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Enhancement on Human Machine

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Abstract - In this paper, we are not concerned with "natural" means for enhancement, which we consider to include such things as taking Advanced Placement classes, hiring a private tutor for music lessons, or eating healthier foods, things that people do often and without real controversy. We are concerned with the controversy surrounding the use of bodily interventions—internal or external–that, whether originally intended or not, are used to enhance a person's physical or cognitive abilities beyond the existing range for that person or his cohort. Moreover, the augmentation concept can also be extended to humans, enhancing their capabilities and senses, which allows the creation of "augmented operators" at smart factories, addressing the concept of human augmentation.

***Key Words*: Human Enhancement, Augmentation, Augmented Human**

1. INTRODUCTION

Human augmentation is a field of research that aims to enhance human abilities through medicine or technology. This has historically been achieved by consuming chemical substances that improve a selected ability or by installing implants which require medical operations. Both of these methods of augmentation can be invasive. Augmented abilities have also been achieved with external tools, such as eyeglasses, binoculars, microscopes or highly sensitive microphones. Lately, augmented reality and multimodal interaction technologies have enabled non-invasive ways to augment human.

In this paper, we first discuss the field and related terms. In addition, we present a call for research to realize this vision. Then, we discuss future human abilities. Wearable technologies may act as mediators for human augmentation, in the same manner as eyeglasses once revolutionized human vision. Non-invasive and easy-to-use wearable extensions will enable lengthening the active life for aging citizens or supporting the full inclusion of people with special needs in society, but there are also potential problems. Therefore, we conclude by discussing ethical and societal issues: privacy, social manipulation, autonomy and side effects, accessibility, safety and balance, and unpredictable future.

1.1 Human Enhancement

Genetic enhancement. Genome editing technology has existed for some time, but the latest iteration, CRISPR-Cas9, is a more precise and efficient tool that makes the possibility of "designing" a baby with specific traits much more conceivable. Even beyond CRISPR-Cas9, scientists are exploring the possibility of creating a human genome from scratch.

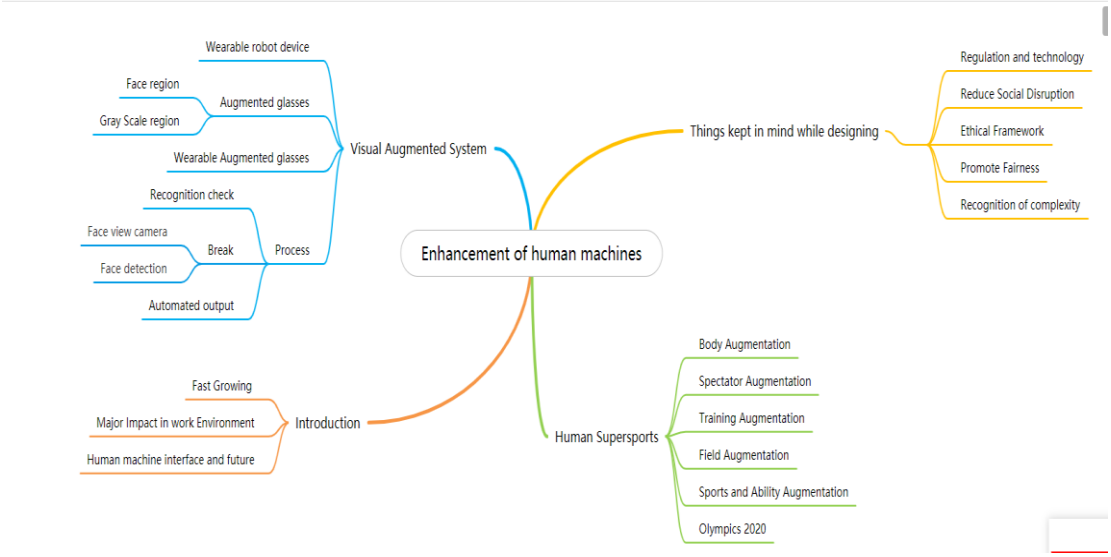
This in and of itself has implications for the disability community. However, it is not inconceivable that in the future parents will ask to use the technology to screen for certain traits they wish to see in their children. Individuals may want their offspring to be enhanced with a certain intelligence level, height, or eye color. Some genetic testing companies today even go so far as to offer scientifically dubious assays they claim will allow you to assess if your child has inherited genes that could lead to, for example, superior athletic performance.

1.2 Wearable Enhancement

The development of exoskeletons, essentially a wearable robot consisting of a motorized frame and computer to help paraplegics walk "on their own," clearly serves a humanitarian purpose, and at least one version has been approved by the Food and Drug Administration. But those now under development and being tested can only be used by a specific range of people. There are height, weight, and age requirements that rule out children and most elderly, raising questions of fairness. The Defense Advanced Research Projects Agency, or DARPA, is funding research into exoskeletons for soldiers. These skeletons are attached to soldiers in order for them to hike long distances carrying up to 17 times more weight than normal, quickly and efficiently. This is only the tip of the iceberg. Further studies involve attaching an Iron Man-like device, called a tactical assault light operator suit, to these exoskeletons to extend mobility and increase protection. This melding of humans and technology also includes neurological devices implanted in the brain.

1.3 Cognitive Enhancement.

For years, students have been using Ritalin and Adderall, prescribed for attention deficit disorder, off-label to increase their focus for exams or writing papers, although the results are relatively modest and short-lasting. But the potential for cognitive enhancement extends beyond pills. Other technologies now used as therapies for people with mental and physical impairments might one day be used by people without disabilities to improve memory, intelligence, and reasoning. Neuroprosthetics are electronic devices that are inserted directly into the brain or nervous system. The initial purpose of this technology is to enable people with severe physical disabilities to control devices outside their bodies to achieve a degree of physical independence otherwise not possible.



Mind Map of Enhancement of Human Machines after detail learning.

2. Future and Applications

2.1 Human Visual Augmentation Using Wearable Glasses with Multiple Cameras and Information Fusion of Human Eye Tracking:

A smart wearable robot glasses system is proposed to assist human visual augmentation in daily life, providing a refined visual recognition result to users from multiple input images of the proposed system. It consists of a glasses-type wearable device with a front-view camera, eye-view camera, mounted display, earphone, and computing unit for signal processing. The scene understanding process on the input image from the front-view camera can be computationally accelerated with the support of the eye-view camera that monitors the eye position of the user.

2.2 Wearable Robot Device

Human Augmentation Robots, which augment confined human ability to a higher level, are attracting robotics researcher and consumer interest boosted up with the technological innovation of information technology industries. To augment human sensing/ perception/ recognition abilities, several new visual wearable robotic devices have been developed, such as First-Person Vision or Inside-Out Vision

a) normal mode b) display mode

Figure 1. Design and implementation of wearable robot glasses with multi-cameras and display for human visual augmentation

2.3 Visual Augmentation System

To demonstrate the feasibility of the proposed system, human face recognition application was implemented for the proposed augmentation device, which is useful for meetings, conferences, and party situations. Using input images from the eye-view and front-view cameras, the purpose is to find human faces and identify the face the wearer is interested in. The identified face recognition result from embedded signal processing units is then translated into audio information or image information for the wearer.

3. Methodology

3.1 Face recognition

For the face recognition, the eye detection program was first applied to the eye-view image. Next, a saliency map of the human intention in the input scene image is created. This saliency map is then combined with the face saliency map for the same input image. In this experiment, the use and non-use of the eye-tracking function implemented by the eye-view camera were compared in terms of the processing time and recognition accuracy. When comparing with general egocentric visions composed of a single camera device, the experimental results showed that the proposed vision system not only shortened the processing time for face recognition, but also improved the recognition accuracy with the help of human intention monitoring. In particular, as shown in Figure 4, when there was no human intention given, the face candidate area detection frequently failed due to illumination noise or image non-uniformity.

3.2 Superhuman Sports: Applying Human Augmentation to Physical Exercise

Body Augmentation

Augmenting the body is the most straightforward notion. The goal is to enhance a sports practitioner's inherent abilities using wearable technologies and implantables. For example, Skeletonics lets the user climb into a completely mechanical exoskeleton so that he or she can enjoy a different body model and new perspective.

Training Augmentation

Augmented training deploys information technology to improve training and enhance the inherent capabilities of professional and amateur sports practitioners—for example, using electric muscle stimulation to build up specific muscle regions or transcranial direct current stimulation to improve handeye coordination or other motor tasks perception using smart glasses that influence our motions using projections in our peripheral vision.

Spectator Augmentation

Augmenting "cheering" focuses on new experiences for those watching a sporting event. For example, those in the crowd might feel the adrenaline rush of an athlete before scoring an important point, or they might experience the exhaustion of a marathon runner just before he or she crosses the finish line.

Moving away from sharing basic vision and sound, new technologies can help share the "affect" of the sport. They are working on Affective Wear smart glasses, which can detect the user's facial expressions by monitoring the distance between glasses

frame and face using photo-reflective sensors (see Figure 4).8 Affective Wear can aggregate the facial expressions of spectators to help organizers evaluate a sporting event and to offer a more crowd-like experience for home viewers with virtual cheers.

4. New approach to Human Enhancement

To successfully embrace this new industrial paradigm and implement emerging technologies, namely AR, companies need to develop human-centric production systems that focus on workers and their needs. The application of this technology will directly affect operators and their workplaces, creating new interaction between humans and machines. This new interaction will merge digital and physical worlds, resulting in a socio-technical transformation in smart factories and a new HMI paradigm.

Therefore, the ongoing project intends to design a new approach for human augmentation, based on an enhanced HMI enabled by AR technology. This new approach relies on H-CPS, and aims to augment human's physical, sensorial and cognitive capabilities using AR technology in workplaces. The purpose of the project consists in creating a symbiosis between human and technology, assessing how AR is changing workforce, workplaces and, consequently, HMI. Accordingly, it intends to assess which type of AR is more suitable for some of the analyzed industrial processes and, therefore, which human sense or capability should be augmented in order to improve task performance, productivity and efficiency at those workplaces.

For this purpose, the processes will be analyzed with a strong focus on human factors, ergonomics, HMI, and safety, identifying the most important human capabilities and senses to perform the required tasks. The main expected outcomes with this human augmentation consist in the decreasing of operation times and human effort, as well as, the mitigation of existent risk factors and the elimination of human errors.

5. Conclusions

Despite of this new manufacturing concept represents an opportunity to improve companies' productivity and efficiency, there are some concerns regarding human factors, once this will deeply affect operators and their workplaces. In industrial context, AR technology holds great potential, allowing higher work performance and efficiency in workplaces that results from human augmentation that consists in the creation of operators with augmented or enhanced physical, sensorial and cognitive capabilities. However, the importance of HMI, in order to ensure a sustainable interaction between operators and machines, has been growing as the technology develops.

There are a lot of critical factors regarding human errors, operator's well-being and industrial safety, being essential to ensure the accuracy of the provided information to simplify tasks performance and reduce workload and operator's effort. After a literature review about several key concepts, such as AR, HMI and human augmentation, an ongoing project has been presented, which intends to create a symbiosis between human and technology, providing a sustainable and enhanced HMI based on human augmentation techniques. The purpose of this project, strongly focused on human factors and mitigation of safety risks in workplaces, consists in assessing which type of AR is more suitable for each process, considering the human senses and capabilities that should be augmented in order to reduce human effort during tasks performance

REFERENCES

[1] https://www.sciencedirect.com/science/article/pii/S1071581919300576

[2] https://ieeexplore.ieee.org/document/7842855

[3] https://ieeexplore.ieee.org/document/6281341

[4] https://www.thehastingscenter.org/briefingbook/enhancing-humans/