HELPING PARAPLEGIC PATIENTS LEARN TO STAND

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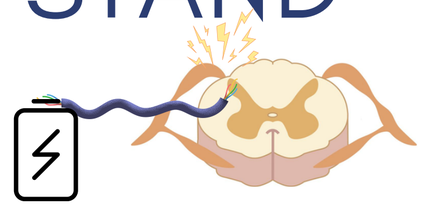

INTRODUCTION

- **Spinal cord injury** (SCI) is a debilitating neurological condition affecting an estimated 15–20 million people worldwide and severely impacting mobility, independence, and quality of life.
- In recent years, **epidural electrical stimulation** (EES) has emerged as a promising approach for restoring locomotion. In contrast, stable standing has been less studied.

OBJECTIVE

- This research aims to design a **3-degrees-of-freedom robotic experimental platform** that provides a safe and controlled environment for **standing training** and assessment of patient performance.

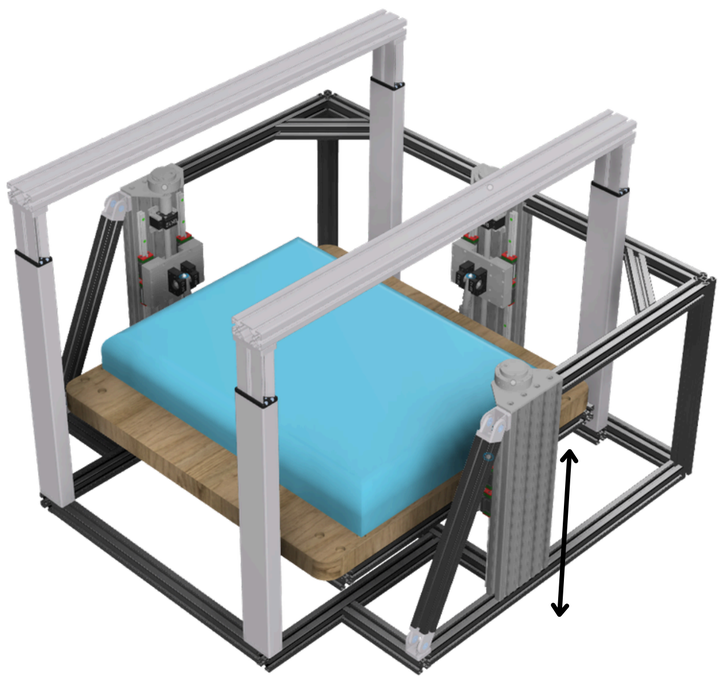

Fig 1 : CAD of the Robotic Platform

- Through electrical stimulation of the spinal cord, patients will **regain the ability to stand** and will be trained to maintain their balance on a platform that can be tilted and elevated. Their reaching abilities will also be trained and assessed through tasks performed in a virtual reality environment.

METHODOLOGY

- The first iteration of the user interface and control architecture is capable of communicating with the platform's motors, acquiring their real-time position, and coordinating their movements.

- The communication between the control software and the robotic platform, as well as the mechanisms required to start, monitor, and safely stop the system were successfully implemented.

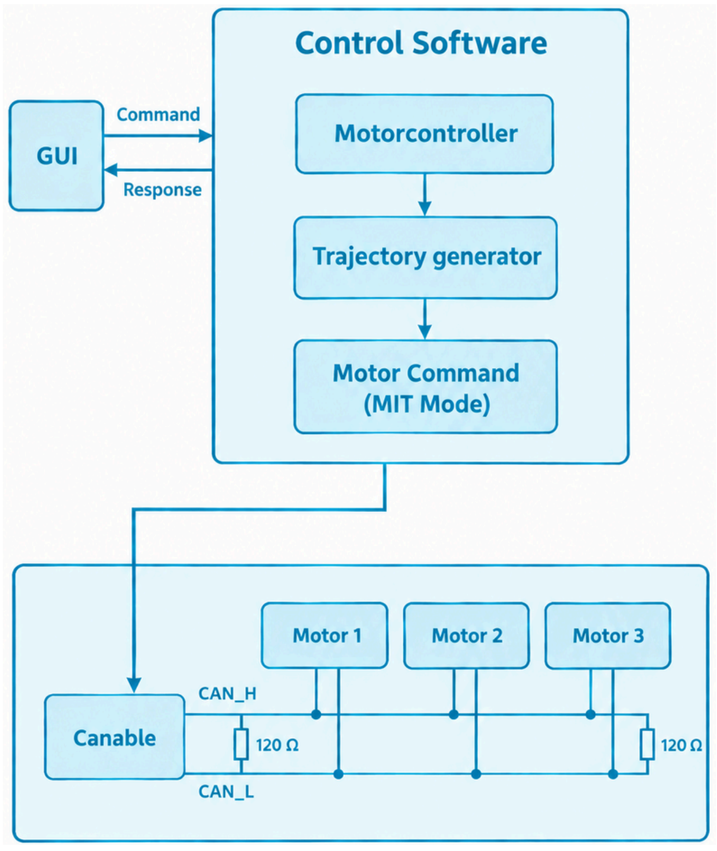

Fig 2 : Framework of the Software

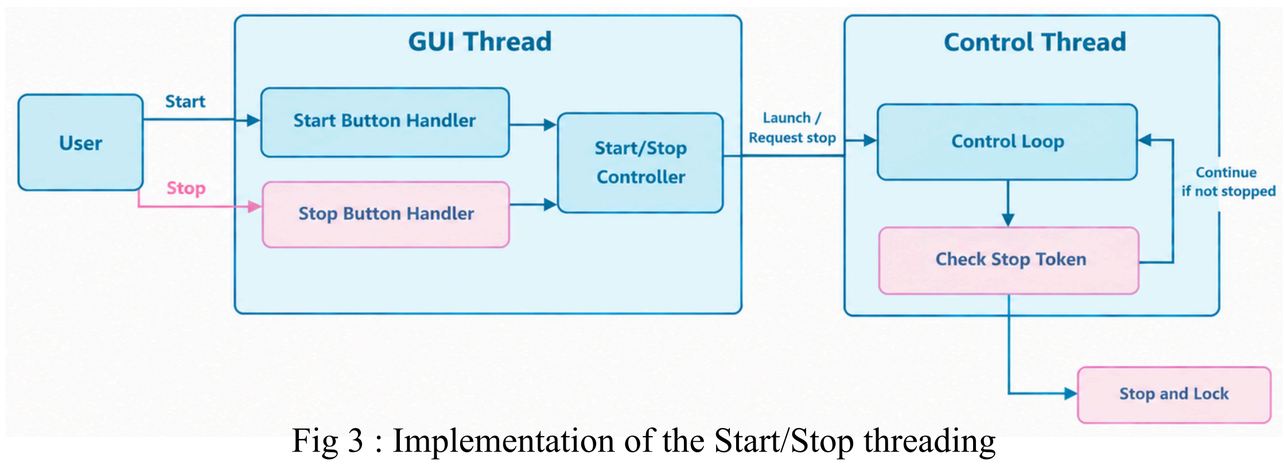

Fig 3 : Implementation of the Start/Stop threading

RESULTS

- This resulted in a software environment providing controlled and reliable operation of the motors of the robotic platform.

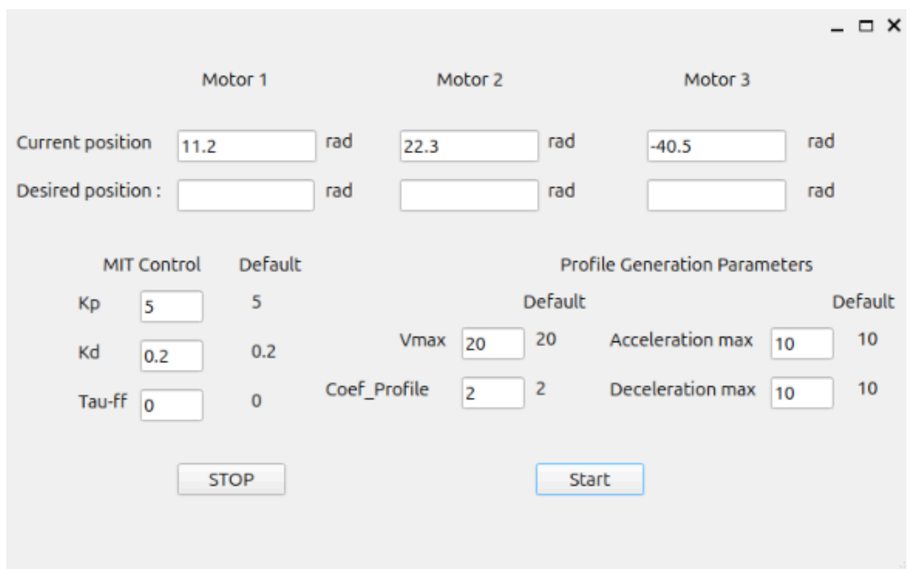

Fig 4 : Graphic User Interface

FUTURE STEPS

- Simulation of the Inverse Kinematics model and linking titlting/elevation to the corresponding motor rotation.

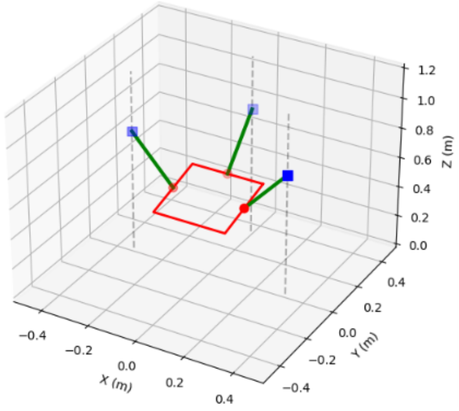

Fig 5 : Simplified tilted model of the robotic platform

- Integration of a Virtual-Reality environment and pressure sensors to assess patient's performance.