Let Me In!!!
("Biometric Access & Neural Control")

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ABSTRACT

The information age is already revolutionizing the way we live our lives. Each day, many more manual tasks are automated and in turn handled via some type of electronic device. This growth in electronic and technology has resulted in a greater demand for a fast and accurate method of access and control. In the not too distant past, technology did not take into account individuals with disabilities as a profitable demographic. However, in the economy of today, many developers are realizing the market potential. This paper will address some of the theoretical benefits and concepts of using biometrics access and a neural interface solution.

1. INTRODUCTION

Based on information collected from the National Organization of Disability (NOD) the number of people in the United States with a severe disability, is currently 54+ million (NOD, 2001). Just imagine the shear number of disabled humans worldwide.

It is our belief that research and information on assistive technologies can be a powerful tool in expanding knowledge and creating opportunities for all individuals worldwide. Hopefully, our theories and concepts will allow at least one individual to gain independence. But, our mission will not be complete until all barriers are destroyed. Therefore, please consider this paper a small contribution to this noble cause.

2. THE TALE OF TWO ENCOURAGING TECHNOLOGIES

It is our belief that Biometrics and Neural Wave Analysis Interface (NWAI), are two of the most promising and life altering technologies in existence today. The implementation of these technologies could launch the world into a new era. An era where anything is possible and disabilities do not exist.

2.A. What is Biometrics and how it can help?

A biometric system is essentially a pattern recognition system that establishes a person's identity by comparing the binary code of a uniquely specific biological or physical characteristic to the binary code of a stored characteristic. This is accomplished by acquiring a live sample (the characteristic) from a petitioner (individual who is requesting access). The system then applies a complex and specialized algorithm to the live sample; it is then converted into a binary code. Once the live sample has been converted into a binary code, it is compared to the reference sample (previously stored binary code) to determine the petitioner's access or not. There are many biometric technologies & applications, for example:

Facial Geometry Verification, Facial Thermography Identification, Hand Geometry Recognition, Fingerprint Scan Identification, Palm Scan Identification, Back-of-the-Hand Scan Recognition, Knee Scan Recognition, Back-of-the-Knee Scan Recognition, Iris Scan Identification, Retina Scan Identification, Signature Verification, Voice Recognition, Ear Geometry Verification, Body Odor Recognition, Keystroke Entry Pattern Recognition, Vein Pattern Recognition, Breathing Pattern Verification, and Gait Pattern Recognition…Etc.

Think of biometrics as a key! Yes… A key, it can open doors for you and provides security to keep others out. It is a key that can be customized to an individual's access needs. You can use a biometric to access your home, your account, or to invoke a customized setting for any secure area/application.

2.A.1. I think therefore, I am "IN"

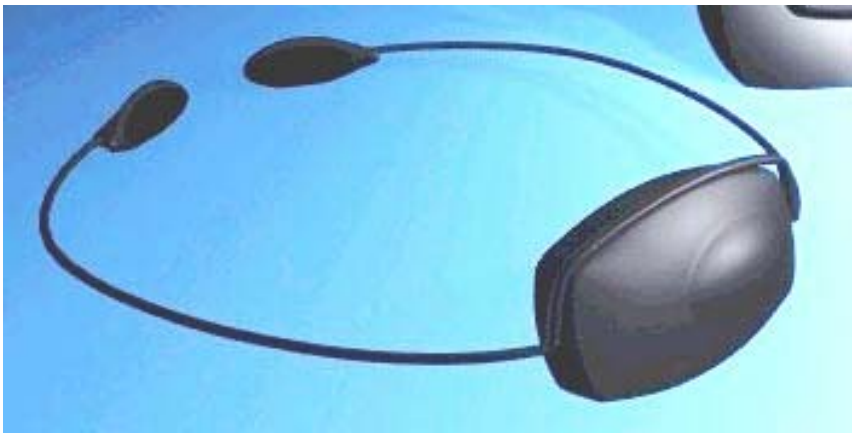
Be creative, exercise your mind's eye and the biometric possibilities are inexhaustible. Case in point, while conducting research for this article, we came across a website sponsored by EEG Spectrum (http://www.eegspectrum.com). This website is dedicated to a research project known as EEG Biofeedback. The mission of the EEG Biofeedback Project is to help people overcome mental disabilities, by teaching them how to alter or normalize a specific brain wave pattern. (EEG Spectrum, 2001)

While it is true that a person has the ability to alter most of their own brain wave patterns, they cannot alter what is referred to as their baseline brain-wave pattern. So, it occurred to us that an individual's baseline brain-wave pattern has the ability to be recognized as the newest undiscovered biometric solution. This is a solution we like to refer to as an "EEG Fingerprint".

2.B. What is NWAI and how it can help?

Another type of technology that can assist individuals is known by many names, EEGI (Electrocenphlogram Interface), BCI (Brain-Computer Interface), HCI (Human-Computer Interface), NHCI (Neural Human-Computer Interface) and NI (Neural Interface). However, we would like to introduce what we believe to be a more accurate description of this type of interface technology, which is NWAI (Neural Wave Analysis Interface). The neural waves can either emanate from a subject's brain (in the form of brain waves) or muscles (in the form of bioelectrical impulses).

Essentially, NWAI is a device that senses and analyzes persons' neural waves and then interfaces with a computer to allow control; NWAI would be analogous to a human hand. The problem is that the technology must be customized for each user and is therefore not easily adaptive to each individual. Here is a picture of a NWAI prototype:



Product Image is that of BioControl Systems (http://www.biocontrol.com)

3. CONTROVERSY OVER PRIVACY FEAR

One of the most consistent and prolific constraint towards the implementation of any new technology is the controversy over privacy issues. In our opinion, opponents of new technologies, such as Biometrics or EEG Interface are necessary. Yes… They are a necessary part of the development and implementation process for any new technology. Why? Opponents of new technologies cause all of us to improve designs, refine processes, and safeguard the things we hold most dear, our freedom and humanity.

Furthermore, it is our belief that the majority of civilization is compassionate and that they recognize the supreme need for new assistive technologies. Therefore, both advocates and opponents alike must do everything possible as civilized human beings to bestow freedom to everyone in need. To accomplish such a monumental task, we must harness the creativity and innovation of our society to develop new theories and assistive technologies.

4. HOW TO CHOOSE THE BEST SOLUTION

When examining the best technological implementation for an application, most companies often focus on the cost of the hardware and software. The result is something like voice verification, which is a low cost and non-intrusive solution. Now the alternative at the other end of the rainbow is a costly and intrusive retinal scan solution. Fingerprint scan competitors have aggressively worked their way from solutions in the thousands of dollars to the low hundreds. However, the actual cost of implementing any biometric technologies goes far beyond these basic factors.

You must first decide if a verification, identification, or multi-modal solution is needed. You must then consider processing power, application/system integration, scalability, training, security, fraud, forged, FAR (False Acceptance Rate), FRR (False Rejection Rate), an acceptable decision threshold, and public perception. Probably the most important consideration is that the biometric or physical characteristic cannot be stolen. Yes, stolen… For example, if using a fingerprint biometric a thief could sever your finger and use it to gain access.

4.A. Contrasting Identification Methods

There are methods of resolving a person's identity:

- Verification - (Am I whom I claim to be?) involves confirming or denying a person's claimed identity. A signature, voice or facial biometric is generally best suited for a low security area.
- Identification - one has to establish a person's identity (Who am I?). A fingerprint, retina, or iris scan are considered to be positive identifiers.
- However, for absolute confirmation of an individual's identity a Multi-Modal is highly recommended. For example the Pentagon will be implementing a Fingerprint and Facial recognition solution within the military (Washington Post, October 29, 2001).

5. OUR CONCEPT AND PROPOSAL

Theoretically, our ideal has the potential to shatter virtually all disability barriers. As the title of this paper suggest, we would use a Multi-Modal Biometric such as Facial Geometry and Facial Thermography to perform the function of a key to gain access. An NWAI solution would work in concert with a Multi-Modal Biometric to provide control and act as the hand. By combining a Multi-Modal Biometric and NWAI, we have envisioned an almost perfect solution:

- A Multi-Modal Biometric decreases the FAR (False Acceptance Rate) & FRR (False Rejection Rate).
- Each facial biometric is non-intrusive.
- Due to the loss of blood, the physical or biological characteristic (the head) would be useless if stolen. Because, the thermogram patterns produced by the blood in the face would no longer exist. Therefore, eliminating the need of stealing the characteristic.
- Using a biometric will allow a NWAI device to be customized and easily adaptive.
- Theoretically, the biometric could be an EEG Fingerprint to engage an adaptive protocol.
- NWAI would negate the need for physical hands or legs.

REFERENCES

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