Bulletin of Electrical Engineering and Informatics
Vol. 12, No. 3, June 2023, pp. 1388~1396
ISSN: 2302-9285, DOI: 10.11591/eei.v12i3.4890

A novel pulse charger with intelligent battery management system for fast charging of electric vehicle

Sunil Somnath Kadlag[1], Mohan P. Thakre[2], Rahul Mapari[3], Rakesh Shriwastava[4], Pawan C. Tapre[5], Deepak P. Kadam[6]

[1]Department of Electrical Engineering, Amrutvahini College of Engineering, Sangamner, India
[2]Department of Electrical Engineering, K.K. Wagh Institute of Engineering Education and Research, Nashik, India
[3]Department of electronics and telecommunication Engineering, Pimpri Chinchwad College of Engineering and Research, Pune, India
[4]Department of Electrical Engineering, Matoshri College of Engineering and Research Centre, Nashik, India
[5]Department of Electrical Engineering, S.N.D. College of Engineering and Research Center, Yeola, India
[6]Department of Electrical Engineering, MET's Institute of Engineering, BKC, Nashik, India

Article Info

Article history:

Received Sep 26, 2022
Revised Nov 16, 2022
Accepted Jan 3, 2023

Keywords:

Arduino Uno
Artificial neural network
Battery management system
Electric vehicle
PID control action
Pulse charging technique

ABSTRACT

Electric vehicles contribute a major role in building an eco-friendly environment. Li-ion batteries are most widely used in electric vehicles. It is very important to maintain the operation of Li-ion batteries within their "safety operation area (SOA)". Hence implementing a battery management system (BMS) becomes a necessity while using Li-ion batteries. This paper proposes an intelligent BMS for electric vehicles using proportional integral derivative (PID) control action along with artificial neural network (ANN). It prefers the improved pulse charging technique. The design consists of a battery pack containing four 12 V Li-ion batteries, MOSFETs, Arduino Uno, a transformer, a temperature sensor, a liquid-crystal displays (LCD), a cooling fan, and four relay circuit are used. Arduino Uno is used as a master controller for controlling the whole operation. Using this design approximately 38 minutes are required to fully charge the battery. Implementation results validate the system performance and efficiency of the design.

Corresponding Author:

Sunil Somnath Kadlag
Department of Electrical Engineering, Amrutvahini College of Engineering
Sangamner, Maharashtra 422608, India
Email: sunilkadlag5675@gmail.com

1. INTRODUCTION

Industries face numerous challenges in introducing electrified approaches to their ranges, and engine configurations, as well as inverters' acquiescence by customers of electric vehicles (EVs) and electric vehicle batteries that are not hybridized with ICEs. The investigators discuss different electrical drives, such as switched reluctance motor (SRM) [1]-[4], brushless DC motor (BLDC), permanent magnet synchronous motors (PMSM), and induction motor drives, in addition to their constraints, and presented configurations for EV applications in [5], [6]. High-efficiency DC-DC converter for renewable energy applications employing a fuzzy logic controller has been presented in [7]. Contrasts the experimental applications of over-modulation schemes in modular multilevel cascaded converters for harmonic elimination for 3-phase two-level voltage source inverters are discussed [8], [9]. For voltage balancing, [10] presented a modular multilevel converter with a simplified nearest-level control (NLC) strategy. Characterizes the implementation and monitoring conceptions of a value stream mapping (VSM-based) multilevel PV-STATCOM for harmonic elimination in a distributed energy system [11]. The uses of include flexible AC transmission systems (FACTS) controllers