





Design of a Robotic Wearable Shoes for Locomotion Assistance System

Bala Alhaji Salihu, Lukman Adewale Ajao,^(✉) , Sanusi Adeiza Audu, and Blessing Olatunde Abisoye 

Federal University of Technology, Minna 92011, Nigeria
ajao.wale@futminna.edu.ng

Abstract. The inability of a patient to move freely or one part of the body paralysis is an indication of stroke disease or symptoms. This challenge resulted in locomotion of body impairment. In this research, a robotic wearable locomotion assistance system in a pair of shoes is developed using closed-control of mechatronic and embedded system approach. This is to render assistance for the patient impairment locomotion, to improve the passive control and design of orthoses for the structural support of the people with moderate lower-limb weaknesses. The adaptation of this system is varied in position during motion instantaneously and to manage the stiffness of the joint. This wearable robotic shoe helps the paralytic leg (prosthesis) to track the position of the non-paralytic leg using awareness of the sensor and transceivers to establish the communication between the foot posture and support. It also helps the stroke patient with orthoses or prostheses of (foot and leg) to walk linearly in an upright position (maintaining alignment of foot and leg), improving balance, and support the arch and heel of the patient. This system prototype was implemented and tested, and the results show high accuracy in linear tracking and alignment.

Keywords: Assistance system, Embedded system, Paralytic leg, Robotic, Wearable device

1 Introduction

The recent advancement in the robotic system and embedded wearable devices using wireless sensor networks (WSN) has been widely developed for the rehabilitation, human disability assistance, and monitoring health status in biomedical professionals [1, 2]. These systems are sophisticated mechatronic technology equipped with sensors and powerful processing units to exploit real-time information that facilitates independent training during the exercise or enable patient-tailored assistance for locomotion [3, 4]. A wearable robotic system is an innovative rehabilitation insight for individuals (patients) with disabilities [5]. This includes muscle weakness, neurological or muscular disorders [6, 7], stroke, and spinal cord injury which ends-up with loco-motion difficulty (walking or arm movements). Stroke is one of the major and com-mon disability diseases among people of this age that required serious attention to rehabilitation. This disease is seriously