# Abstract

Several designs had been proposed by various researchers for different orthotic devices to assist the disabled people during walking. However, most of those designs might not be optimal in terms of their weights, strength, power consumption of their motors, and others. Thus, there is a need for the design and development of optimized orthotic devices for the different joints. In this study, a novel design of the orthotic device for assisting the knee and hip joints had been proposed. Kinematic and dynamic analyses of the orthotic device were carried out. The problems had been formulated for carrying out optimization and solved using nature-inspired optimization algorithm. The orthotic device for the hip and knee joints had been fabricated. Some four-bar mechanisms were used in the proposed design, which could also be utilized as the function generators. To ensure, whether the joints could generate the desired motions, some trials were made experimentally to trace a few mathematical functions by using the motor-driven four-bar mechanisms utilized in this orthotic device. It is important to note that a good accuracy had been obtained in tracing these mathematical functions. Thus, it is concluded that the desired motions at the different joints could be achieved with the developed orthotic device. The modeling and analysis of sit-to-stand motion of human-beings is another important problem, which had also been studied here. The data related to this study were collected from the available literature. Optimization was carried out using nature-inspired optimization algorithm, which could evolve the optimal strategies of the sit-to-stand motion of human-beings.

**Keywords:** Orthotic device; Knee joint; Hip joint; Optimization; Sit-to-Stand motion; Genetic Algorithms.