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BRAIN PORT VISION TECHNOLOGY

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ABSTRACT :

The Brain Port Vision Technology abstract would likely summarize its innovative approach to helping visually impaired individuals "see" by converting visual information into tactile or electrical signals that the brain can interpret. It may cover aspects like its device components, functionality, and potential impact on improving quality of life for those with visual impairments.

Keywords—Brain port device, blindness, vision, CT scanners, positron emission tomography.

Introduction :

The introduction to BrainPort Vision Technology would typically provide background information on visual impairment, highlighting the challenges faced by individuals with conditions like blindness or low vision. It would then introduce the BrainPort device as a groundbreaking solution, explaining its concept of using alternative sensory modalities, such as touch or electrical stimulation, to convey visual information to the brain. Additionally, it might touch on the development process, key researchers involved, and the overall goal of improving independence and quality of life for visually impaired individuals.

LITERATURE SURVEY:

Paul Bach-Y- Rita: known for pioneering research in sensory substitution, including early work on Brain port vision technology that the paper describes the blindness people can have their vision by the Brain port vision device.

Michael Bach: Notable for his contributions to vision science and rehabilitation, including studies related to sensory substitution devices.

Aimee Arnoldussen: Known for her research of brain port technology and its applications in visual rehabilitation.

Thomson W Persson: Notable for his work on sensory substitution and brain port devices particularly in the context of aiding visually impaired individuals.

Kurt A Kaczmarek: Recognized for his contributions to sensory substitution and neuro rehabilitation including research involving brain port technology.

Kleynhans and Fourie describes about the introduction and how brain port is invented. And says that brain port is a device that can be used for the brain people and it will senses the sight exactly as normal people will see.

Pradeep and Medioni G describes that it provides a comprehensive review of blindness and not a proper vision to blind people and describes the sight and any object to be visualized by blind people. The paper reviews the standards and regulations of brain port vision technology.

TECHNOLOGY

POSITRON EMISSION TOMOGRAPHY

Positron emission tomography is a functional imaging technique that uses radioactive substances knownas radiotracers to visualize and measure changes in metabolic processes and in other physiological activities including blood flow regional chemical composition and absorption. Different tracers are used for various imaging purposes depending on the target process within the body. PET scanners can incorporate a computed tomography scanner and are known as PET-CT scanners. PET scan images can be reconstructed using a CT scan performed using one scanner during the same session.

FIG 1: Positron Emission Tomography

A. TESTING DEVICE:

Other than normal use of tongue for tasting Food, eating, talking there are also many other uses. One of them is for sensing of light. It is called as tasting because it can taste the light and sense the objects. It is this property which is used in BrainPort vision device. Other parts of the body, such as the back, were not sufficiently sensitive. The fingertips were sensitive enough, but people wanted full use of their hands to grip a cane or to grab objects. placing the device on the tongue inside the Mouth, frees the hands to interact with environment, Plus, the device can be hidden in The Mouth.
The key to the device may be its utilization of the tongue, which seems to be an ideal organ for sensing electrical current. Saliva there functions as a good conductor.

FIG 2. Position of Electrode array

PARTS OF BRAIN PORT DEVICE

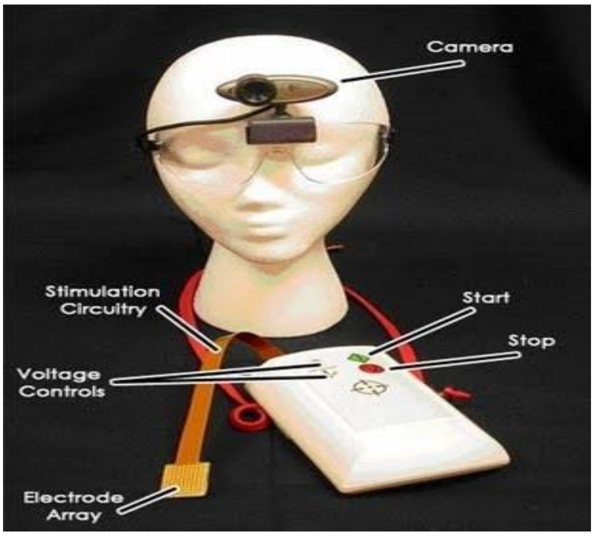

FIG 3. Parts of Brain port device

1. Digital Video Camera:

Brain port vision device consists of a digital Video camera placed in the pair of glasses as shown in the figure. Visual data is captured through the camera (1.5cm in diameter). Signals from the camera are then passed to the Brain port device along a cable and then to the lollipop-shaped stick, placed on the tongue.

2. Brain Port Balance

Power Button: Used to start and stop the brain port balance. Control Unit: This unit comprises of a CPU and Battery CPU is used here to convert the digital output from the camera into electric pulses. Brain port balance works with the help of a battery. Lollipop shaped stick : It consists of Three Parts, they are: Electrode Array, Simulation Circuitry,

Accelerometer.

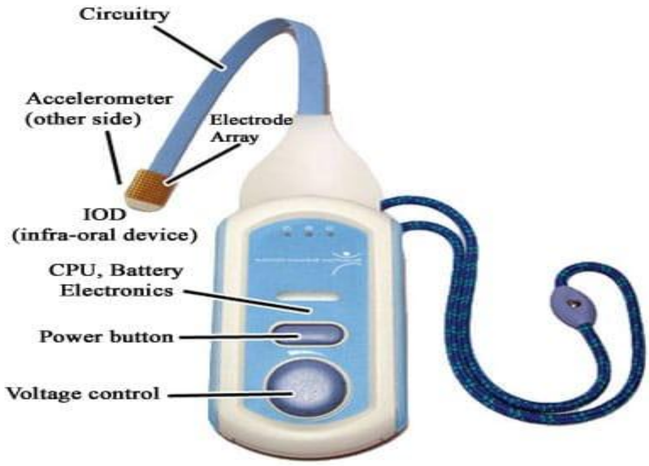

FIG 4. Brain Port Balance

Electrode Array:

The electrode array is a square grid consisting of about 400 electrodes placed on the tongue. The control unit of the brain port vision device helps in conversion of the image into a black, grey and white picture. This picture is then recreated to the electrode array. Each electrode present in the array will provide an electronic pulse on the tongue according to how much light is present in the area of the picture. Usually strong pulse vibrations from the electrode array represent white pixels, medium pulse represent grey, and zero vibrations represent black pixels.Stimulation Circuitry:It consists of

User Interface: User interface allows selection of current and voltage mode.Processor: Configures the brain port device.

Accelerometer:Accelerometer is used on the other side of the electrode array to give information about body and head position to brain through electrical stimulation of tongue.

WORKING PRINCIPLE

About two million optic nerves are required to transmit visual signals from the retinathe portion of the eye where light information is decoded or translated into nerve pulses to the brain primary visual cortex. Visual data are collected through a small digital video camera. Bypassing the eyes, the data are transmitted to a handheld base unit, which is a little larger than a cell phone. From the CPU, the signals are sent to the tongue via a lollipop an electrode array about nine square centimeters that sits directly on the tongue.Densely packed nerves at the tongue surface Receive the incoming electrical signals, which Feel a little like Pop Rocks or champagne bubbles to the user.These signals from tactile or touch receptors cells are sent to the somatasensory cortex in response to stimulation in the form of pattern impulses.Although users initially ‘feel’ the image On their tongue, with practice the signals Activate the ‘visual’ parts of the brain for Some people. In any case, within 15 minutes of using The device, blind people can begin Interpreting spatial information via the Brain Port.

FIG 5. Working

TESTING

This device has been tested on several blind People; one among them is Erik Weihenmayer. A genetic eye condition known as retinoschisis caused him to be visually impaired at birth and completely blind by age 13. In retinoschisis, tiny cysts form within the eyes delicate retinal tissue, eventually causing its layers to split apart. Neither medication nor surgery can restore sight. But with the help and practicing this device he was at least able to identify the obstacles, objects around him and can also read the signs. And by use of this device he has climbed mountains around the world highest peaks, in fact, on every continent.

APPLICATONS

Visual Prosthesis: It could aid individuals with visual impairments by bypassing damaged optic nerves and transmitting visual information through other sensory pathways, such as the tongue.

Navigation Assistance: BrainPort could assist users in navigating unfamiliar environments by providing spatial awareness and obstacle detection through tactile feedback.

Object Recognition: It might help users recognize objects and their characteristics through the sensations generated on the tongue, enhancing independence and interaction with the environment.

Medical Training: BrainPort could be utilized in medical training to simulate various medical conditions or surgical scenarios, providing a hands-on learning experience for healthcare professionals.

Remote Sensing and Robotics: Integrating BrainPort technology into remote sensing devices or robotic systems could enhance remote operation capabilities by providing users with real-time tactile feedback from sensors or cameras

.

Augmented Reality: BrainPort could be integrated into augmented reality systems to provide tactile feedback alongside visual and auditory information, offering a more immersive and inclusive experience for users.

Military and Law Enforcement: It might have applications in military and law enforcement, such as enhancing situational awareness in low visibility environments or providing tactile feedback for surveillance operations.

Assistive Technology: BrainPort could serve as an assistive technology for individuals with disabilities, helping them interact with digital interfaces, read text, or interpret visual information in various contexts.

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