MAMEM - MULTIMEDIA AUTHORING and MANAGEMENT USING YOUR EYES and MIND (a HORIZON 2020 RESEARCH and INNOVATION ACTION)

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Objective

With the growing number of people with severe disabilities who live longer and the growing use of computers for social interactions, we introduce an ambitious objective of The Multimedia Authoring and Management using your Eyes and Mind (MAMEM) project, i.e., a more natural human computer interfaces based on electroencephalography (EEG)/Eye movements (EMs) technologies.

Background

Loss of the voluntary muscular control while preserving cognitive functions is a common symptom of neuromuscular disorders leading to a variety of functional deficits, including the ability to operate software tools that require the use of conventional interfaces like mouse, key-board, or touch-screens [1-2]. The use of computers and information technologies is essential for social participation and productive life [3]. As a result, the affected individuals are marginalized and unable to keep up with the rest of the society in a digitized world. MAMEM's goal is to integrate these people back into society by increasing their potential for communication and exchange in leisure (e.g. social networks) and non-leisure context (e.g. workplace).The final objective of the project is to deliver the technology to enable interface channels that can be controlled through eye-movements and mental commands [figure 1].

References

1.Steriadis, C. E., & Constantinou, P. (2003). Designing human-computer interfaces for quadriplegic people. ACM Transactions on Computer-Human Interaction (TOCHI), 10(2), 87-118.

2.Rupp, R. (2014). Challenges in clinical applications of brain computer interfaces in individuals with spinal cord injury. Frontiers in neuroengineering, 7.

3.Caltenco, H. A., Breidegard, B., Jönsson, B., & Andreasen Struijk, L. N. (2012). Understanding computer users with tetraplegia: Survey of assistive technology users. International Journal of Human-Computer Interaction, 28(4), 258-268.

Hypothesis

A platform for computer use based on EEG and Ems reading technologies will enable better multimedia authoring and management for disabled people. This may help to reduce the Marginalizing of such individuals and enable them to keep up with the rest of the society in a digitized world.

Methods

- First, the device's clinical requirements are to be defined using literature reviews, focus groups and questionnaires that will be passed to the potential users.
- Later, the technological partners will create a prototype according to these clinical requirements.
- Next, clinical trials will be conducted with the patients to assess the feasibility and usability of the system. During the clinical trials stage, three cohorts of individuals with disability (Parkinson disease, neuromuscular conditions and tetraplegia following spinal cord injury) from two countries will be enrolled. The participants will test a set of prototype applications dealing with multimedia authoring and management.
- In an interim stage, the device will be modified in light of these trials and then a next set of trials will be preformed.
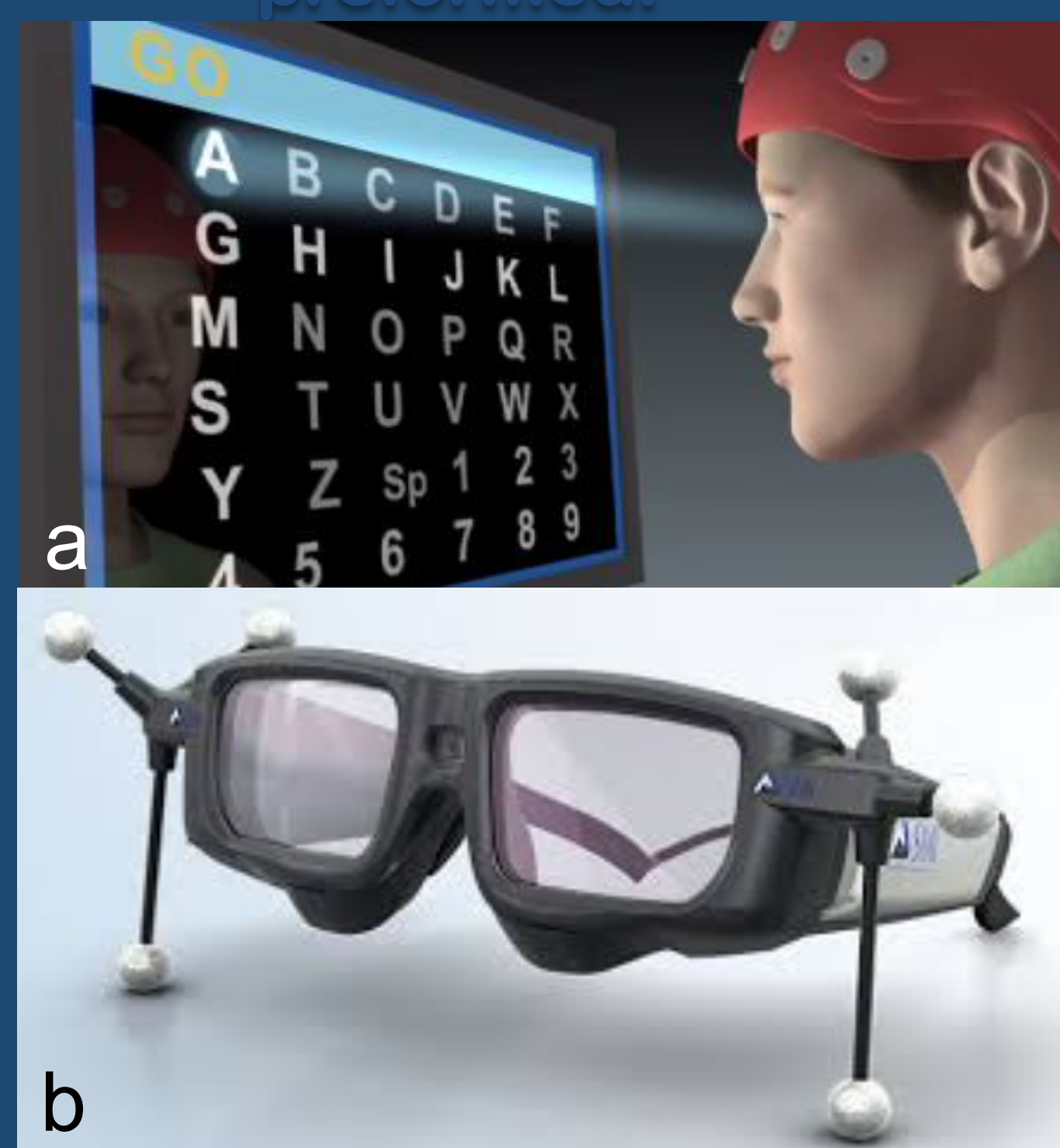

Figure 1:

(**a**) an illustration of an EEG reading based computer interface. This includes an electrode cap for EEG signals and a software interface that enables the user to control a computer. (**b**) An example of eye tracking glasses used for gaze behavior analysis.

Key findings

Clinical requirements for the platform have been created. These were passed to the technological partners who will later produce a prototype that will be tested in the clinical trials stage

Results

The results of the project so far have been a list of clinical requirements which the platform should fulfill, based on literature surveys, focus groups and questionnaires passed to the potential users. The methods used to asses the requirements also produced several conclusions:

- Computer is commonly used among disabled people and it is important to them in several aspects.
- Disabled people experience some difficulties in computer operation.
- It seems there is a general positive attitude among the potential users and their caregivers and the health professionals towards an EEG/Ems based assistive device.

The clinical requirements were passed to the technological partners who will later produce a prototype that will be tested in the clinical trials stage.

Conclusions

A platform based on EEG and Ems reading for computer use could offer a solution for Marginalized individuals such as disabled people. The current results in the project so far support this hypothesis. The next stages of the project include creating a prototype and testing it in clinical trials with the potential users.

Acknowledgments