A NEURAL NETWORK BASED VECTOR CONTROL SCHEME FOR REGENERATIVE CONVERTERS TO USE IN ELEVATOR SYSTEMS

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Degree of Master of Science

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Thesis/Dissertation submitted in partial fulfilment of the requirements for the degree Master of Science in Industrial Automation

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DECLARATION

I declare that this is my own work and this dissertation does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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The above candidate has carried out research for the M.Sc. thesis under my supervision.

Signature of the Supervisor: Date:
(Prof. K. T. M. U. Hemapala)

Abstract – Current days, large scale buildings are the major energy consumers in the world. In most of the cases, energy is wasted than using effectively in buildings. Clients always request optimum energy consumption levels when the new buildings are designed. In a conventional elevator system, energy is dissipated as heat in a set of resistors when braking occurs. Using this dissipating power for another useful activity as regenerative power will make the energy usage of a building more efficient.

The main modification to be done for the motor drive to collect this regenerative power is to replace the passive rectifier in the drive input side with an active AC/DC converter. Traditionally, these converters are controlled with PI controllers. Though, modern experiments reveal that arrangements of these kinds demonstrate restrictions with their suitability in practical applications.

This research explores on mitigating similar limitations by applying a neural network in regulating active front end converters in such systems. Further, it proposes a neural network related switching regulation scheme for bi-directional AC/DC converters to improve the efficiency of extracting regenerative energy in elevator systems. By using this kind of NN controller setup, bi-directional AC/DC converters can achieve the advantages such as quick switching response, simpler structure and better output waveform.

Neural network controller's performance was analysed together with normal vector control stipulations and compared versus traditional vector control arrangements. This establishes that the neural network vector control scheme introduced in this research is more efficient and useful. Even with rapidly changing and power switching converter control arrangements, the NN based vector control mechanism exhibits good performance levels. Following input reference signals which are fluctuating frequently, fulfilling the basic regulating requirements for faulty power utilities and enduring of unstable situations in power regeneration system.

Keywords – Elevator Regenerative Power, Active Front End Converters, Neural Network Control Systems.

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