



Humanoid Robot and Human Interaction: Emointelligence Equation $I = T \times E^\alpha \times \varepsilon$

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Abstract

Emointelligence of Animals, Humans and Humanoid Robots do have many common rules and algorithms, but the question is, whether the potentially existing Emointelligence of Humanoid Robots has an implication on the interaction between them and Humans as well as Animals or not. This manuscript is intended to study, discuss and interpret the Emointelligence equation for Animals, Humans and Humanoid Robots $I = T \times E^\alpha \times \varepsilon$ (I: Intelligence or Innovation, T: Time, E: Emotion, α : Exponent and ε : Factor). By applying the Emointelligence equation on Humanoid Robot (HR) $I_{HR} = T_{HR} \times E_{HR^\alpha} \times \varepsilon$ and by looking for their possible interaction with Humans and Animals, we attempt to introduce an innovative concept, called emotion mirroring on Humanoid Robots: Door 1, which is related to emotion modulation: E varies with Door 1 position in Human. In contrast, Humanoid robots could have a near zero Emotion or just mirrored emotions (residual Human emotions from control programs algorithms). Door 2, which is related to logic and innovation: I vary Door 2 position by Humans. Interestingly, Humanoid robots may have a mirror images of I and E, due to their control programs, which are implemented by humans.

Keywords: Logic; Intelligence; Humanoid robot; Emotional bank system; Emotion

Introduction

The next industrial revolution is on the go, taking the form of new concepts such as industry 4.0, smart cities, cell phones, autonomous vehicles, etc. As a consequence, the humanity will face an unprecedented wave of automation and thus we will have to endure a very fast growing exposure to electromagnetic pollution that probably will modulate positively or negatively the emotions of Humans and Animals. Likewise, the Human-machine interactions could also be influenced by the electro-smog. In this regard, we have to consider whether these interactions could intervene on the emotional level and ask: Could we conceive the Humanoid Robot's ability to feel or its ability to understand how we feel? Could it be possible, that a new generation of robots with emotional capabilities will emerge in the near future? Preliminary results of related studies show a great improvement in the interaction between Humans and these machines but the hypothesis of the involvement of emotions in this these interactions, is poorly analyzed and understood. Thus, we have to begin to discuss in depth, the empathy and the personality of Humanoid robots [1,2]. Just imagine a companion machine that

autonomously become aware of your bad mood and automatically plays your favorite song or serves your preferred drink, in order to elevate your spirit. Understanding emotion algorithms and the link between emotion and intelligence is the first step towards developing real "empathetic machines". This kind of machines has been successfully implemented using Deep Learning architectures, specifically Convolutional Neural Networks. In addition, we have to address in this context the issue related to the classification of emotions in several categories, such as sadness, joy, anger, fear, surprise and neutrality [3].

Recently, many Animal and Humanoid robots were developed such as Sand Flea robot, which is a small robot with four wheels and mighty jumping legs. It moves like an RC car on flat terrain but is able to jump 10 m high to get over obstacles. That is high enough to overcome a compound wall, to land onto the roof of a house, to reach the upper story window, which opens the door wide for autonomous robots to be used in new kind of applications related to law enforcement, rescue and fire department operations etc.

Based on the Emointelligence equation published by Abdelmelek et al. [2], we can propose the Emointelligence equation of Sand Flea $I_{SF} = t \times E_{SF^\alpha} \times \mathcal{E}$. In the first case, we may assume that Sand Flea Robot has near zero emotion level giving an ISF about zero. Now, if we try to discuss the existence of an Emotional interaction between Humans and Sand Flea, we have to consider the suggested postulate of a conscious interaction between Human and Sand Flea coming from the implemented control algorithm in the robot. Thus, Sand Flea equation becomes as follow: $I_{SF} = t \times E_{CSF^\alpha} \times \mathcal{E}$ (CSF: influence of Human consciousness through mirroring of human emotions on Sand Flea). We can also apply the equation to different kind of robots such as Wildcat robot, which is the fastest free moving quadruped robot worldwide, running at a speed of 32 km/h. Wildcat is powered by a methanol-burning engine that drives a hydraulic actuation system. The robot uses a variety of gaits, including trotting, bounding, and galloping to maintain its balance while running and maneuvering over relatively flat terrain. The on-board computer uses dynamic control algorithms and a variety of sensors (ground contact, proprioception, visual odometry, etc) to control and stabilize its fast running motion. In addition, it uses a set of laser range finders to accurately measure the robot's height and attitude above the ground. Likewise, we may apply the Emointelligence equation, published by Abdelmelek et al. [2] to Wild Cat: $I_{WC} = t \times E_{WC^\alpha} \times \mathcal{E}$ (WC: influence of Human consciousness through mirroring human emotions on WildCat).

The same calculation of E and I could be applied to other robots like BigDog robot, which has four legs, that are articulated like a living animal. It's equipped with appropriate features to absorb shocks and recycle kinetic energy from one step to the next one. BigDog's on-board computer controls locomotion, processes sensors, and handles communications with the operator. The control system keeps it balanced, adapts locomotion on a wide variety of terrain and insures the navigation. Sensors for locomotion include joint position, joint force, ground contact, ground load, a gyroscope, and a stereo vision system. Other sensors focus on the internal parameters of Big Dog, monitoring the hydraulic pressure, oil temperature, engine functions, battery charge, and others. Big Dog runs at a speed of 10km/h, climbs slopes up to 35 degrees, walks across rubble, follows muddy hiking trails, walks in snow and water, and carries up to 150kg loads. Regarding the eventuality of emotional interactions between Human and Big Dog, we must interpret the equation $IBD = t \times E_{BD^\alpha} \times \mathcal{E}$ (BD: influence of Human consciousness through mirroring human emotions on BigDog). In Finland, a new primary school teacher named Elias is on duty. He has an endless patience for repetition, and he makes sure, that a pupil never feel uncomfortable when asking the same question agains and again and can even teach while performing a "Gangnam Style" dance to entertain his pupils and to get everyone's attention in the classroom. At this point, we should mention, that Elias is nothing else but a robot. This Artificial Intelligent language machine, which is shaped like a Humanoid robot, is acting currently at primary

schools in the southern city of Tampere (Finland). This robot is a capable teacher like no other, since he has the full command of 23 different languages and can evaluate pupils needs and to help inspiring their learning process. It recognizes in addition pupil's proficiency levels, adjusts its questions accordingly and gives feedbacks to other teachers about their possible learning problems.

Based on the Emointelligence equation published by Abdelmelek et al. [2], we can discuss the emotion levels of Elias, compared to those of the children or other teachers as well as the emotional interaction between children and Elias [4,5-8]. Thus, the Emointelligence equation of Elias is $I_{EL} = t \times E_{EL^\alpha} \times \mathcal{E}$ (EL: influence of Human consciousness through mirroring human emotions on Elias). The present manuscript exposes a major theory related to a comprehensive definition of Animal, Human, and Humanoid Robot emotions and their mutual interactions [8-13]. Taking into account that water-containing cells of living beings probably plays a key role in the capture of emotions, inert materials, which by contrast contain no water, so have probably have a near zero emotion level. The current theory suggests the existence of a link between emotions and consciousness, which could affect machines and robots through the emotional interaction between them and Human beings. Our innovative concept introduces the Emointelligence equation ($I = T \times t^\alpha \times \mathcal{E}$), which establishes the link between emotions and creativity [13-17].

Conclusion

We conclude that Emointelligence equation $I = T \times E^\alpha \times \mathcal{E}$, could be used to better understand Human-Machine interactions on the emotional level, using different combinations: Human-Humanoid Robot, Human-Animal Robot, and Humanoid Robot-Humanoid Robot.

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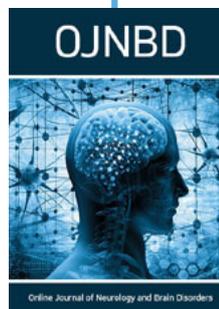
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