The Concept of Human Augmentation

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ABSTRACT: ***Human augmentation is a research area that aims at developing human capabilities through medicine or technology. This has been accomplished traditionally by the use of chemical substances which enhance a selected skill or by installing implants requiring medical attention. All these raise approaches can be invasive. External devices like binoculars, microscopes, eyeglasses and extremely sensitive microphones have now provided improved capabilities. Recently, expanded perception and multimodal technologies of connectivity have provided for human development in non-invasive ways. Researcher addresses the sector and associated conditions first in this paper. Based on existing sector knowledge they have appropriate descriptions. This is accompanied by a description of augmented senses, behavior and cognitive research. They have a portable raise platform for our commitment to the future. Furthermore, they call for work in order to understand this view. They then think about human capacity for the future. Wearable devices will serve as mediators for human development in the same way as glasses until the human eye is revolutionized.***

KEYWORDS: ***Augmented Reality, Augmented Action, Human Augmentation, Interaction Paradigms, Multimodal Interaction, and Wearable Computing.***

INTRODUCTION

The evolution of common interaction between human-technology has been gradual since the advent of visual manipulation and graphical user interfaces. They make for more efficient, accurate, and powerful use of the devices, but the concept of interaction underlying this concept stays the same, namely the notion that a computing system is a machine [1], [2]. Throughout recent years, the field of study has evolved through a broad and interactive application, including embedded applications and smart user interfaces. Yet the distinction between the customer and the device is still visible. Humans had to adapt to technology in the past. Computers should be customized to humans in the future [3], [4]. There, researcher use the term' natural' when they refer to behaviors that are closely related to the inherent mode of contact between humans and physical objects.

Due to numerous meanings of the word ' natural' in literature, it is crucial that this concept is established. Many technology and UI paradigms are present to improve the normal and productive interaction. Nowadays, for example, a person can control a device by shouting, gesturing, staring at the eye or even by electrophysiological signals [5], [6]. The device will gather data via various sensors to provide users with information in real time, including visual, auditory to haptic presentations. In the same function, different input and output modalities, such as simultaneous auditory and haptic verification of important activities in the immediate environment, are progressively being integrated. Paradigms on the human-centered user interface include vision, virtual reality (VR), augmented reality (AR) and ubiquitous computing [7], [8].

Human augmentation is a model that draws on these earlier paradigms by incorporating contact, where human behavior is the focus of attention. These activities are enabled by that technology relating to the environment and user knowledge, detecting, influencing or manipulating it in a cognitive manner. So here are several similar terms closely to augmentation of human. Human creation involves a wide variety of fields from electrical and mechanical to genetic engineering [9], [10]. Experts describe it as' any effort, by natural or artificial means, to temporarily or permanently transcend the inherent limitations of the human body.' Technological approaches are used in choosing or modifying the human features and capabilities, when the improvements contribute to characteristics and capacities that go outside the human range. "Human enhancement may include means and solutions involving, for example, activity or chemical stimulants for better control. Such approaches are not related to the relationship with human technologies and hence omitted from this paper.

1. *Present and Past in Human Augmentation*

1.1. Augmented senses

Enhanced senses use both approaches and techniques to mitigate sensory impairments (mostly visual and audible) or to surpass current senses ' capabilities. In the first example, sensory impulses are greatly enhanced or augmented by certain balanced senses. In order to explain a blind person or to talk to the deaf, for example, haptic actuators may be used. In the second example, human senses are enhanced by using additional sensors to track signals which surpass ordinary sensory capacities of humans and turn them into an adequate human format. Many innovations will increase the human sense beyond its normal boundaries. Light sensors or small cameras might send the user ' eyes eagle,' or night vision, or they would go beyond the ranges of human vision. A typical example is to see occluded objects by having "x-ray vision." Visionaries proposed that AR technologies would replace much of the existing hardware and user interfaces. For AR devices such as Nreal, Magic Leap One, Focals by Vuzix and North Blade, this vision addresses nature step by step. Although the technical advancement of intelligent glasses remains important for increased human use, experiments have already shown the utility of these devices. For example, researchers have found that the auditory and haptic data can be used to increase human comprehension of reality on AR interfaces.

Another significant work in this area is to establish eye monitoring methods which have no calibration and to use visual, auditory and haptic information and to have haptic instructions to direct the look. The integration of gazing interactions and haptic feedback recently indicates that these two modalities can be implemented together to meet the key interface interests of wearable experiences. Researchers have recently developed several extensions in order to facilitate the technical advancement of integrated VR / AR glasses. The conceptual proof-of-concept helps users to view and experience simulated 3D objects without connected devices. Even the complete human FOV can be fitted with a superwide visual field (FOV) configuration for VR lenses. They recently have tested the expansion of a VR display device's FOV to have sensory input on the retina–overriding the eye and the lens for a smart glass user. Pan-tilt superzoom and 360-°-cameras provide the experience to a VR audience. A pan-tilt zoom can be used. The taste sense has been improved by similar methods. The sensors can be designed relatively straightforward to classify each specific flavor as savory, sweet, sour and bitter. However, taste experiences have proved hard to create as they are closely related to the feeling of scent and partially a personal experience. While electric actuators are proposed to stimulate taste buds in tongue, they have not been common. Increased perceptions of the mouth primarily rely on flavor, which means that olfactory impulses are used to express a taste perception.

1.2. Augmented Action

The finest examples of augmenting human activity have been motion increase. For e.g., prosthesis limbs have regained some of the amputated limb capabilities. Recently, emerging interactive developments have provided for expanded intervention beyond the normal human motor and sensory limits. Exoskeletons, for instance, require people disabled to walk on robot feet. Exoskeletons and methods for dual-arm amplification are useful in the different activities historically carried out by humans but which have yet to be completely implemented, since they require human intelligence. The handling of objects, for example the Cray X exoskeleton8, may be a possible use scenario. Exoskeletons allow humans to raise heavy things and decrease their weight in the lowest back region.

The definition of an exoskeleton can be generalized to simulated exoskeletons where a robot is working in accordance with the actions of the person. When the user uses VR glasses and sees from the viewpoint of the robot, the use of a robotic exoskeleton can be extremely immersive. The remote involvement of this kind, focused on contact between human and robot systems, is especially beneficial if the operating environment is dangerous and a human user is not protected. Types of operations cover manufacturing, nuclear power stations, space or sea assembly operations and search and rescue operations. Certain feedback mechanisms such as touch, gestures, glance and voice can also be used to enhance human activity through computer contact or machinery control. VR's remote controls, gloves and other similar systems often require virtual limbs to manipulate items of any weight and size. Manifestations should be used to maximize distance operation. A controller can tend to use telekinetic powers to manually operate machinery over a distance through a simple motion of his hand or by some gesture. Yet gesture-based increase-motion also triggers a' Midas touch

problem ' phenomenon. It ensures that the individual makes choices and confirmations unintentionally. The computer interface to mediate behavior is one approach to the problem.

Furthermore, the advancement of automatic speech recognition allowed a more accurate use of VR and robotic control voice commands. In the optimal case, communicating between human and computer speech is flexible enough that the software can understand the speech accurately beyond the user's skill. Digital worlds may also be regulated through the movement of the head or glance. Many of the enhanced activities often involve a feedback loop for the processing of the user's sensory data. For instance, tactile function feedback systems will improve the precision of virtual limbs, strength sensors will mediate to user's tactile data calculated by a computer, and artificial skin may restore contact to the prosthesis. Sensory feedback will mimic real processing of the sensory modes and emotions of humans to better help enhanced behavior. In certain cases, successful action increase involves synthesizing multi-sensory input from the environment and using the human sensory system to change the action. As more things are linked to one another through the Internet of things, our actual living world is smarter. This allows us to experience and communicate with our surroundings in different ways through simple and natural means, such as gestural and verbal speech. The use of the view control assisted by touch input and feedback provided alternative ways for communicating with the environment.

2. Future Vision

2.1. Wearable Augmentation Model

As mentioned in the previous segment, there is a great deal of relevant work. Human augmentation, however, is lacking architectures and models which incorporate individual contributions as an integral approach to practical applications, which could be exploited further. Next, they are proposing a paradigm for wearable increase: human senses increase, behavior and awareness through wearable technology. It starts with the assumption that the device directly improves man's abilities, not through an external interface tool. Interaction would be as similar as possible to true human activity, contributing to the importance of observing human actions as feedback for the increase method. The proposed wearable raise technology (see Figure 1) is as follows:

- Sensing technologies can sense the environment, objects and events. They include pattern recognition, other processes of computer vision, sound sensors, spatial, motion and thermal sensors, multispectral cameras and contact, gustatory and olfactory sensors.
- Multisensory devices help treatment, memory and perception; it can only be done with lightweight mixed-reality multimodal goggles, trans-modal information delivery and functional accessories. It uses multiple senses: sight, sound, touch, gustation, olfaction as a way of mediating increased sensing and input on augmented behavior.
- The adaptive devices are based on human activity monitoring technology. Human behaviors are recognized as inputs through speech recognition, monitoring of physical movements, eye-tracking and force and contact data, for example. On the basis of this low level of information, human behavior is modeled on a higher level.
- Actuation technology is used when driven by human beings to influence the environment, which involves different forms of visual displays, haptical actuator, audio devices, perfumes and taste generator. For dynamic settings, a sense of balance may also be influenced by forces and individual poses.
- Ubiquitous digital infrastructure and artificial intelligence technology can provide access to Internet, artificial intelligence and networked information systems. This allows the development of custom AI plugins that accommodate and facilitate a range of activities that users can not or do not wish that execute autonomously.

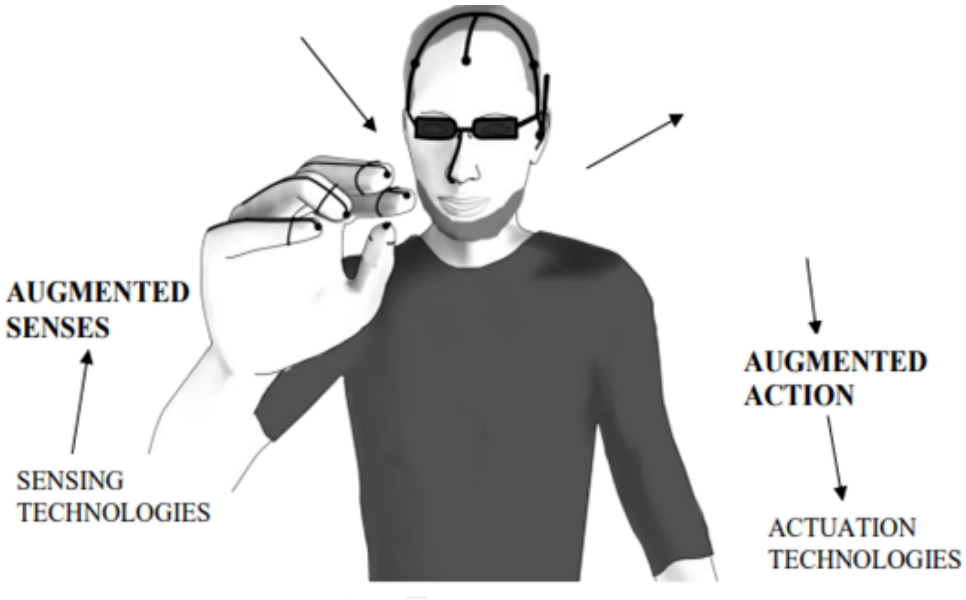

Figure 1: The Flow of Information and Associated Wearable Augmented Technology.

3. Call for Research

Step by step, the improved human is already understood. Along the road it gets easier, smaller, and cheaper. However, even though many required pieces of hardware already exist the idea of the wearable human increase is still completely unrealized. It pulls elements from fields like RA, VR, omnipresent computation, AI, and sensing technologies, but fuses and brings them further forward. In reality, the proposed work builds upon existing interaction. Work in the following areas at least would be required to realize the vision:

- The paradigm establishes an underlying framework for interaction and language that allows for enhanced senses, behavior and cognitive skills. A shift in perspective would involve open-exploratory work in connection with human technologies.
- Technology carries out work on sensing and actuation systems, cross-information delivery, context modeling, artificial intelligence and multi-knowledge convergence.
- Experimental science performs theoretical empirical studies into how individuals should use enhanced senses, interaction and cognitive mechanisms: paradigm testing, metaphors, communication techniques and strategies for communicating knowledge.
- In everyday processes and applications advanced science uses growing human technologies. Conduct field work using real-approaches. Collect recommendations to make a wider use of research and practice technologies.
- Theory and models form a basis in experimental research for the theory of human wearable development; model multiple senses, actions and cognitions in different ways. Design dynamics of the digital systems implementation of these technologies.
- Ethics and social research: analyze what it means for individuals to change through expanded development. The legal implications of the use and usage of these innovations include questions of equitable access, exploitation and unfair comparative advantage.

4. Societal and Ethical Discussion

Human improvement or raise can be interpreted as a single option that generates consumer interest. It will not preclude questions posed regarding the impact of human increase on individuals and culture as a whole. Even as human development continues, people have legitimate realistic questions about emerging technology of human improvement that can weigh more than personal perceptions and benefits. Eventually, human augmentation is a jump into the unknown, so it may generate unforeseen possible possibilities that ignore the potential adverse impact of these developments on everyday life and culture.

CONCLUSION

Human beings have also tried to enhance their natural ability. It has influenced human existence and the sense of being alive. However, the evolutionary evolution of the human world may quickly take place when man gains charge of his own future. As a culture, humans are now more motivated than ever to adapt and better ourselves. A vast deal of technological advances have been motivated by the desire to be stronger, easier and informed. A great deal of technology will quickly improve and change the abilities from gene modification to exoskeleton attachments and from the brain machine interfaces to have the entire global archive of knowledge at the disposal. Any technology is still in its infancy and will evolve over time. Many technologies can be incorporated now to improve key human skills. Both of these techniques are usually used separately with little to no fusion. The design of an interconnected, intelligent wearable device, as this paper demonstrates, is the next critical step in the growth of human potential. The previously diversified innovations with flexible uses now coalesce into a stable structure that lays the groundwork for the growing citizen of the future. Such development would revolutionize the nature of life. Nonetheless, in order to guarantee data protection, uniform access to these technologies; it is important for the legal problems relevant to these changes, legislation and international norms and guidelines. Enhanced technologies should not only enhance an individual's well-being and quality of life but should also have a positive effect on the environment and on culture.

REFERENCES

[1] M. Sreenivasa, M. Millard, P. Manns, and K. Mombaur, "Optimizing Wearable Assistive Devices with Neuromuscular Models and Optimal Control," in *Biosystems and Biorobotics*, vol. 15, 2017, pp. 627–632.

[2] N. E. Krausz and L. J. Hargrove, "A survey of teleceptive sensing for wearable assistive robotic devices," *Sensors (Switzerland)*, vol. 19, no. 23. 2019.

[3] D. P. Ferris and B. R. Schlink, "Robotic devices to enhance human movement performance," *Kinesiol. Rev.*, vol. 6, no. 1, pp. 70–77, 2017.

[4] K. Lansing, W. Yu, and B. Samanta, "A non-intrusive wearable bio-sensor based assistive robotic system for human mental and physical intervention," in *ASME International Mechanical Engineering Congress and Exposition, Proceedings (IMECE)*, 2017, vol. 4B-2017.

[5] X. Peng, Z. Tang, F. Yang, R. S. Feris, and D. Metaxas, "Jointly Optimize Data Augmentation and Network Training: Adversarial Data Augmentation in Human Pose Estimation," in *Proceedings of the IEEE Computer Society Conference on Computer Vision and Pattern Recognition*, 2018.

[6] M. H. Jarrahi, "Artificial intelligence and the future of work: Human-AI symbiosis in organizational decision making," *Bus. Horiz.*, 2018.

[7] Y. Cui, G. Yang, A. Veit, X. Huang, and S. Belongie, "Learning to Evaluate Image Captioning," in *Proceedings of the IEEE Computer Society Conference on Computer Vision and Pattern Recognition*, 2018.

[8] M. Harvey, M. Langheinrich, and G. Ward, "Remembering through lifelogging: A survey of human memory augmentation," *Pervasive and Mobile Computing*. 2016.

[9] C. Si, W. Wang, L. Wang, and T. Tan, "Multistage Adversarial Losses for Pose-Based Human Image Synthesis," in *Proceedings of the IEEE Computer Society Conference on Computer Vision and Pattern Recognition*, 2018.

[10] T. Tran, T. T. Do, I. Reid, and G. Carneiro, "Bayesian generative active deep learning," in *36th International Conference on Machine Learning, ICML 2019*, 2019.