ABSTRACT

Stroke is a serious health condition that often causes motor impairment in the lower limbs. A foot rehabilitation robot, or Ankle-Foot Orthosis (AFO), is designed to provide support to the ankle and lower limbs to help post-stroke patients recover. The battery is one of the critical components in the AFO robot, and battery performance greatly affects the functionality of the device. Non-optimal battery charging can lead to system malfunction or decreased efficiency of the robot. Several previous studies have explored various methods of charging and balancing battery cells. However, some of these methods still have limitations, especially in maintaining charging stability and efficient power management. Therefore, this research aims to develop a stable and efficient external battery charging system for physiotherapy robots, focusing on the integration of critical features such as constant voltage (CV), constant current (CC), battery cell balancing, and voltage and current limiting. The system is expected to maintain even power distribution between battery cells, protect against the risk of overcharging, and extend battery life. Testing is done through simulation and prototyping, with real-time monitoring using INA219 sensors. Results show that the proposed charging system successfully charges the battery safely, efficiently, and maintains voltage equality between cells with minimal differences. In conclusion, this battery charging system is able to optimize battery performance in physiotherapy robots by ensuring safe and stable operation. Further research is expected to include trials on a larger scale as well as integration of the charging system into the robot to improve efficiency and easy.

Keywords: AFO Robot, Battery Charging, Cell Balancer