

PROJECT FINAL REPORT

Name of project : Visualization of a drive with asynchronous motor worked as electrical brake controlled by dSpace® system with Matlab/Simulink®

Number of project: 191

Infrastructure: PUT - partner 14: VDS.PL

Project Date : 19 Jan – 30 Jan 2015

For many years, asynchronous motors have wide range use in industrial applications due to its simple and robust structure and low costs when compared with others like DC motors. Furthermore, due to development of power electronics in the last few decades, better high performance control options are possible. There are two methods in high performance control of asynchronous motors: Field oriented control and Direct Torque Control.

The Direct torque control (DTC) is a method used in variable frequency drives to control the torque (and thus finally the speed) of three-phase asynchronous motors.

This involves calculating an estimate of the motor's magnetic flux and torque based on the measured voltage and current of the motor.

Beside, many comparative studies between the field oriented control and the DTC methods show that the DTC has simplicity, a fast dynamic response, and is robust to parameter changes. The real-time hardware based on PC technology and its set of I/O interfaces make the controller board an ideal solution for developing controllers in various fields, such as drives, robotics, and aerospace. dSpace® controller boards that the capable of working integrated on Matlab/Simulink® environment are one of the well-known real-time controller boards.

Work description

The realization of the project was divided into two main stages:

- Real time speed control of the asynchronous motor

For this step of the project, inverter based motor driven system has been used. The system has been modelled with Matlab/Simulink®. The dSpace® controller board has also been integrated to the drive system. Such, the speed of the asynchronous motor has been controlled as real-time with controller board and acceleration and braking conditions have also been examined in detail.

- Visualization and simulation of the drive with asynchronous motor driving a mass control system

To visualize the asynchronous motor which drive a mass, the DTC based asynchronous motor speed control algorithm has been designed and modelled. The DTC controller has been chosen due to the its fast dynamic response behavior and less motor parameter needs. The mass transport system that driven by the DTC controlled asynchronous motor, model has been created with Matlab/Simulink® 3D Visualization toolbox.

Future work

Specification of the next tasks:

- Implementation of the intelligent control algorithms (ANNs or Fuzzy controllers) the speed/torque controlling
- Visualization of the vector controlled inverters on renewable energy conversation systems
- Real time implementation of the vector controlled inverters

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Table of figures

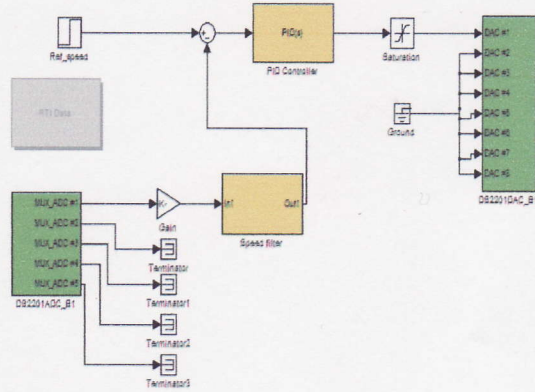


Fig.1. Simulink model of dspace motor control system

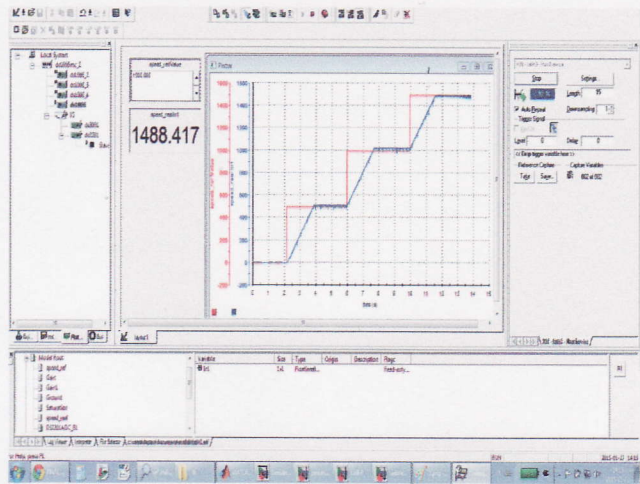
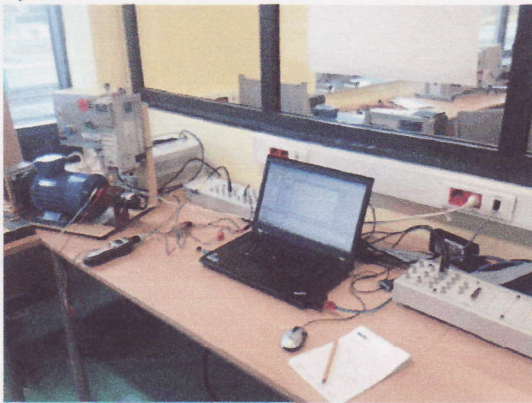
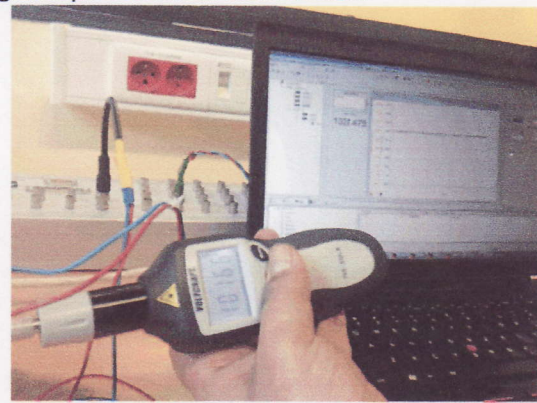


Fig.2.Dspace control desk screen



Pic.1. Overview of the test desk



Pic.2. Checking of the speed measurement

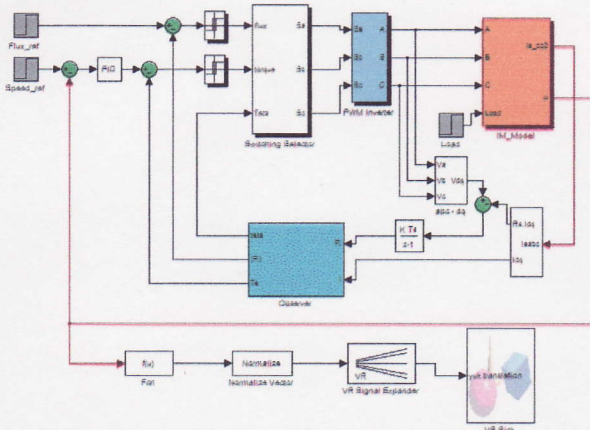


Fig.3. Simulink model of visualized DTC based speed control system

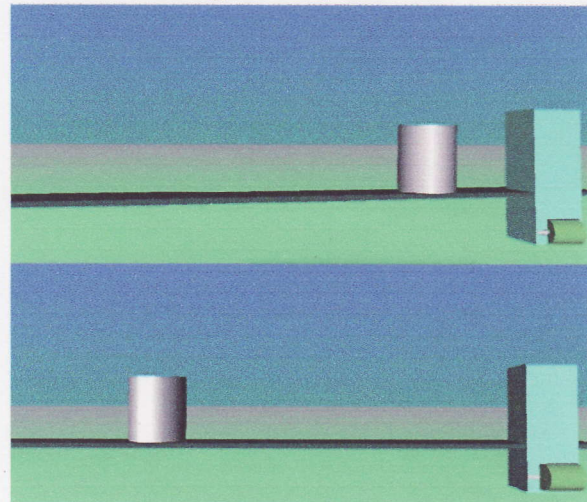


Fig.4. Visualized mass transportation system

Visitor

Assist. Prof.Dr.Fatih Korkmaz
Çankırı Karatekin University
Faculty of Engineering
Department of Electric-Electronic Engr.

[Signature]

Host

Prof. D.Sc. Ph.D. Eng. Andrzej Milecki
Poznan University of Technology
Faculty of Mechanical Engr. and
Management

Division of Mechatronic Devices
PEŁNOMOCNIK PROJEKTU
EU FP7 VISIONAIR NR 262044

[Signature]
prof. dr hab. inż. Andrzej Milecki