BIONIC STEP II: Biped Mechanical Device for the Locomotion of People With Spinal Cord Injury

Vilela , Julia Otoni (School: Fundacao Escola Tecnica Liberato Salzano Vieira da Cunha)
da Rosa, Julia Isabel (School: Fundacao Escola Tecnica Liberato Salzano Vieira da Cunha)

Our research deals with the development of a biped mechanical device, capable of reproducing an artificial movement of human gait with pneumatic artificial muscles (PAMs), for locomotion of people with spinal cord injury. Considering that the rate of occurrence of traumatic spinal cord injuries has been increasing in the last years, our project has the objective of improving the physiotherapy of people with paraplegia and, consequently, attenuating the side effects of this disability. In addition, we want the developed device to be financially accessible to a majority of the population, unlike the models available for purchasing today. Therefore, we started performing tests with a McKibben pneumatic muscle, which allowed us to prove the feasibility of applying these components since a muscle assembly of three PAMs is capable of moving 6 centimeters while lifting a 4-kilogram mass. From the prototype planning phase on, we modeled the parts in CAD software and consequently performed stress analysis on the main points of the structure, obtaining as results a minimum safety coefficient =12,9 and a maximum displacement =0,4 millimeters. Finally, we elaborated the electro-pneumatic circuit in software and listed the main components for a first laboratory test. At the present, we are building the prototype and analyzing its functionality. Our next plan of action aims to assemble the electronic circuit, conclude the construction of the prototype, and conduct practical tests, with and without real users, in order to proceed with points that require improvement.

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