

ARTIFICIAL NEURAL NETWORK BASED
MODEL FOR TEMPERATURE PREDICTION
OF AN INDUSTRIAL OVEN

MARTIN IRUNGU KAMANDE

A THESIS SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENT FOR THE AWARD OF
DEGREE OF SCIENCE IN ADVANCED
MANUFACTURING AND AUTOMATION
ENGINEERING DEDAN KIMATHI
UNIVERSITY OF TECHNOLOGY

MARCH 2017

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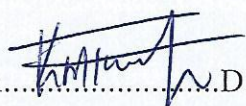
MARCH 2017

DECLARATION

This research is my original work and to the best of my knowledge, it has not been presented for a degree award in this or any other university

Martin Irungu Kamande

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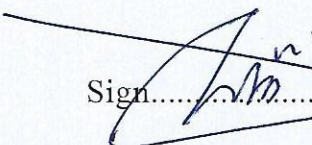
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This research proposal has been submitted to the School of Engineering, DeKUT, with our approval as the supervisors:

Dr. Jean Bosco Byiringiro (PhD, Reg. Eng)

Department of Mechatronic Engineering

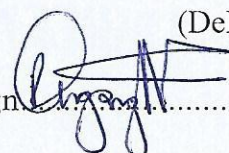
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ABSTRACT

Industrial ovens often consume a considerable amount of the electrical energy and have a significant effect on the quality of the product and the production cost. The cost of energy all over the world is increasing and the natural resources are depleted as more and more energy is being harnessed. Temperature and heat losses contribute significantly to this problem and needs to be controlled. Several methods have been applied to control the temperature including the use of proportional-integral-derivative (P.I.D) controller and Fuzzy systems. These systems are slow since they require tuning every time new system parameters are applied. Their accuracy and reliability are also not good since they cannot be used for prediction.

This thesis presents a model for the prediction of temperature used to predict the temperature of an oven. A back propagation neural network model was developed in this thesis. Experiments were conducted where the oven was heated up over a period of time and the temperature was recorded over this period of time. The obtained temperature values were trained, tested and validated on the MATLAB's Neural Network Toolbox. A comparison of the target data against the output data was done and it was found to be a good model for prediction since the value of statistical measure was 1 ($R=1$) for all the data values (Training, testing and validation data). The oven model used in this research had a problem of temperature control where temperature could shoot above or cool below the set temperature. This rendered the lab samples to extreme temperatures and losses of energy. This research contributes in a big way to the methods of temperature control in the industrial heating processes, energy management and conservation processes.