# Soft Wearable Augmented Walking Suit with Pneumatic Gel Muscles and Stance Phase Detection System to Assist Gait

## Abstract

Lower limb of the human body is responsible for human locomotion and maintain a good quality of life. However, there are many cases of muscle fatigue or injuries due to the stressful work environment, aging and work that involve walking a long distance. Therefore, there is a need for walking assistive suit which can unload muscle activation during walking and reduce the chances of lower limb muscle fatigue. In this paper we discuss the development of lightweight and wearable Augmented Walking Suit using Pneumatic Gel Muscle and its actuation control using lower limb pose detection mechanism by considering human gait cycle. The objective of this assistive suit is to reduce required muscle effort of posterior and anterior muscle during the swing phase of the gait cycle thereby making it easier to move forward. To evaluate the effects of the suit we tested this suit with random subjects and record surface electromyography (sEMG) of 8 primary lower limb muscles for two level of assistive forces. The evaluation was done based on the sEMG signal envelope for each subject for a different level of assistive forces and the statistical difference in percentage maximum voluntary contraction (\%MVC) of 8 primary lower limb muscles active during the gait cycle. In our result, we found that all subjects showed no change or a statistically significant reduction in muscle efforts due to assistive suit for all the muscles responsible for swing phase of the gait cycle.