



MeWe

Robots for making humans more human

By Prof. Dr. Edson Prestes and Marsali Hancock

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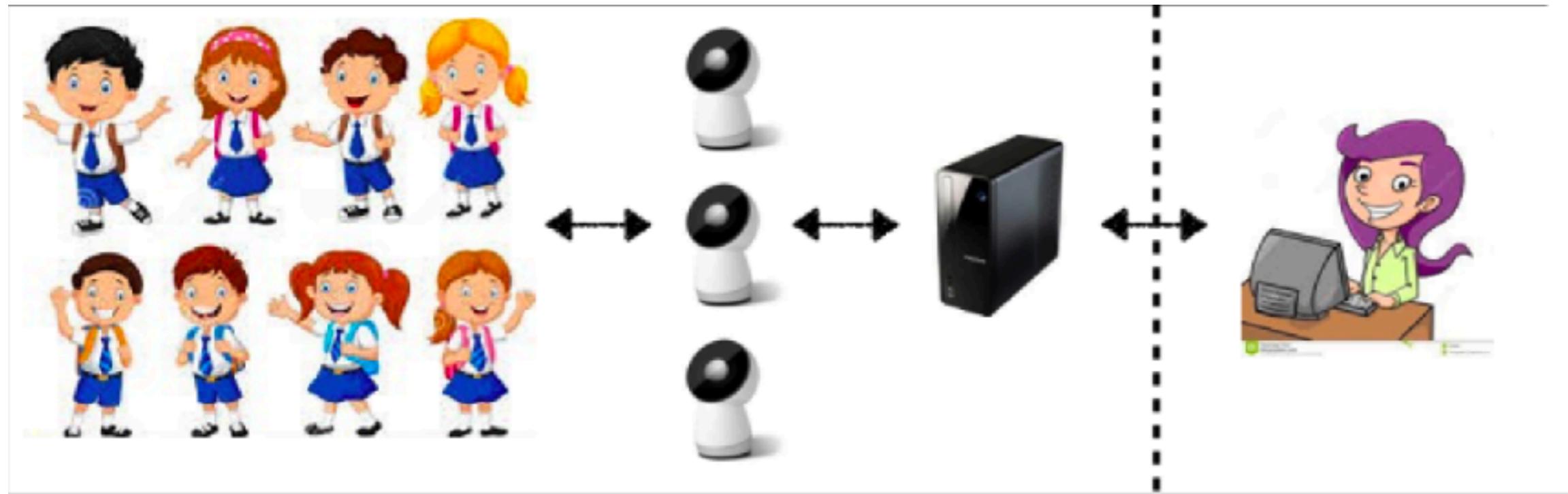
Goal

Investigating and developing new Robotics and Interaction technologies to promote human flourishing and the development of empathic processes.

We believe that the promotion of positive emotions, commitment, meaning for life and the development of empathic behaviors have the potential to improve the interpersonal relationship in society and therefore minimize the different facets of violence (bullying, segregation, racism, ...).

Note: We will call this new domain Robotics MeWe in honor of Martin L. King and Muhammad Ali. Martin advocated racial equality by fighting against racial segregation during the US civil movement in the 1950s to 1960s. Martin argued that the segregation laws established a **I - IT** relationship where black people were treated as inferior humans being compared to objects. In 1975, during a speech to a group of trainees at Harvard, Ali was asked to recite a poem by a member of the audience. His answer was simply Me We. This poem was considered the shortest and most intense of all time since it contained a strong empathic message saying that all people are part of a single whole. And that there is no distinction between them.

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Robots will have different personalities and be able to simulate characters with different nationalities, races, genders, and ages.

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Cooperation

- Students are organized into subgroups with 4-5 children each.
- Each subgroup is supported by one robot which is teleoperated by an external operator (child?).
- Children's voice changes to prevent identification, i.e., the child that is controlling the robot is not able to identify his(her) corresponding subgroup and vice-versa.
- Cameras should be placed in a certain way to also prevent identification.
- Tasks could be to build cardboard robots or play strategic games, etc.

Nudging/Manipulation

- If the subgroup attained a good result. The subgroup can be told it only attained the result because it was supported by a child with race/gender different from the whole group.
- If the subgroup did not attain a good result. The subgroup can be told it only attained that result because it was supported by a child with the same race/gender of the whole group.

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Evaluation

- Subjective evaluation based on child perception about others with difference race and gender.
- This perception should be collected before the experiment.

Additional Experiment

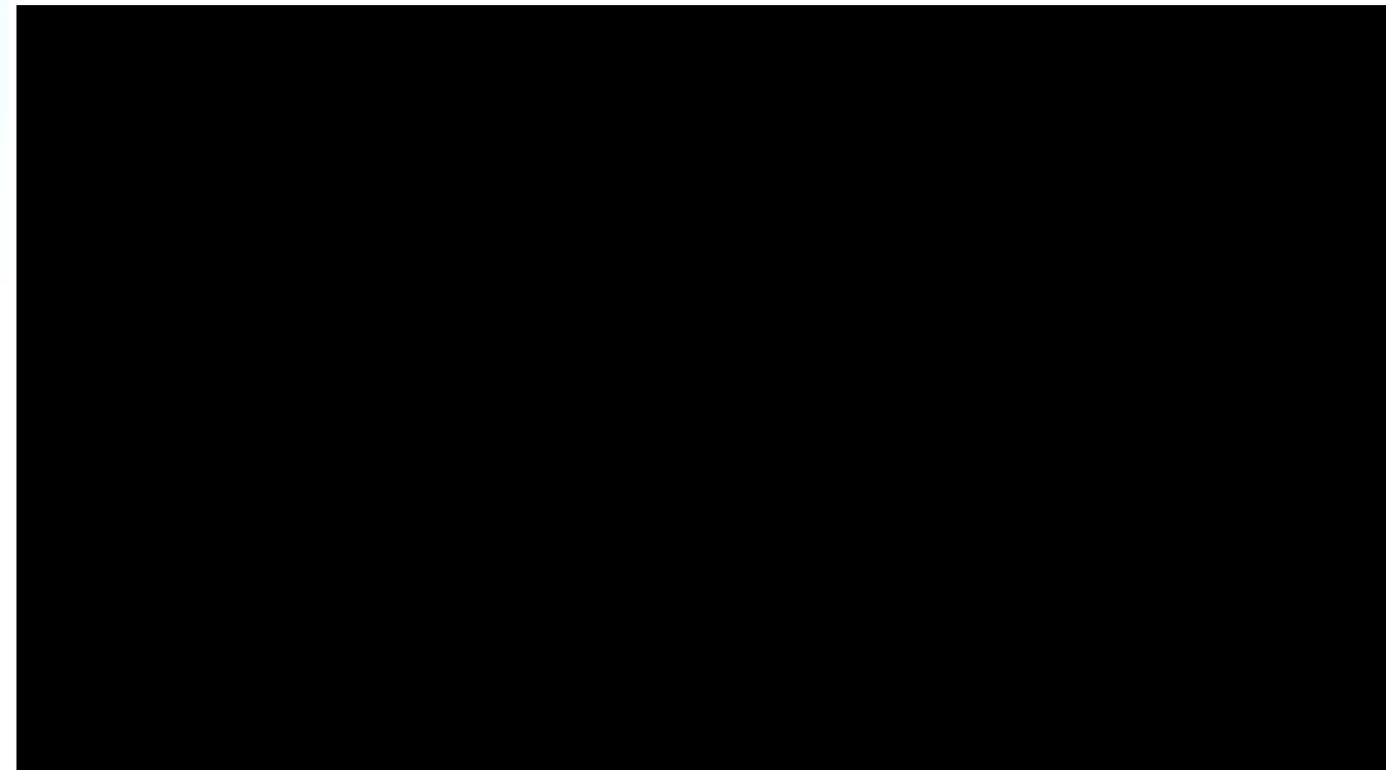
- Information collected by cameras could be used to teach children to recognize emotions.
- Each children could see his/herself and express his/her emotion at that particular moment. In the end, all emotions are labeled.
- Children can try to recognize other's emotions. Is an extended roots of empathy experiment?.

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POALab/IFRS
Prof. Andre Peres - Coordinator

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Promoting Compassion/Empathy

- Children can sit surround the robot and talk about their daily, about the bad and good events that happened during the past week.
- A storytelling robot could do the same, i.e., expressing its emotions during telling stories.
- An auxiliar robot could nudge the children to make them to recognize emotions and cheer up the story-teller.
- Emotions expressed by the robots could be collected by facial analysis of babies or of children during the cooperation tasks.

Robótica *MeWe*

Robotics for making humans more human

Prof. Dr Edson Prestes.

1 Introduction

Robots are no longer just science fiction characters. They are beginning to take on important roles in the modern world. Currently we can find robots being used in the most varied types of environments to perform tasks among which some exclusively performed before by humans. Robots capable of performing minimally invasive surgeries already exist on the market ¹, performing household cleanings ², hosting guests at hotels ³, preparing dishes at restaurants ⁴, transporting humans between different points of a city ⁵, among others. These examples are a small glimpse about what is reserved for the humanity in the future, since it is a consensus among Roboticists that humans and robots will walk side by side.

The advances in Robotics grow every day and this raises numerous concerns. Until few years ago, the research in this domain was directed to improve people's quality and standard of life. Little was debated on the ethical issues involved in the development and use of robots, with the exception of the autonomous lethal weapons. The discussion on the development of autonomous lethal weapons is well advanced and there are already numerous manifests ⁶ and, currently, formal discussions such as those conducted by the United Nations ⁷ to ban robots capable of autonomously deciding when and how to kill a human. In relation to the other uses of robots, as elderly and children caregivers, or robot lovers, the discussion exists but it is still embryonic. In these examples, the concerns are about dependence on technology, abuse and replication of this abuse on people, safety, data's protection and privacy, among others [LIN 2014]. For these reasons, on December

¹ <http://www.davincisurgery.com/>

² <https://www.irobot.com/For-the-Home/Vacuuming/Roomba.aspx>

³ <http://www.hnh.jp/en/>

⁴ <https://www.therobotreport.com/news/robotic-cooks-servers-and-noodle-cutting-devices>

⁵ <http://nutonomy.With/>

⁶ <http://futureoflife.org/open-letter-autonomous-weapons/>

⁷ <http://www.techrepublic.com/article/un-opens-formal-discussions-on-ai-powered-autonomous-weapons-could-ban-killer-robots/>

13, 2016, IEEE launched ⁸ the document entitled “IEEE Ethically Aligned Design” [ART 2016] which presents a set of concerns and recommendations about the development of artificial and autonomous intelligence systems. This document was prepared by more than one hundred world leaders in diverse areas of knowledge such as robotics, law, psychology, sociology from various academic institutions, industries and government agencies. It discusses ethics in Robotics from various points of view including legal aspects, development of autonomous lethal weapons, how to imbue ethics in AI, etc.

Despite the concerns raised by the international community, it is common sense that Robotics has the potential to impact positively and directly the lives of everyone in the medium/long term, bringing new opportunities in terms of services, jobs, well being and quality of life. There are a number of examples in the literature that focus more on improving the standard of living than on improving the quality of life. In relation to the quality of life, international groups such as the IEEE Special Interest Group on Humanitarian Technology (IEEE SIGHT) ⁹ aims to promote the use of Robotics and Automation to improve the quality of life of people in underdeveloped areas through the collaboration between the international community and government agencies. An illustrative example of activity developed by this group is the international competition for autonomous detection of landmines using wheeled robots [PRE 2016, MAD 2015a]. It aims to raise the global awareness in the international community about the post-war consequences suffered by countless countries and to promote the development of low cost robotic solutions to detect landmines left in conflict areas. This competition has the participation of members of this project and is in its fourth edition ¹⁰. Another relevant initiative, however led by ETH Zurich, is the Cybathlon competition ¹¹. It aims to promote the interaction between the industry and academia to leverage the development of robotic devices for people with motor disabilities. This competition has different modalities according to the type of limitation. An example is the run with robotic leg prostheses where the person must perform several steps and movements in order to navigate in an environment full of obstacles. The winner is the one who achieves the highest possible score considering all the tasks to be performed.

Another aspect of the use of robotics to improve quality of life focuses on the mental, psychological, emotional aspects of people and their social relationships. In this direction, we can find as a good example the Keepon robot [KOZ 2009]. Despite its simplicity, it was developed to study the basic mechanisms of social communication being able to help children with behavioral disorders like autism. It has been employed in schools and cen-

⁸ http://standards.ieee.org/news/2016/ethically_aligned_design.html

⁹ <http://www.ieee-ras.org/ras-sight>

¹⁰ url <http://www.inf.ufrgs.br/hratc2017>

¹¹ <http://www.cybathlon.ethz.ch/en/>

ters for treatment of behavioral disorder since 2003. Another example is the robot PARO [BUR 2013] developed by the Japanese AIST Institute. It is used in therapeutic procedures in hospital settings or where the presence of animals is prohibited. The use of PARO has presented numerous benefits such as reduction of behavioral and psychological symptoms in patients with cognitive decline; stress reduction of patients and their caregivers; increased interaction between patients and between them and their caregivers; etc. The robot Yotaro [KUN 2010] is another interesting example. It was developed by researchers at Tsukuba University in Japan and consists of a robotic baby to simulate couples to have real children and increase the birth rate in Japan. Recently, Toyota has launched the Kirobo mini robot ¹², an alternative version with the same purpose as the Yotaro robot. The original version ¹³ of the Kirobo robot was developed to be the first Japanese astronaut robot. Because of this, Kirobo was awarded the Guinness Prize for being the first company robot in space. Recently, Hasbro launched the company robot called Golden Pup ¹⁴. It resembles a Golden Retriever dog and it is able to respond and interact with its owner in a manner similar to a real dog. It has been used to decrease the loneliness of the elderly by increasing their quality of life.

The researches that focus on the interaction between robots and humans come from the area of human machine interaction and seek to understand the technical, methodological, behavioral and theoretical aspects involved to generate a fluid and natural interaction between humans and robots. This requires an interdisciplinary and multidisciplinary effort involving many areas including artificial intelligence, engineering, social sciences and psychology. That is, to endow a robot with the capacity to interact naturally with humans, it is necessary to understand the verbal and nonverbal communication process present in any human communication. Understanding this process is fundamental to ensure the correct transmission of the intended message without generating any kind of misinterpretation. A robot with this cognitive ability will be able to understand the sociocultural rules of the community where it is embedded and create empathic bonds. Although there are no robots with this capability today, they are expected in the coming decades and because of this, there are already numerous discussions around the ethical aspects involved in this interaction [ART 2016, ART 2017].

In this project, we intend to investigate and develop semi-autonomous robotic systems based on psychology techniques to promote human flourishing and the development of empathic processes. We believe that the promotion of positive emotions, commitment, meaning for life and the development of empathic behaviors have the potential to improve the interpersonal re-

¹² [Http://www.reuters.com/article/us-toyota-robot-baby-idUSKCN1230BR](http://www.reuters.com/article/us-toyota-robot-baby-idUSKCN1230BR)

¹³ <http://kibo-robo.jp/en/>

¹⁴ <http://joyforall.hasbro.com/en-us>

lationship in society and therefore minimize the different facets of violence. In this sense, we will advance research in different areas that include human machine interaction, positive psychology, robotics ethics, among others.

2 Contextualization

Humans have created great historical moments bathed by violence and blood. In a retrospect, one can recapitulate huge wars empowered by the desire for acquiring new lands and political power. By rebuilding a brief timeline of major battles, it is possible to account for billions of killed human beings, ruined families, cities destroyed by exasperated violence that annihilated dreams and lives.

Looking at the prehistory, one can highlight the attacks committed to different groups focusing on the conquest by food, territory and often the women of the bands. Giving an imaginative leap to Athens and Sparta in ancient Greece, one sees the same interests. These, too, were responsible to the extreme poverty of many peoples. Over the years, we can cite as examples the campaigns of Alexander, the Great; the crusades; wars of independence in countless countries; civil conflicts; instability in the Middle East, and so many others that defined colonialism, created slavery, the exploratory work of children and women, extorted ethnic groups, sub-classified cultural nuclei, disrupted entire communities, among other misfortunes that still prevail in today's society. In parallel to this evolution, one can find the development of the war industry. This, in turn, is promoted by the development and perfection of technically sophisticated and deadly military equipment. The combat that was once carried out using armor and swords, today is made by huge machines of mass destruction. For Pinker [PIN 2013], unlike the archaic wars, twentieth-century wars were destructive to an unprecedented degree because they were waged with machine guns, artillery, shelling, and other long-range weaponry freeing soldiers from natural inhibitions against combat melee and allowing them to mercilessly kill a large number of faceless enemies.

Defeating the enemy without looking him in the eye, questioning him or understanding his points of view, made the fighting more intense and devastating. Hiroshima and Nagasaki are examples of how an entire community can succumb to political disagreements and revenge desires. To this day these peoples live the torments and remnants of war. The Holocaust, one of the greatest atrocities in the modern world, was also responsible for the murder and persecution of thousands of Jews and Gypsies. Viktor E. Frankl, a psychiatrist and founder of the school of logotherapy, reports in his book [FRA 2015] the period that remained in various concentration camps, including Auschwitz. Some of his lines illustrated how much violence, as well as prejudice, racism, among others are so ingrained in people, so that they cannot see the other as being of equal value and feeling.

Etymologically, according to Dadoun [DAD 98], the meaning of violence goes back to aspects related to strength, energy, power, value and vital force. It is perceived, therefore, that in its own origin, it tends to illustrate certain content of intensity and brutality. For Krug [KRU 2002], violence can be classified into three general categories: self-inflicted, when it is committed upon oneself, as self-flagellation or suicide; interpersonal, when it is directed at the other or small groups, such as family or co-workers; and collective, when produced by larger groups such as the state, irregular troops, terrorist groups or economic organizations acting on oligopolies or market reserve strategies.

When one thinks of the roots of violence, one can perceive its ramifications beyond our comprehension. It has many faces and can be imposed by totalitarian systems or arise from cultural, religious, generational, and other differences. It is also incited when one has a desire for power, money, land or business, and can be much wider for those affected by wars, because it is not always physical, verbal or moral. Violence can also be symbolic and present in our daily lives without feeling it. Examples include fashion, media and body trends imposed by society. According to Bourdieu [BOU 98], the presence of a dominated and domineering is necessary to build a scenario where oppression happens.

Violence, which is not only physical, is conditioned to the social being that is put as dominated before an authoritarian society that dictates and imposes power. It transcends morality and verballity. Bourdieu [BOU 2007] adds to this violence the physical, economic and social power as agents of force that are decisive for the existence of the dominator and dominated. Symbolic power, like authoritarianism, leads people to follow rules even though they are hard and/or terrible to be executed, i.e., common citizens acting in unprecedented ways, using force and violence in their decisions. Adolf Eichmann is a great example of a faithful follower of the imposed rules. He was one of the greatest perpetrators of the Holocaust, responsible for the deaths of thousands of people. In his trial in 1961, he stated that he was only “following orders”.

Although violence permeates human history, being present today in the world, one can observe the emergence of many movements for peace and the search for the care of the other. Since the Second World War, people have strived for a global and local understanding of their problems and challenges. From that point, many movements began to take power, led by the United Nations (UN) and non-governmental organizations (NGOs) in the most varied areas. Another driver of this aspect that goes against violence is the massive access to the worldwide information often in real time. This has brought people closer to each other as they become aware of what is happening on the other side of the world. Formerly the wars were very romanticized and nobody gained access to what happened in the battle fronts. The information was slow to reach the homes and there was

great censorship on certain matters that could hinder the progress of the fighting. Today, thanks to technology and its more democratic access, it has been possible to reduce the incidence of violence. From the twentieth to the twenty-first century the communities were able to re-signify themselves, from the new concepts and values, to then empower a very widespread concept that is now called empathic exercise [KRZ 2015].

3 Why Empathy Matters

Looking through the other's eyes, wearing their shoes or taking an imaginative step beyond the own perception are metaphors that denote exercises to become more empathetic. But what in fact is empathy? There are many thinkers in different areas, periods of time and places that have converged to a similar definition. Analyzing from its etymology empathy denotes "within the emotion" or "along with the emotion". From Greek *pathos* designates quality of passion [EDI 87]. Unlike sympathy or antipathy, according to Krznanic [KRZ 2015], empathy is an art of putting oneself in the place of the others through the imagination to understand their feelings and perspective in order to guide his/her own actions.

The basic elements that lead people to the process of empathy are [KRZ 2015]: putting themselves in the position of others disregarding dogmas and prejudices; perceiving others points of view; listening attentively; understanding but not necessarily supporting; being curious by perceiving the different aspects of situations and trying to understand what leads the other to commit such acts or attitudes.

Wars, as well as genocides and other attacks on the population, can be defined as great movements where the empathic process has failed, because they go back to scenarios where people do not seek to recognize all ways of seeing and being through others. Each person is fighting for his/her "justice" and "rights". The film *Nothing new on the front*, based on the novel by Erich Maria Remarque, tells the story of a German infantryman who enlisted to fight the French in World War I. One of the most brilliant scenes of the film happens when the German soldier, Paul, is on the battlefield and, during the shooting, a soldier of the French forces falls in front of him. And Paul is forced to take shelter in that trench next to the soldier. In the first moments, he feels angry with the soldier's groans of agony. However, afterwards, he begins to feel great guilt for what he has done and remorse for his actions. But it's late and the soldier passed away. The next few moments are of great horror, because Paul realizes what he's been doing through that war, of the unprecedented deaths. He imagined that the French soldiers were people like him, with families and children. Suddenly, he humanizes the enemies by putting himself in the their places and feeling their pains. This dramaturgy has built a symbolic scenario that illustrates the empathic exercise.

The 1980s and 1990s were two decades where several psychotherapeutic

and psychological treatments appeared. People sought more and more to understand themselves. There was a strong tendency for books and self-help treatments. Krznaric [KRZ 2015] reports that the twentieth century was the Era designated by Introspection. Named for the period when more people sought support within therapeutic and psychological care clinics. They believed it was necessary to understand who they were in order to become better people. That way, they focused on their desires and experiences.

However, this strong tendency to look at themselves failed to make people's lives better or to make them feel happier [KRZ 2015]. For Krznaric the twenty-first century is the Outrospection Era. He believes in looking and understanding the other to know himself. In the same way, for him, empathy has the power to heal relationships, make people better, transcend prejudices, see the world from different points of view, create bonds, make people more human and give meaning to life. In this line, Gandhi (apud [KRZ 2015]) disseminated his Talisman to the people and it contained the following meaning

Whenever you are in doubt, or when the self becomes too much with you, apply the following test. Recall the face of the poorest and the weakest person whom you may have seen, and ask yourself, if the step you contemplate is going to be of any use to him [her]. Will he [she] gain anything by it? Will it restore him [her] to a control over his [her] own life and destiny? In other words, will it lead to swaraj [freedom] for the hungry and spiritually starving millions? Then you will find your doubts and your self melt away.

Empathy has the power to transform lives. Patrícia Moore, product designer and creator of the Shell logo and the Coca-Cola bottle, experienced the empathic process by transforming herself into an eighty-five-year-old lady to live the dilemmas of an older person with arthritis. For three years, she went through several States observing and feeling the great daily difficulties faced by an elderly in some basic activities like opening a door or climbing the stairs. All this empathic sense began when, at a work meeting, she questioned whether the new model of a refrigerator could be modified to allow people with arthritis to open it easily [KRZ 2015]. One of her colleagues was adamant and explicitly stated that the project was not for "this kind of person." Ever since, Patrícia Moore has become an empathic activist and one of the largest special product designers specifically developed for people with motor disabilities. The elderly Oscar Schindler also felt the power of empathy by re-signifying his anti-Semitic beliefs and saving one thousand and two hundred Jews from the Holocaust. It started with the friendship between him and his Jewish accountant Itzhak Stern. Schindler began to see Jews and people from other ethnicities as human beings equal

to the Germans, and this led him to spend all his fortune on bribes to keep all his Jewish workers safe until the end of the war [KRZ 2015]. Mahatma Gandhi, Siddhartha Gautama, Jesus, Mother Teresa of Calcutta are other great people in history have also achieved excellence in their empathic exercises.

4 The Role of Technology in the Human Development

Technology has the potential to contribute significantly to human development. Practitioner and Researchers might combine scientific advances coming from different domains like Robotics, Psychology, Computer Science into solutions that promote human well-being. A simple example is the application SuperBetter¹⁵, available to smartphone, which aims to increase resilience making its user more capable to cope with tough situations. According to some users, this application is able to improve mood and reduce anxiety and depression. SuperBetter is a good example that shows how positive psychology can take advantage of computer science tools. Another interesting approach is based on Virtual Reality (VR). VR focuses on immersing people in different environments. In partnership with the United Nations, the visual artist Chris Milk¹⁶ produced the documentary *Clouds Over Sidra* using VR in 2015 that shows the conditions of life of refugees in Jordan. This documentary shows the day in the life of a 12-year-old Syrian refugee named Sidra. Sidra lived in refugee camp for 18 months with thousands of other refugees. Wearing the VR glasses, the movie watchers could see and experiment for just one day the Sidra feelings and fears. This documentary was broadcast at the World Economic Forum in Davos, Switzerland for a group of executives. For Milk, “[Virtual reality] connects humans to other humans in a profound way I’ve never before seen in any other form of media, and it can change people’s perception of each other”. He concluded “That is why I think virtual reality has the potential to actually change the world?”.

Following this line, the Stanford Virtual Reality Lab¹⁷ have developed several projects with immersive processes. One such project is called *Empathy at Scale*. Its purpose is to design, test and distribute virtual reality interventions that teach empathy. Experiments allow the student to live the life of another person through simulations. Already Microsoft, with use of hololens developed the holoportation: a virtual 3d teleportation in real-time¹⁸ that has as proposal the meeting of people through the simulated teleportation.

¹⁵ <https://www.superbetter.com/>

¹⁶ <https://www.wired.com/brandlab/2015/11/is-virtual-reality-the-ultimate-empathy-machine/>

¹⁷ <https://vhil.stanford.edu/projects/>

¹⁸ <http://research.microsoft.com/holoportation>

Affective Computing and Artificial Intelligence are also efficient technology solutions for empathic promotion, recognition of emotions and facial expressions. Little Dragon ¹⁹, an artificial intelligence system for children, uses a tablet application and dragon-shaped avatar, to assist children in their homework and independent study. It analyzes user facial expressions to detect his emotional state and adjust the content accordingly, thus, engaging him not to give up his activities. Affectiva ²⁰, a MIT Media Lab spinoff, created a database with several faces that are the core of Little Dragon inference system.

Another relevant application for promoting empathy is That Dragon, Cancer ²¹. It is autobiographical video game based on the creators' experience of raising their son Joel, who was diagnosed with terminal cancer at twelve months old succumbing four years later. The game tries to recreate the joel's parents experience, the low and high moments in an adventure game format. There are other applications where users play games that stimulate empathic learning. Some of these games are directed to children and aims to promote moments of reflection about their daily attitudes and ways in which they interact with the world. For instance, Avokiddo Emotions ²² allows children to evaluate responses from animated figures of animals with strong personalities to a variety of emotional stimuli. Middle School Confidential ²³ utilizes stories with sounds, tips, and questions, in the format of a graphic novel, about the dilemmas of children in different social situations that require empathy and understanding.

5 Problems and Goals

The empathic process has the power to minimize conflicts as it stimulates the correct understanding of people's needs from their point of view. There are several narratives of people who have completely changed their perspective under a given social situation from the understanding of the situation from the point of view of the affected person. This was the case of Schindler, Moore, Gandhi, among many others, as reported by Krznaric [KRZ 2015]. This fact is corroborated by the report of researchers as Steven Pinker who suggests that the expansion of empathy was the main cause of the reduction of violence in the world in the second half of the millennium [PIN 2013]; And as Ronan Krznaric [KRZ 2015] who supports Pinker by claiming to be convinced that empathy is essential for the minimization of violence which has nevertheless been neglected.

Going toward this direction, we can find some educational programs

¹⁹ <http://littledragon.artha.hk/>

²⁰ <https://www.affectiva.com>

²¹ <http://www.thatdragoncancer.com>

²² <http://avokiddo.com/apps/avokiddo-emotions-app/>

²³ <http://www.middleschoolconfidential.com/apps.html>

like the Roots of Empathy ²⁴, which emerged in Canada, and the Social and Emotional Aspects of Learning ²⁵, which came about in Britain. These have been very successful in minimizing violence in schools through the promotion of empathy. A program that follows the same line, but in another scope is the Parents Circle - Families Forum ²⁶. It uses empathy to bring together Israelis and Palestinians who have had relatives dead in conflict. Although it has suffered harsh criticism from political and religious sectors, this program has gained strength as a pioneering project of reconciliation.

We believe that the empathic process can be accelerated and enhanced through the use of positive psychology techniques. One person will be more susceptible or more likely to see the point of view of another if she is well with herself. This fact helps the person make comparisons about his/her current situation with that of the affected one, stimulating empathy and consequently compassion. Understanding our own emotions and how they affects our daily life is critical to understanding the viewpoints of other people.

Based on this, this project aims to investigate and propose the use of new Robotics and Interaction technologies to promote human flourishing and consequently to prevent and combat violent behaviors (bullying, segregation, racism, ...) in society. We will call this new domain Robotics *MeWe* in honor of Martin L. King and Muhammad Ali. Martin advocated racial equality by fighting against racial segregation during the US civil movement in the 1950s to 1960s. Martin argued that the segregation laws established a I - IT relationship where black people were treated as inferior humans being compared to objects. In 1975, during a speech to a group of trainees at Harvard, Ali was asked to recite a poem by a member of the audience. His answer was simply *Me We*. This poem was considered the shortest and most intense of all time since it contained a strong empathic message saying that all people are part of a single whole. And that there is no distinction between them.

The target audience for this project are children aged 4 to 8 years. According to Paul Bloom [BLO 2014], during this phase, children exhibit preferences for interacting with others who resemble them in terms of race and language. These rudimentary social relationships are important for the social development of the child, but if the child is not properly stimulated, the feeling of superiority in terms of race, gender, or sociocultural condition may appear. Based on this, we believe that our solution, that is multi and interdisciplinary and that has robotics and psychology as its core, is the ideal to act in the origin of violence. We believe that it is possible to use techniques and interventions from psychology in a friendly and attractive

²⁴ www.rootsofempathy.org/

²⁵ <http://www.rosettaprimary.co.uk/seal-social-and-emotional-aspects-of-learning/>

²⁶ <http://www.theparentscircle.com/>

robotic system that enables the child to evolve to become a more empathic, compassionate and altruistic person. **WE MAY CITE Tina Malti's work here???? It would be great to add Tina's work!**

In order to achieve the aforementioned objective, it is necessary to achieve a set of more specific objectives listed below:

- Develop new technologies in terms of hardware and software capable of promoting empathy, compassion and altruism.
- Develop and test facial animation techniques of virtual humans in interaction with children to provide “empathy”.
- Propose new techniques for personal and group flourishing and also for empathy promotion.
- Propose new methodologies for evaluation of flourishing and empathy.
- Develop a plan to expand the use of these technologies throughout the World.

From the scientific point of view, this project has numerous challenges such as research and development of: a software architecture to manage the different levels of abstraction found in robot control (motor activation, speech synchronization, etc.);

- algorithms for facial expressions recognition;
- algorithms for eye-gaze tracking;
- algorithms for lip synchronization;
- algorithms for the generation of facial animation in virtual humans;
- activities to promote empathy;
- activities to promote flourishing.

From the community point of view, this project also has challenges such as:

- minimize violence in primary schools;
- promote the adoption of the system in public educational systems;
- promote the expansion of the system to educational units outside the country.

6 Team

Prof. Dr. Edson Prestes e Silva Júnior received his B.Sc. degree in Computer Science(CS) from the Federal University of Pará (UFPA), Brazil, in 1996 and M.Sc. and Ph.D. in CS from the Federal University of Rio Grande do Sul (UFRGS), Brazil, in 1999 and 2003, respectively. Actually, Edson is Professor at UFRGS, since 2005, CNPq Productivity Fellow and Head of ϕ -Robotics Research Group. UFRGS is one of the most important universities in Latin America. In particular, in the Informatics Institute, the Undergraduate Programs are first-ranked, while the Graduated Programs are among the top-five in Brazil. Edson is IEEE Senior Member and has active participation in the IEEE Robotics and Automation Society (IEEE RAS) and IEEE Standards Association (IEEE SA) as

- Chair, IEEE RAS/SA P7007 - Ontological Standard for Ethically Driven Robotics and Automation Systems Working Group;
- Vice-chair, IEEE RAS Ontologies for Robotics and Automation Working Group (ORA WG);
- Member, Affective Computing Committee in the IEEE-SA The Global Initiative for Ethical Considerations in the Design of Autonomous Systems;
- Member, How to Imbue Ethics/Values into Autonomous and Intelligent Systems in the IEEE-SA The Global Initiative for Ethical Considerations in the Design of Autonomous Systems;
- Member, IEEE SA P7001-Transparency of Autonomous Systems;
- Member, IEEE RAS Robot Task Representation Working Group;
- Member, IEEE RAS Autonomous Robotics Working Group;
- Advisory Committee Member, IEEE RAS Standing Committee for Standards Activities;
- Advisory Committee Member, IEEE RAS Special Interest Group on Humanitarian Technology;
- Founding Chair, IEEE South Brazil RAS Chapter;
- Past vice-chair, IEEE RAS Standing Committee for Standards Activities.

In 2015, IEEE Standards Association approved the P1872 (Standard for Ontologies for Robotics and Automation) document, elaborated by ORA WG, as a new IEEE Standard. This is the first standard elaborated by IEEE

Robotics and Automation Society! Also in 2015, ORA WG won the IEEE-SA Emerging Technology Award. This standard is cited in *The National Artificial Intelligence Research and Development Strategic Plan* (pag. 32) elaborated by the US White House in 2016:

“One example of an AI-relevant standard that has been developed is P1872-2015 (Standard Ontologies for Robotics and Automation), developed by the Institute of Electrical and Electronics Engineers (IEEE). This standard provides a systematic way of representing knowledge and a common set of terms and definitions. These allow for unambiguous knowledge transfer among humans, robots, and other artificial systems, as well as provide a foundational basis for the application of AI technologies to robotics.”

Among Edson’s achievements, he co-organized the book *Robótica Móvel (in portuguese)* together with Roseli Romero (ICMC/USP), Fernando Osório (ICMC/USP) and Denis Wolff (ICMC/USP) that has won the Jabuti Award in the category Engenharias, Tecnologias e Informática. This award is the most important and established literary Award in Brazil.

7 Relevance and Expected Impact

We believe that the results obtained by this project will give rise to a new field that we named as Robotics MeWe or Positive Robotics. We did not find yet in the literature, similar researches that combine robotics and psychology in this way. An area closer to ours is a positive computing [CAL 2014] which uses computational platforms together with positive psychology. This area develops computational systems to promote the human flourishing. The differences between our proposal with it are the use of robots to promote the human flourishing and to improve the interpersonal relationships through the empathy. It is important to emphasize that positive psychology focuses only on the human flourish considering the improvement in the interpersonal relationships as a consequence of the process. In addition, the use of robots, instead of a computer system, becomes the most friendly and natural process since children tend to anthropomorphize robots and treat them as social agents instead of simple machines [BEL 2013].

In addition to the scientific relevance, we believe that the results of the project have a high social impact. This is corroborated by the fact that we are following the same steps of successful initiatives as Roots of Empathy; Social and Emotional Aspects of Learning; And Parents Circle - Families Forum; But with the difference of the use of robots. The role of technology in this project is fundamental since it has the potential to allow the massification, dissemination and distribution of the results of this project internationally.

8 Methodology

Still in Portuguese

9 Metas

Para alcançar o objetivo apresentado na Seção 5 será necessário atingir uma série de metas que são listadas abaixo:

1. Investigação e desenvolvimento da arquitetura de hardware
2. Investigação e desenvolvimento da arquitetura de software
3. Investigação e desenvolvimento de algoritmos de reconhecimento de expressões faciais
4. Investigação e desenvolvimento de algoritmos de rastreamento da direção do olhar
5. Investigação e desenvolvimento de atividades para a promoção da empatia
6. Investigação e desenvolvimento de atividades para a promoção do florescimento humano
7. Experimentos em ambientes reais

10 Methodology

One of the first step in implementing this project is to design a hardware architecture to support all planned activities. This architecture involves several components ranging from robots to the central operating unit. It will allow the system operator to have real-time access to all the information collected by the robots as well as to perform predefined behaviors and/or communicate with the students.

As an initial idea we will develop a physical private network where the robots will be connected to a local processing unit which, in turn, will be connected to a central processing unit. This is shown in Figure 1. This topology will allow a distributed control where some control modules will be processed by the robots and by the local units while others will be processed by the control center. It will minimize response time and maximize system throughput because the processes will run multiple processes simultaneously on different machines.

In our project we are considering that the system will have three robots with different personalities. One of them will be the bad robot, another will be the good one and the last will be the neutral one. Using these robots it

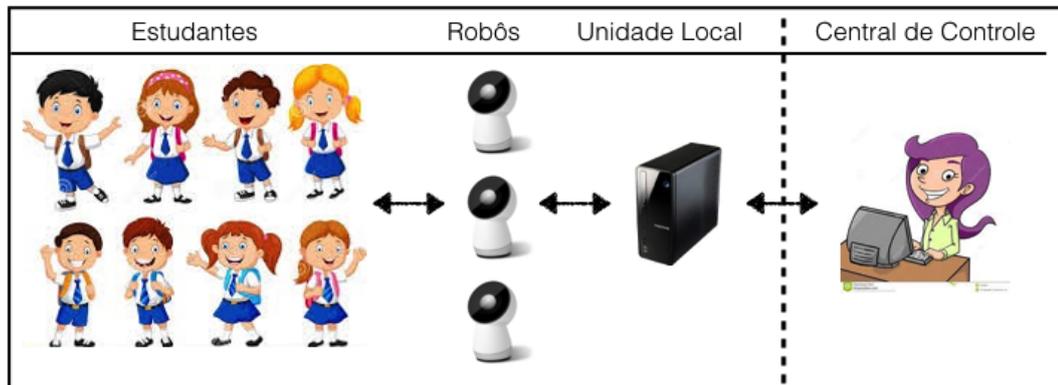


Fig. 1: Arquitetura

will be possible to devise different educational scenarios to teach the child to be more positive, empathic, compassionate, and altruistic. This distribution was inspired by the puppet theater experiments made with children and reported by Bloom[BLO 2014]. The robot will be able to simulate characters with different nationalities, races, genres, and ages. An important observation is that the entire educational process will focus on the actions performed by robots, that is, no child will be reprimanded or by embarrassment. With this system we can elaborate situations of racism or misogyny interpreted by the robots, making one robot reprimand the other and giving an example of correct attitude towards the children. Besides, we can stimulate gender equality using this prototype. For instance, a team comprised of male children can be tutored by a female robot in some specific tasks. In another example, we can create situations where teams composed by children of a specific race and gender are guided by a person of a different race or gender. Since we are using robots, we can their cameras to collect visual information from their perspectives to use it *a posteriori* in the educational process of the child by the specialist.

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