ISSN: 0974-6471, Vol. 12, No. (3) 2019, Pg. 106-114

Oriental Journal of Computer Science and Technology

www.computerscijournal.org

Nanotechnology – Intentionality and Free-Will

T V GOPAL

Centre for Applied Research in Indic Technologies (CARIT) & Department of Computer Science and Engineering, CEG Campus, Sardar Patel Road, Anna University, Chennai – 600 025, India.

Abstract

Body modification (or body alteration) is the wilful altering of the human body by an individual in a way that lasts forever or for a very long time. This is usually for non-medical reasons that include sexual enhancement, a rite of passage, aesthetic reasons, denoting affiliation, trust and loyalty, religious reasons, shock value, and self-expression. It can range from the socially acceptable decoration (e.g., pierced ears or nose in many societies) to the religiously mandated. Body art is the modification of any part of the human body for artistic or aesthetic reasons. Nanotechnology is currently available to implant biometric devices in human beings, which can be monitored by software, satellites and utilized by Government and Industry. In fact several developers are currently bringing these technologies to the public and private sector at affordable prices. The context of "Technology Consumerism" compounded by Intentionality and Free-Will of its consumer's results in many unintended consequences outlined in this paper. Geometry of Morphogenesis is the proposed theory for decoding body modification.

Article History

Received: 08 July 2019
Accepted: 19 September 2019

Keywords

Automation;
Cybernetics;
Consciousness;
Disruptive Technologies;
Free-Will;
Geometry of Morphogenesis;
Intentionality;
Theory.

Introduction

Every theory in the making is quite enchanting.[9] Ignore everything that does not fit into the theory becomes an acceptable norm. In the process, either fortunately or unfortunately, educating the young minds invariably gets delayed. The Wright brothers observed the flight of birds to make an aircraft.[3] There is no evidence of plenty of data being collected and simulations of birds in flight done by the Wright brothers. Yet, the aircraft happened. It is a pity that educating the young minds to use such methods got delayed both for right and wrong reasons.

Clayton Christensen coined the phrase "Disruptive Technologies" in his 1997 book titled "The Innovator's Dilemma: When New Technologies Cause Great

CONTACT T V Gopal gopal@annauniv.edu Centre for Applied Research in Indic Technologies (CARIT) & Department of Computer Science and Engineering, CEG Campus, Sardar Patel Road, Anna University, Chennai – 600 025, India.

Doi: http://dx.doi.org/10.13005/ojcst12.03.05

Firms to Fail". Gradually the phrase "Disruptive Innovation" came into regular use. It is all about passion and privation. "Automation" always ranks very high in any list of disruptive technologies[15] that have been influencing the world. Automation has the following facets:

Use
Voluntary activation or deactivation of automation by human operators.

Misuse
Over reliance on automation

Disuse
Negligence or Underutilization of Automation

Abuse
Automation without due regard for the consequences for the Human

The nature of technology is such that the users discover new ways of using it as they progress in deploying the technology. It is not uncommon for even naïve users to think of new applications which the developers have not thought of. Unintended Use of technology often implies a pronounced thrust to works an unforeseen use warranting improvements in the associated systems and sub-systems. In other words, there is a high chance of many hazards at various levels tormenting the stakeholders for a reasonable spell of time. Responsible innovation factors the standardization life-cycle as well. It is the grey area where the definitions and standards are yet to emerge that is a serious particularly when life forms are involved.

Cyborgs Brought in a Wide Range of Electronic Implants
A bio-electronic implant, which is about the size of a pencil eraser, would actually sit behind the retina at the back of the eyeball, and images would be transmitted to the brain via a connector the width of a human hair. One can see images better. This is just one case in point.

Material and Methods[3,5]
"The highly developed living being is an open system having many relations to its surroundings – in the respiratory and alimentary tracts and through surface receptors, neuromuscular organs and bony levers. Changes in the surroundings excite reactions in this system, or affect it directly, so that internal disturbances of the system are produced. Such disturbances are normally kept within narrow limits, because automatic adjustments within the system are brought into action, and thereby wide oscillations are prevented and the internal conditions are held fairly constant."

- Walter B Cannon, "Organization for physiological homeostasis", Physiological Reviews, 9:399-431, 1929.

Engineers have developed machines that could implement homeostatic behavior. The quest for making these machines emulate human intelligence was natural. Rapid advances in miniaturization have fuelled various processes of affordable body modifying devices and appliances proliferate the consumer markets.[4]

"As a result of these comments (fluctuations of magnetic fields of the earth may cause undesirable behavioral changes), I was contacted by Dr. James Hamer of Northrop Space Laboratories, who informed me that his group was already involved in this area. He also noted that Dr. Norbert Weiner of MIT, the originator of cybernetics, had been interested in the same subject.

Weiner had been involved in a German experiment in which human volunteers were unknowingly exposed to a low-intensity, 10-Hz electrical field. The subjects reported feelings of unease and anxiety when the fields were turned on. Both Hamer and Weiner were working under the assumption the ELF internal rhythms in the brain were determinants of behavior, and that pulsing external fields could "drive" these internal rhythms, thereby altering behavior."

- Robert O Becker, "Crosscurrents", Tarcher Perigee, 1990

In theory a combination of body modification and generation of impulses that can penetrate the Blood – Brain – Barrier more easily than the presently known drug formulations and psychedelic substances may result in a superior functioning of the human brain. A combination of sophisticated drugs and technologies do hold the promise of making superhuman and terrific creatures. This article is

more about the impact of such practices on the human brain.

"An intelligence that could at a given moment comprehend all the forces by which nature is animated and the respective situation of the beings who compose it, if it were sufficiently vast enough so as to submit this data to analysis, would encompass in one single formula the movements of the greatest bodies of the universe and those of the lightest atom; for this intelligence, nothing would be uncertain and both the future, as well the past, would be present before its eyes."

- Pierre - Simon Laplace, "Essai philosophique sur les probabilities", 1814

The sign of life is a pulse. It is the beat that all living systems answer to. It is perhaps the seed with which the energy cascades, feedback cycles and the dynamics happen in accordance to a principle of circularity that ensures maximum safety to the living systems. Pulse it is that challenges the notion of path of least resistance in the design of circuits[12] that work on electronic pulses. The present day technocracy has shifted the societal thinking towards faith in machines and a narrow path of cause – and – effect logic they are made up of. The foundation for such a view is usually attributed to Rene Descartes who postulated that the world outside is just a vast and intricate machine.

Computing brought with it the notion of a "Clock" that controls the timing in the execution of a given sequence of actions expressed in a lingua franca that is compatible with the machine on which they are executed. Pulse which is the sign of life began to be modeled as a combination of system clocks and the electronic pulses in the circuitry. In reality a far superior model for pulse is mandatory. The world has its own best model.[1]

The role of biology is the key because it provides guiding principles and suggests useful components. A very important lesson from biology is the scale of structural components. The lower energies involved in non-covalent interactions make it much more convenient to work on the nanometer scale (or lesser) utilizing the biological principle of self-assembly.

There are two major technical issues. One is positional control (holding and positioning molecular parts to facilitate assembly of complex structures) and the other is self-replication. The vital factor is the engagement with the outside world that brings into sharp focus two difficult concepts termed as Intentionality and Free – Will. The challenge of ensuring the preservation of the intent in making a given technology and while giving a thrust to the exploratory nature of the free – will of the consumers has no unique solution. This article outlines the inter-play of Intentionality and Free – Will in the context of body Implants (Alexis, 1939).

Some Lessons from Bio-Medical Instrumentation

The Bio-Medical Instrumentation[2] which includes Recording and monitoring instruments, Measurement and analysis techniques, Modern imaging systems and Therapeutic equipment has a physiological basis. The physiological aspects of several internal organs is modeled as an electric activity. It is useful to observe that a large proportion of these activities captured as associated signals are presently not deemed very useful in clinical practice are most of them elude precise measurements. However, patient care has improved significantly due to the signals that are of diagnostic significance. Electric conductivity in the human body is presumed to be due to ions serving as charge carriers. Special electrodes perform the necessary transducing function between the ionic solutions and the electronic circuitry of the instrument. These electrodes are now highly sophisticated and can be made for any organ of the human body. These electrodes provide the bio-potential interfaces. To some extent the behavior of a given organ can be influenced using therapeutic equipment that deploys such interfaces. Clinical Medicine opines that the associated practices are for healing some organs and may not be advisable to use these practices for enhancing the performance of healthy organs.

Technologists however keep attempting to build completely autonomous creatures that co-exist in the world of humans and are perceived by the humans as intelligent enough in their own right.[13] There are two major technological advances namely Robotics and Cyborgs that remain in focus in the context of use of technology.

Robotics and Cyborgs[18]

The history of robots has its origins in the ancient world. Concepts of artificial servants and companions date at least as far back as the ancient legends. In Greek mythology, Hephaestus created utilitarian three-legged tables that could move about under their own power and a bronze man, Talos, that defended Crete. The myth of Pygmalion whose statue of Galatea came to life is very interesting. Around 1495 Leonardo da Vinci sketched plans for a humanoid robot. The ancient Hebrews wrote about a person made out of dirt and clay called a golem. The golem was created to help with menial labor. The ancient Greek god Hephaestus was believed to build himself mechanical assistants out of gold.

The Indian Lokapannatti tells the story of King Ajatasatru of Magadha who gathered the Buddhas relics and hid them in an underground stupa. The Buddhas relics were protected by mechanical robots (bhuta vahana yantra), from the kingdom of Roma Visayar; until they were disarmed by King Ashoka.

Scaling was the first of the Two New Sciences revealed in Galileo's Discourses and Mathematical Demonstrations (1638); physics was the second. Galileo observed that "…..a horse falling from a height of three or four cubits will break his bones, while a dog falling from the same height ... will suffer no injury?.." The study of materials has thus been a real challenge. "Robotics" is one discipline of research that blends certain aspects like intelligence of the live forms with the materials as understood by the physicists. "Big is weak, small is strong" is the result of this research.

Isaac Asimov Gave the following Laws of Robotics

- A robot may not injure a human being or, through inaction, allow a human being to come to harm;
- A robot must obey the orders given it by human beings except where such orders would conflict with the First Law
- A robot must protect its own existence as long as such protection does not conflict with the First or Second Law
- The Zeroth Law: A robot may not harm humanity, or, by inaction, allow humanity to come to harm."

Many ideas related to Robots thus began to be seen as dominated by Mechanical and Electrical Engineering. Today, it is now possible to envisage human sized robots with the capacity for near human thoughts and movement. Robots have thus become inter-disciplinary and computing and related ideas began to find place in this very important area.

Very soon miniature robots were on the anvil. Today, we have excellent fabrication technologies and we made rapid progress in Nanorobotics that are playing an important role in diagnostics and drug administration within the human body.

"Cyborg" is an innovation to enhance the capabilities of the human being in some manner. The term "cyborg" is used to refer to a man or woman with bionic, or robotic, implants. There are two popular methods of making a Cyborg. One method is to integrate technology into organic matter resulting in robot-human. The other method is to integrate organic matter into technology resulting in human-robot. Cyborgs were well known in science fiction much before they became feasible in the real world. Cyborgs are being experimented with in Border Crossings, Engineering the Body Electric, Machinic adventures in Space, Prosthetics, Spiritual Cyborgs, Mind Uploading and such challenging ideas. The Ethics of Cyborgs is a very important area of research. There have been a good number of indicators for involuntarily implantation into humans.

Why do Consumers Want Implants?

It is a matter of inconvenience to pull out an Identification Card to make the RFID sensors take cognition of the Individual. It would be nice if that is done by a miniature implant of the RFID card under the skin and this process is fully automated. In a sense, the physical body becomes machine readable and has many ramifications in the way Smart Cities happen all over the globe.

This is a simple use of implants that is very realistic. Human organ Performance enhancement implants

are increasingly in demand.[11] The potential risks to health associated with such implants are: adverse tissue reaction, migration of implanted transponder, compromised information security, failure of technology at various stages including an overhead high tension electrical cable inducing deathly currents through the implants or camera flash lights, electromagnetic interference, electrical hazards, incompatibility with imaging technologies, and possible needle stick injuries.

This is true even if the positivism associated with faith in humanity at large prevails on such unintended uses of technology.[15]

The Quagmire of Networking

Smart sensors are being used to improve agriculture from farming lettuce to producing beef and even protecting bees. From smart pans to connected scales, the internet of things is now tackling the art of cooking. Connected Cars, Consumer Electronic goods that provide Integrated Services are now regularly used.[7] The connected world is transforming markets with affordable, multi-purpose smart devices.

Software-defined networking (SDN) is an approach to building computer networking equipment and software that separates and abstracts elements of these systems. SDN decouples the system that makes decisions about where traffic is sent (the control plane) from the underlying system that forwards traffic to the selected destination (the data plane). The Open Networking Foundation was founded to promote SDN standards and engineering as Cloud Computing blurs the boundaries between networks and computers. Implant within the Human Body is just another abstract element in the SDN.

Technology Assurance Addresses the following Three Main Challenges

Trustworthiness

No exploitable vulnerabilities exist, either maliciously or unintentionally inserted.

Predictable Execution

Justifiable confidence that technology functions as intended.

Conformance

Planned and systematic set of multi-disciplinary activities that ensure processes and products confirm to requirements, standards/ procedures.

Sustainable technologies indeed help us build a positive for generations to come. However, they are often deployed to weather the storms of short-term exigencies, disruptions and disasters. Long-term societal conditions warrant a switch back to self-reliance when technology fails. This is becoming increasingly difficult in societies that have taken to the technocracy path of addressing the complex demands of the global villages.

"The older people used to say that the trees, the rocks, the birds, and the animals used to talk. They had a voice, and today, as I realize it, they still have a voice. My People always say that you have to take care of them in order for you to continue on. If you don't, when they die off, you are going to die off with them."

- Corbin Harney, spiritual leader of the Western Shoshone Nation, from The Way It Is

The Reality Check from Medicine[6, 16]

Implants can potentially result in[14]

- Alzheimer's disease
- Delusional
- Schizophrenia
- Electrical currents running into and/or through various body parts
- Electrical shocks to various body parts
- Electrical jolts to random body parts
- Deep pain/aches various body parts
- Burning sensations to various body parts (often internally),
- Pressure in the head and various body parts
- Clicking/popping sounds in the head
- Heart problems
- Palpitations
- Major organ failure
- Various cancers
- Involuntary body movements
- Forced speech
- Slow memory recall
- Erased memory of set periods of time or timed dementia

- Continuous headaches that are near impossible to heal
- Ear aches
- Ear hums and clicks
- Piercing high pitch sound inside ears
- Multiple Chemical Sensitivity / Electro-sensitivity
- Sudden unconsciousness
- Mimicked voices/conversations to the head - But no one is there - (Known as the auditory effect)

It is very easy for a trusted professional to embed an implant into the human body (or any living being) without informed consent through an open wound during a surgery or use of an intravenous needle including dentistry needles and in the form of pills form. X-Rays and other scans seem to be doctored or remain untraceable for regular checks. Many suffer in silence due to the possible undetected and unintended or abuse of a very sophisticated technology.

Results and Discussion[17]

Measuring body temperature is very important in medicine. Change in body temperature is vital to the functioning of any implant used for body modifications mooted in this paper. Temperature regulation is a type of homeostasis, which is a process that biological systems use to preserve a stable internal state to survive.

In physics and mathematics, the heat equation is a partial differential equation that describes how the distribution of some quantity (such as heat) evolves over time in a solid medium, as it spontaneously flows from places where it is higher towards places where it is lower. It is a special case of the diffusion equation that governs the process by which molecules spread from areas of high concentration to areas of low concentration.. This equation was first developed and solved by Joseph Fourier in 1822 to describe heat flow. It is of fundamental importance in diverse scientific fields. It is vital for Electronics and Communications.

The general heat conduction equation is given in the Figure 1 below.

$$\frac{\partial}{\partial x}\left(k\frac{\partial T}{\partial x}\right)+\frac{\partial}{\partial y}\left(k\frac{\partial T}{\partial y}\right)+\frac{\partial}{\partial z}\left(k\frac{\partial T}{\partial z}\right)+q_V=\rho c_p\frac{\partial T}{\partial t}$$

where
k is the materials conductivity [$W.m^{-1}.K^{-1}$]
q_V is the rate at which energy is generated per unit volume of the medium [$W.m^{-3}$]
ρ is the density [$kg.m^3$]
c_p is the specific heat capacity [$J.kg^{-1}.K^{-1}$]

Fig. 1: Heat Conduction Equation

Classical Physics is based on the solution for these equations. The difference between quantum physics and classical physics is that classical physics only works within a certain range of phenomena. Typically, when one starts talking about things that go on at the level of photons and electrons classical physics no longer gives reliable answers. It is no longer a "useful fiction".

The Theory of Relativity requires that the laws of nature are invariant to the reference frame. This is not satisfied by the Newtonian formulation of mechanics which assumes one absolute frame of reference and a separation between space and time. In contrast, the Lagrangian and Hamiltonian formulations of the principle of least action remain valid in the Theory of Relativity once the Lagrangian is written in an invariant form.

The calculus of variations is concerned with the maxima or minima [collectively called extrema] of functionals. In simpler terms, a function showing the shortest path following all the known rules of the system is called the Lagrangian. In physics, it is typically the least amount of action that is the desired Lagrangian.

A strong extremum is also a weak extremum, but the converse may not hold. An example of a necessary condition that is used for finding weak extrema is the Euler–Lagrange equation seen in Figure 2.

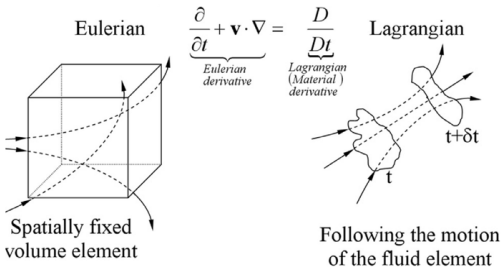

Fig. 2: Euler and Lagrangian Equations

Spotting the "extremum" points is easy and is governed by geometry of abstract spaces and / or "Sacred Geometry". The core challenges are Inclusion and Interaction.[8]

"Geometry" literally translates from Greek as "land measurement", and reflected a popular Greek belief that they learned it from Egyptian "rope stretchers", land meausurers, who used ropes to perform what came to be called straightedge and compass constructions. The Human Form can perhaps be abstracted as "Sacred Geometry" for the dynamics it can possibly mirror in the cosmos.

Sacred geometry, or spiritual geometry, is the belief that numbers and patterns such as the divine ratio have sacred significance. Concepts of sacred geometry are expressed in the beliefs of Christians, Jews, Hindus, Muslims, and other formal religions. Pythagoras taught that each number had its own peculiar character, virtues, and properties. Everywhere in this cosmos, the Circle, Triangle, Square, Hexagon, and so on remain the same unchanging archetypes.

This paper proposes the nanotechnology that reflects the human form as a progress of Geometry from Earth into the Cosmic Spaces. Such a nanotechnology reflects the geometry of any given human form even with body modifications in an abstract space that indicates the modification and the associated intentionality and free-will. Please see Figure 3 and Figure 4.

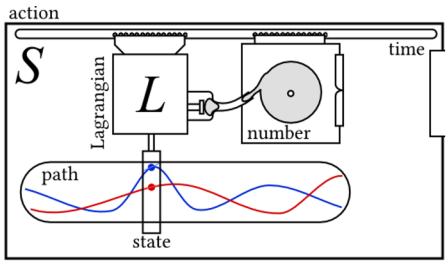

Fig. 3: The Lagrangian at Work

$$\begin{aligned}\frac{\partial \mathcal{L}}{\partial(\partial A_\mu/\partial x_4)} &= F_{\mu 4} \\ \mathcal{H} &= (F_{\mu 4})\,\frac{\partial A_\mu}{\partial x_4} - \mathcal{L} \\ &= F_{\mu 4}\frac{\partial A_\mu}{\partial x_4} + \frac{1}{4}F_{\mu\nu}F_{\mu\nu}\end{aligned}$$

Fig. 4: The Lagrangian for Electromagnetic Fields

Towards a Better Comprehension of Human Body[14]

Technology thrives on a language that weaves brilliant sequences of calculations, hypotheses and positions reality in a framework of unutterable abstractions (Henry, 2013). Biological sciences are founded in an inextricable jungle that is not amenable for definition using algebraic equations.[10]

(Late) Sir John Maddox, the well-known former Editor-in-Chief of Nature wrote an article titled "The Unexpected Science to Come..." while ushering in the year 2000. This article by (Late) Sir John Maddox was published in the December 1999 issue of the Scientific American.

"The most important discoveries of the next 50 years are likely to be ones of which we cannot now even conceive" is the advice that is indeed apt at the stroke of the year 2000. (Late) Sir John Maddox goes onto add that "Our understanding of the human brain is incomplete in one conspicuous way: nobody understands how decisions are made or how imagination is set free".

In fact, the quest to understand the human brain got into the realms of Computer Science several decades back. Not entirely unrelated are the following set of really big questions one must answer to hopefully replicate the activities of human brain using technology in some form.

- What is Intelligence?
- What is life about?
- What is Thought?
- How did Language Evolve?
- What is Consciousness?
- Does GOD exist?

Human body cannot be separated into parts that are isolated from one another, modeled as objects or things that have only known relationships. Through the senses of fellow human beings and the sophisticated scientific instruments the dynamics within a human body appear to be physical, chemical, physiological, or psychological. A possible science demands the use of practically every other science. The sheer complexity of such an inter-disciplinary science is daunting.

Conclusion

The technology has advanced considerably over the past few years. Support systems that include the practice of medicine have been simplified. However, detection and repair systems outside of the human is very likely to take a longer time. It is wise to educate the consumers[11] on the indicated unintended and abuse of advanced technologies that are very enticing and enchanting. There are many hazardous presumptions and assumptions that are hard to revisit at a later time. The biological sub-systems in the process would have been impacted in an irreversible manner very soon. Taking recourse to the mathematical foundations of geometry and morphogeneis is presently the most optimal method of safe and secure decoding of this usage of highly advanced technologies.

Acknowledgement

The author thanks Anna University, Chennai, the Steering and Program Committees of the "Theory and Applications of Models of Computation [TAMC]" series of conferences and the various committees of 21st Century Norbert Wiener [21CW] series of conferences for the opportunitites and support to work on this research.

Funding Source

There is no specific funding source for this research outside of the regular support indicated in the Acknowledgement.

Conflict of Interest

This is a single author paper. There is no conflict of interest.

References

1. Alexis Carrel (1939), "Man, The Unknown", Harper & Brothers, USA.
2. Arumugam M (2014), "Biomedical Instrumentation", Anuradha Publications, Chennai.
3. Daniel C. Dennett (1988), "Evolution, Error and Intentionality", Y. Wilks and D. Partridge, [Eds], Sourcebook on the Foundations of

Artificial Intelligence, New Mexico University Press, USA.

4. Chris Woodford (2015), "Atoms Under the Floorboards", Bloomsbury Sigma, New York, USA.
5. Dale Jacquette (2014)., "Art, Expression, Perception and Intentionality", *Journal of Aesthetics and Phenomenology,* Vol. 1, No. 1, Pp 63-90.
6. Franssen Maarten, Kroes Peter, Vermaas Pieter, Light Andrew and Moore Steven. (2008), "Design, Use, and the Physical and Intentional Aspects of Technical Artifacts", n Book: Philosophy and Design - From Engineering to Architecture,Springer.
7. Gopal T V (2016), "Engineering Software Behavior in Cyber – Physical Systems", *International Journal of Engineering Issues*, Vol. 2016, no. 1, pp. 44-52.
8. Gopal T V (2019), "Geometric Simplification of Cyber-Physical Systems", Maya Dimitrova and Hiroaki Wagatsuma [Eds], "Cyber-Physical Systems for Social Applications" (Pp 222 – 239), IGI Global USA.
9. Henry Smith Williams (2013), "The Beginnings of Science", Apple Publishing International (P) Ltd., India.
10. Matthew Stein (2000),"When Technology Fails - A Manual for Self-Reliance & Planetary Survival", Clear Light Publishers, New Mexico, USA.
11. Melissa Leach, Ian Scoones and Brian Wynne (Editors) (2017), "Science and Citizens", Orient Longman Pvt. Ltd., India.
12. Neuman, M. R. "Biopotential Electrodes." *The Biomedical Engineering Handbook: Second Edition*. Ed. Joseph D. Bronzino, Boca Raton, CRC Press LLC, 2000.
13. Paul Bloom (1996),"Intention, History, and Artifact Concept", Cognition, Volume 60, Issue 1, Pp 1-29.
14. Robert Frenay (2006), "Pulse – How Nature is Inspiring the Technology of 21st Century", Little Brown Book Group, UK.
15. Samuel Florman (1982), "Blaming Technology: The Irrational Search for Scapegoats", St Martins Pr, USA.
16. Sipi Helena(2003), "Artefacts and Living Artefacts", *Environmental Values*, Vol. 12, No. 4, pp. 413–430.
17. Suresh Ganzi, Kavuluru Lakshmi and Mantrala Mallik. (2017). "A Review on Development of Medical Implants by Rapid Prototyping Technology", *International Journal of Pure and Applied Mathematics*, Vol 117, No. 21, Pp 257-276.
18. Verbeek Peter-Paul (2008), "Cyborg Intentionality: Rethinking the Phenomenology of Human-Technology Relations", *Phenomenology and the Cognitive Sciences*, Vol. 7, Pp 387-395