer. Since the command overrides orders to protect the lives of innocents, the way to minimize losses is to turn against those orders.

While Watts' text remains for now within the realm of science fiction, it raises an important issue of technological development. More and more often the tools we actively use suggest certain options, enter into dialogue, and indicate preferred solutions. They cease to be passive instruments and become, at least to some extent, active partners in our activities (Ostrowicki 2013). This poses a new kind of challenge for educators. It is no longer just a question of how the new media and the underlying technology can be made tools in the process of educational interaction. It seems necessary to ask whether they themselves should not be the subject of some kind of educational intervention.

Popular culture abounds in various fantasies about computers reaching self-awareness. These are usually visions of gloom and doom, filled with a great deal

of fear. What if our own creations turn against us? Doesn't the success of creating a digital, fully functional mind herald the end of mankind at the same time? We seem to expect some revolutionary change in the world on an apocalyptic scale. Sometimes we fail to notice that the transformation of our relationship with machines has already begun and continues, step by step, with a qualitative change in our world and way of life.

Interactive being

A real digital "being" – intelligent and self-aware – is still a thing of the future. It is perhaps not even too distant and certainly conceivable. For years, however, we have been talking about the gradual personalisation of individual computer applications. With the help of appropriate animation techniques, the computer programming can obtain a more or less anthropomorphic visual identity. It is possible to interact with it by means of communication, whether text or voice. If properly programmed, the application can also be an excellent substitute for the human being, for example as a game partner, a person providing specific, simple information, or even conducting a teaching process. Goffman's sociology, with its strong emphasis on the face as the primary tool of social interaction, seems to have much to say here. Even if computer programs are not yet fully-fledged social actors, by giving them personal characteristics they can at least participate to a limited extent in various social interactions.

Slightly older users of office software packages may still remember Microsoft Office 97, one of the characteristic features of which was the appearance of "intelligent" agents, whose task was to help the user work with the program. They took the form of simple algorithms, based on probability, which offered convenient or alternative solutions to current tasks and presented new capabilities (compared to previous versions of the program). They were additionally enriched with an animated visualization, which communicated with the user through dialog boxes in a form similar to comic strip "bubbles". Suffice it to say that this enhancement was not entirely successful. The agent proved more irritating than useful. Nevertheless, it was an interesting attempt to introduce a more personal dimension to man-machine relations.

Similar types of technical solutions are also used in popular computer games. Well-designed artificial intelligence is intended to control the behaviour of fictitious characters in the game environment. Programs of this type are created by selecting one of the two possible approaches. They may strive to undertake actions that are deemed the most reasonable or be guided by maximizing the similarity of their results to those of a human player (Jaśkiewicz 2012: 100). Such programs – the so-called bots – are aimed at replacing people in the performance of certain tasks, so it is understandable that in their activities they should strive for the greatest possible similarity to humans. In the case of bots, we can usually also talk about a specific educational function. In simulating human behaviour, they are to enable the player to master the rules of the game, practice effective behaviours, and develop their own strategies of action. Their role here is mainly substitutive, i.e. they replace real people. This being said, it is perfectly conceiv-

able that there will be situations when they are virtually indistinguishable. The context in which interactions with users or programmes take place is of decisive importance here. The nature of the virtual environment may, on the one hand, facilitate their identification – for example by clearly identifying (graphically or textually) avatars run by computer programs – and, on the other hand, the gameplay's mechanics and lack of appropriate labelling may make them indistinguishable from human players.

This type of human substitution by a machine has also been applied in pedagogy. Since the 1980s, attempts have been made to use similar programs based on reactive algorithms in educational processes (Wang 2013). The educational agent was to perform a function similar to that of an individual teacher. Equipped with complex mechanisms of diagnosing the state of knowledge of the student and recognizing his or her learning style, they were to actively support and direct the teaching process, increasing its effectiveness. The idea itself, leaving aside the question of its efficacy, has major consequences. The machine and its software are no longer just tools in the hands of the student. It is to become their active partner not only in the transfer of knowledge, but also in the evaluation of the learning outcomes. To some extent, it is to take control of the process in place of another human being. Not only the formal aspect of this relationship is essential. The assignment of tasks and the evaluation of their performance could be done equally well without the help of the agent's anthropomorphic visualization. However, the importance of emotional and motivational relations between the teacher and the student was recognised. A computer agent, in order to fulfil its task effectively, had to produce a proper effect also at the affective level. Unable to make a real personal commitment, it should at least imitate it adequately (Wang 2013: 14–16). To achieve this, the program could use its own situation assessment mechanisms – measuring the response time of the human partner, evaluating changes in their mode of action, and with the help of external hardware – also monitoring subtle physiological changes (Soliman, Guetl 2013: 828).

Educational agents are to some extent autonomous, in their own (limited) way, intelligent programmes guided by a predefined set of objectives. Available tools – such as reading user feedback, diagnosing progress and learning patterns – are designed to implement them more effectively.

The operation of interactive educational programmes, although essentially purely mechanical, is not free from a number of theoretical assumptions about how the human mind works. The model based on stimulus, response and reinforcement is deeply rooted in behavioural theory and the concept of Norman Crowder's programmed instruction (after: Meger 2013: 40–45). Nowadays, they reject simplified, linear patterns of knowledge transfer, replacing them with branching models, which often allow for a considerable degree of freedom in the choice of material to be learnt. Moreover, learning with this type of software has become quite popular in some fields, such as foreign language teaching (Meger 2013). This is also due to the widespread use of personal computers and mobile devices of all kinds allowing access to the Internet. A user-friendly program is oftentimes cheaper to use than paying for a course with a real teacher. It allows for more flexibility in terms of the amount of time spent on studying and also significantly reduces the stress we are exposed to when we come into contact with others. The program can

evaluate the accuracy of the work we have done, describe the progress we have made, but we don't have to worry about its anger, loss of patience or disappointment. In the worst case scenario, the program will calmly advise us to review the material again and will prepare the next series of exercises.

Despite some criticism that educational software faces (arising, for example, from its behavioural origins), we are undoubtedly dealing with a qualitative change not only in education, but also in the way the human being functions. The interactive machine becomes a partner for work, leisure and learning. Not only does it suggest the right solutions to be adopted in a given situation, but it also evaluates its human partner, points out their wrong moves or even challenges them – for example, within the framework of the game being played. Thanks to the developing technology, the available software is able to accomplish all these goals increasingly better – not only in terms of simple efficiency, but also in terms of imitating the human being.

Multilayer reality

The ever-increasing frequency and intensity of people's interactions with digital actors is a natural consequence of what is sometimes referred to as cyborgization. This is what we call the phenomenon of the ever deeper coexistence of man and machine (Klichowski, Przybyła 2013: 143–144). A line of development can be drawn from the abacus to the personal computer. In the same sense, the first alphabetic writing system is the ancestor of every interactive computer program we may work with today. Both the abacus and the calculator, as well as the laptop used in our work, are tools supporting our cognitive abilities. They can be for the mind exactly the same as a hammer for our hand, i.e. the reinforcement of certain existing skills or aptitudes or their extension. However, you can drive the nails with your fist just as you can make complicated statistical calculations in your head. In both cases, however, there is a good chance of achieving lamentable results.

The advancing cyborgization is a widespread phenomenon. The degree to which new technological solutions determine our lives is growing to such an extent that without a number of technical amenities, ordinary day-to-day social functioning seems virtually impossible. A notable example is the mobile phone. Having it and carrying it with you all the time has become the default way of working in our everyday environment. Nowadays, it is no longer used only for voice communication. Together with other mobile devices, it transforms into a platform for work and entertainment. Telephones are replacing classical notebooks, diaries, notepads, portable radios and televisions. You can use them to read books in the form of e-books or play games of ever higher quality. More importantly, these devices can also effectively expand our perception of reality. If you get lost in a new city, a simple phone with Internet access can help you find the right address. Having doubts about the choice of restaurants, we can instantly check the reviews on the places nearby on the web. When we are waiting for a meal, a few hand movements will allow us to check our bank account balance and in the meantime pay our bills. We can also use our phone instead of our payment card.

However, this simple list of available features – of which there are many, many more – has an additional aspect that is often overlooked in everyday thinking. The electronic devices we carry or wear allow us to perform a whole set of effective actions that relate to a completely different level of reality while having their most physical consequences. This fusion of virtual and physical dimensions is commonly referred to as augmented reality. In short, it means that the world available to our senses is being expanded in real time with an appropriate, artificially generated, reactive plane (Klichowski, Przybyła 2013: 147). The key to augmented reality is its interactive nature. With new technological means, man is able to take symbolic action with entirely real, tangible consequences. To be more precise, interactivity is a way of mediating the human being in an artificially generated virtual space – functioning in it under certain predefined conditions (Ostrowicki 2009: 58). This relationship is also of a feedback nature. While, thanks to appropriate devices, we are able to exert our influence on a new level of reality, we ourselves become an object of influence of the virtual space.

The effect of the coexistence of the physical world and its digital extension is what Kazimierz Korab tends to call "the real world" (Korab 2010: 24). As he points out, there is a huge difference between what we call reality (i.e. a certain intersubjective form of existence external to us) and what is available to us after we have experienced contact with the virtual world. The experience of mediation in a higher-order reality permanently obscures the previously available world, replacing it with a completely new quality. It is not without reason that virtual space is defined here as a reality of a higher order. Firstly, it is secondary to the physical world. It is manufactured by means of appropriate hardware, but is in no sense equivalent to it. On the contrary, it is a symbolic space, constructed through related systems of meanings. Although its existence is intentional and secondary, it is characterized by interactivity – it allows its participants to undertake effective actions (Gurczyński 2013: 124). Secondly, a person who comes into contact with virtual reality may find it to be a space for a fuller existence, a place more realistic than the physical world (Gurczyński 2013: 24). Things previously impossible become suddenly available, the access to information seems to be almost infinite, and the very consciousness seems to be free from material limitations.

The virtual world holds a powerful attraction for users. Not only does it change the way we perceive the world around us, it also, through its appeal, prompts us to engage more profoundly in the digital environment and its hybrids. Theorists used to talk in this context about the phenomenon of immersion, i.e. the process of sinking deeper into virtual space; about a specific redirection of one's attention and the transfer of activity within its framework (Ostrowicki 2007a: 539–540). This experience also translates into the creation of a specific, emotional relationship with respect to the alternative plane of one's own existence. The virtual is no longer just a tool in our hands – it is becoming a very real alternative to the current way of life, which with time is gaining acceptance as something natural. Michał Ostrowicki goes so far as to say that it can be compared to breathing, which is one of the basic functions of our body. Without contact with the virtual world, it seems suddenly impossible (or at least very difficult) to perform the most basic tasks, and our very existence loses its current nature (Ostrowicki 2007a: 549). The real world, i.e. a hybrid combination of the intersubjective reality and the virtual world, is

considered to be the starting point of the contemporary human condition, the fundamental plane of its existence and day-to-day functioning.

Implications of the existence between two worlds

As I said earlier, there is a certain affinity between the abacus and the computer. We are still inclined to think of computer programs as thoughtless tools, which are merely capable of the passive execution of commands – only that they are highly complex and sophisticated. However, let us consider the following issue. For many Internet users, the primary tool for finding information remains the online search engine (mostly Google). The search engine, in turn, for the purpose creating a page directory, uses programs called bots that are autonomous to some extent. They search the web relentlessly, indexing the pages – which allows the search engine to function efficiently. In doing so, they are guided by an appropriate set of mechanisms, with which they were previously equipped by programmers. They are not "intelligent" in any sense, they do not have self-awareness. They are far from artificial intelligence as depicted in films or science fiction novels. However, their role cannot be underestimated. It is these bots that structure countless information resources, ultimately contributing to the results we obtain by entering a specific query into the Google search box. In a sense, it is these bots that control a significant part of the mechanisms of obtaining information in our culture. They may not be self-aware, but it is difficult to deny them power and influence on our lives.

The bots are not visible to the average network user. However, their function would make them quite important actors in social life. Such programs function across the entire network – they populate it in countless numbers, subtly directing various activities, taking care of user security and convenience. At the same time, they take more and more control over user behaviour. Even a simple spam filter, which is used today in most mailboxes, can significantly determine which type of correspondence we will receive and which will be deemed undesirable. Of course, there is no reason to be concerned about this, as long as the filter actually works and stops e-mails offering cheap medicines of suspicious origin or letters from fraudsters who allegedly want to share their assets. But what if its algorithms were changed and instead of junk mail it started to censor information about important social campaigns or even private correspondence which, when scanned, would contain words considered inappropriate?

The Internet is usually perceived as a medium, i.e. as a means of communication. In this respect, it is indeed the successor to a newspaper, radio or television. However, its interactivity, immersive character and ability to seamlessly intertwine with reality, give it a completely new quality. It still remains a communication tool, but it offers much greater possibilities, which were previously difficult to imagine. This is very well illustrated by the research on virtual computer environments for online games – simulations of the world in which users (players) are equipped with appropriate digital bodies – so-called avatars – functioning in a fictitious space and capable of taking action in it and modifying it according to pre-established rules. A person in such circumstances can make contact with

others on several levels: in their own name – i.e. as if they were in a real life situation; they can also speak from the avatar level, i.e. by referring to the actions of their digital body, putting them in the foreground; finally they can also immerse themselves fully and behave as if everything in which they participate were completely real (Szeja 2004: 111–115).

A player immersed in a virtual environment also has the opportunity to interact not only with avatars controlled by other people. All kinds of bots, also equipped with digitally generated bodies, can function within this realm. In some games it is possible to engage in conversations with them, cooperate in the performance of tasks, issue instructions to them, etc. A properly programmed bot can also effectively replace a human being by controlling his or her avatar as instructed by its owner.

It is not necessary to simulate the physical reality in order to have this type of contact. The network is a "natural" environment for all kinds of autonomous agents; they can operate freely within it, carrying out the tasks for which they have been designed. A large number of bots operate, for example, on popular social networking sites such as Facebook or Twitter, impersonating (sometimes quite effectively) real users. Contact with a bot in a game environment or working with the help of an educational agent is usually a straightforward and transparent situation. The user is, in most circumstances, aware that they are interacting with a machine. In the case of programs running freely on the Internet – in discussion lists, online forums, social networking sites – this transparency is gradually disappearing, to the point where the software agent can manage our actions in a completely invisible and subtle way, so that we do not even think that we ourselves may be in any way influenced by it.

Still, the entire network – or rather the functioning within it – is much more complex. The interactions to which the user is subject cannot be characterized only as the sum of effects caused by particular programs with which they come into contact. By its very nature, we are dealing with an open space, full of interdependencies subject to strong dynamics. However, there is no denying that there have been changes in thinking and action as a result of engaging with the network itself and with the other players present. One could say that a human being succumbs to certain programming carried out by their own creations (Ostrowicki 2009: 66). Thus, due to the subject matter, we are dealing with a situation of great significance for the pedagogical sciences, the consequences of which are still not entirely clear to us. This is probably the cause of some of the concern and of the alarming tone of some of the commentators on current technological developments.

The way forward for education

Teachers have already learned to reap the benefits of technological progress and nearly universal Internet access. All kinds of e-learning courses enjoy great popularity, and there is a growing range of different educational programmes available, some of which serve only to support the teaching process, while others, using the pedagogical agents described above, are intended to be used indepen-

dently by the user as self-study resources. Not only is technological support for the teaching and learning process becoming standard practice, but it is actually expected. Even in the "typical" context of a teacher, a specific venue and a group of students, the use of appropriate multimedia tools or networking is becoming increasingly important (Jackson, Helms 2011: 294).

An additional positive aspect of the changes in this respect is the extension of the scope in which students themselves can participate in the educational process. By broadening communication opportunities and increasing the availability of alternative sources of knowledge, teaching takes on the character of building knowledge together, slowly moving away from a model based on one-way communication. Such processes are nowadays not only the domain of the educational sector, but also the way the Internet works in general – or at least in its areas based on Web 2.0 (DePietro 2013: 4). It is fair to say that we are living at a time when education is facing one of its greatest challenges, but also one of its greatest opportunities. A completely different issue, however, is whether it is able to make good use of those opportunities in the current state of affairs.

As I mentioned earlier, we are increasingly the ones who are conditioned by machines. Our activities begin to run according to the protocols and recommendations given to us by the computer software. Bots, in the form of web crawlers, have a strong impact on our access to information. This overlaps with the process of the gradual hybridization (cyborgization) of the human being as such. One could risk saying that even proto-intelligence, which is currently available to machines, is capable of controlling many spheres of our lives. Further technological development, research into neural networks and other learning systems, will soon increase this impact. The question of whether a teacher is necessary for the educational process is already pertinent, be it as a source of knowledge or as a facilitator of the learning process. As the focus shifts to multimedia use and the application of information exchange networks, there is also a colossal change in the structure of the educational relationship. If students or pupils are looking at the presentation displayed using the overhead projector and are taking down this information as part of their notes, then who is the teacher? The multimedia, which are to serve only as auxiliary materials, are turning the educator into an instrument. He or she falls out of the leading role and even gradually ceases to be real. In a sense, it is the medium that becomes reality, and the human is a simulative addition to it (Leopard 2014: 87).

The acquisition of control by technological devices is all the more challenging the wider the scale of this process. A school lesson or an academic lecture in which media support becomes more important than a sound relationship between teachers and their students is problematic. On a global scale, we are faced with an uncontrolled process the impact of which is difficult to predict. However, the problem does not lie in the fact that the role of technological solutions is increasing, as this is a natural development. Just as the invention of writing changed social life fundamentally by gradually diminishing the role of oral communication (Hopfinger 2010: 31), so too do the new media modify our way of life. The real challenge seems to be to find a space for ourselves in a rapidly changing system. We are averse to the idea that "anyone" can act as a teacher – we expect such an individual to have the right attitude, demonstrate adequate competence

and follow ethical principles. In the case of software that serves the same purpose, we do not set similar requirements, evaluating it rather on the grounds of efficiency. However, everything seems to indicate that the future of pedagogy is inseparably connected with computer programs that carry out specific practical tasks. The way they will address them is therefore becoming a major new ethical issue (Bober 2008: 58).

Today, pedagogical knowledge must focus on more than just working with a real person. It is equally important that it provides solutions that will allow the design and transformation of both the web and the software. Programming knowledge is not sufficient to create appropriate services in this area, it is also necessary to be able to properly diagnose needs and objectives, including, first and foremost, demonstrating familiarity with learning processes and broad competences in the field of the social sciences. Perhaps sooner than we think, we will find ourselves in a situation where there is a great demand for teachers with superb IT skills who will be able to successfully combine their abilities in both fields. However, it poses a challenge not only in terms of vocational training, but also in terms of a change requiring a redefinition of the role of one's profession and its place in society. The more advanced the software deployed in this area becomes, the closer it gets to the status of genuine artificial intelligence, and the stronger the response it will demand of us. This will continue right up to the point where the individual computer programs will be recognized as both the subjects and the objects of pedagogical intervention.

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Summary

Notes on the Pedagogical Role of Non-Human Actors

The aim of the text is to highlight the growing role of autonomous computer software in the decision-making and cognitive processes, especially in the field of education. This paper discusses the subject of the relationship of education, virtual reality and the contact with the advanced computer programs, which are of even greater importance in determining the goals of human activity. The author argues that advanced and complex software has become an actor itself in educational relationships – as important as any human being.

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pedagogy, socialization, virtual reality, artificial intelligence

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