**Problem**

The problem is the necessity to rehabilitate people that have suffered from limp motion restrictions, due to various medical conditions. The condition that Is the focus on this work Is stroke.

As stated before, the medical condition that the work is focused on is stroke. A stroke occurs when the blood supply to part of the brain is cut off. This is a serious life-threatening condition that needs urgent treatment to diminish the damage caused. Stroke survivors frequently obtain long-term injuries caused by the damage suffered to their brain. The rehabilitation of the patients can be a tough and long process where they try to recover their former independence.

The patient rehabilitation takes a lot of resources, both material and human. It would be Important to develop a way to decrease the resources needed to execute the rehabilitation task. The cut in the resources results in a cost reduction, as well as lowering the workload of medical staff.

This work revolves around the development of a Virtual Reality environment for stroke rehabilitation with BCI and hand tracking sensors, focusing on the data collecting and extracting a control signal for implicit input to a system (e.g., workload, attention measures).

Bibliography:

https://www.mayoclinic.org/diseases-conditions/stroke/in-depth/stroke-rehabilitation/art-20045172

<https://www.nhs.uk/conditions/stroke/>

**Introduction**

In the past two decade or so, the engineering has been allied to the medical community to provide a different way to perform the rehabilitation process of patients. With the development of the computational power and of the performance of new algorithms, the virtual reality can take a bigger and bigger role in rehabilitation.

Traditional rehabilitation takes a lot of resources, both material and human. There is always the need to have a therapist following every step of the patient. This fact causes costs that could be avoided if we could use a process that it is possible to be done, not only without constant medical supervision, but also in a more efficient way.

The research will focus on the Machine Learning contribution for the creation of a Virtual Reality environment for Rehabilitation. It will be discussed a framework, based in a neural network, that uses multimodal signals from different sources: brain, eye and muscle, just to name a few, to extract control signals that are used as input to a system. In this case the system is the Virtual Reality environment that will be used in rehabilitation.