

IMPLEMENTATION OF SENSORLESS SPEED CONTROL FOR TWO-PHASE INDUCTION MOTOR DRIVE USING ISFOC STRATEGY*

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Abstract— This paper presents a new technique based on model reference adaptive system (MRAS) observer for sensorless speed control of Two-Phase Induction Motor (TPIM). The MRAS identification is performed by means of comparison of stator fluxes obtained from both stator and rotor equations with stator voltage and current measurements. Simulation and experimental results for a 1.1 kW TPIM set-up are presented and analysed using a dSpace system with a DS1104 controller board based on digital signal processor (DSP) TMS320F240. Simulation and experimental results at nominal, low and zero speeds confirm the effectiveness of the proposed sensorless speed controlled TPIM drive.

Keywords— Two-phase induction motor (TPIM), indirect stator-field-oriented control (ISFOC), model reference adaptive system (MRAS)

1. INTRODUCTION

Two-Phase Induction Motor (TPIM) is widely used in several industrial and domestic applications. In those applications the motor runs at constant frequency and is fed directly from the ac grid without any type of control strategy. The TPIM is found in air conditioners, washers, dryers, industrial machinery, fans, compressors, tools, blowers, vacuum cleaners, household appliances and many other applications. The reduction in the cost of the power electronic circuitry provides economically justifiable applications for adjustable speed Two-Phase Induction Motor Drives (TPIMD). In recent years, several methods that use inverters for the variable speed control of TPIM have been proposed [1]-[15]. An alternative approach is to use a 6 switch three phase Voltage-Source Inverter (VSI) bridge, connecting the two windings of the motor as an unbalanced load between the phases, as shown in Fig. 3. This is a more cost effective solution [1], [2], [9], [11], [16]. Recently, Stator Field Oriented Control (SFOC) of TPIMD has been gaining wide attention in literature [1]-[3]. In vector control, the flux linkage magnitude and the electromagnetic torque are controlled independently [14]-[15]. The SFOC represents a better solution to satisfy the industrial requirements. The field orientation is relatively straightforward in all operating conditions if the rotor speed is accurately known, which traditionally necessitates a sensor on the shaft of the motor. However, there are several reasons for preferring a system without the sensor. The cost of the speed sensor, at least for machines with ratings less than 10 kW, is in the same range as the cost of the motor itself. The

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Neural and Fuzzy Logic Control of Drives and Power Systems Marcian Cirstea, Andrei Dinu, Malcolm McCormick, Jeon Ghee Khor, 2002-07-01 The authors guide readers quickly and concisely through the complex topics of neural networks fuzzy logic mathematical modelling of electrical machines power systems control and VHDL design Unlike the academic monographs that have previously been published on each of these subjects this book combines them and is based round case studies of systems analysis control strategies design simulation and implementation The result is a guide to applied control systems design that will appeal equally to students and professional design engineers The book can also be used as a unique VHDL design aid based on real world power engineering applications Introduces cutting edge control systems to a wide readership of engineers and students The first book on neuro fuzzy control systems to take a practical applications based approach backed up with worked examples and case studies Learn to use VHDL in real world applications Recent Advances in Power Electronics and Drives Shailendra Kumar, Bhim Singh, Arun Kumar Singh, 2022-05-26 This book contains select proceedings of EPREC 2021 with a focus on power electronics and drives The book includes original research and case studies that present recent developments in power electronics focusing on power inverters and converters The book also consists of research work on electrical drives regulated power supplies operation of FACTS HVDC etc The book will be a valuable reference guide for beginners researchers and professionals interested in the advancements of power electronics and drives Industrial Engineering, Machine Design And Automation (Iemda 2014) - Proceedings Of The 2014 Congress & Computer Science And Application (Ccsa 2014) - Proceedings Of The 2nd Congress Shihong Qin, Xiaolong Li, 2015-03-30 This proceedings put together 68 selected articles from the joint conferences of 2014 Congress on Industrial Engineering Machine Design and Automation IEMDA2014 and the 2nd Congress on Computer Science and Application CCSA2014 held in Sanya China during December 12 14 2014 The conference program of IEMDA 2014 focused on areas of Industrial Engineering Machine Design and Automation while the CCSA 2014 program provided the platform for Computer Science and Applications Collected together the latest research results and applications on industrial engineering machine design automation and computer science and other related Engineering topics All submitted papers to this proceedings were subjected to strict peer reviewing by 2 4 expert referees to ensure that all articles selected are of highest standard and are relevance to the conference **Proceedings of the 4th International Conference on Electrical Engineering and Control Applications** Sofiane Bououden, Mohammed Chadli, Salim Ziani, Ivan Zelinka, 2020-09-29 This book gathers papers presented during the 4th International Conference on Electrical Engineering and Control Applications It covers new control system models troubleshooting tips and complex system requirements such as increased speed precision and remote capabilities Additionally the papers discuss not only the engineering aspects of signal processing and various practical issues in the broad field of information transmission but also novel technologies for communication networks and modern antenna design

This book is intended for researchers engineers and advanced postgraduate students in the fields of control and electrical engineering computer science and signal processing as well as mechanical and chemical engineering

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