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LIST OF SYMBOLS AND ABBREVIATIONS

SYMBOLS

$P_{gb}$ - Airgap power developed due to the backward field

$P_{gf}$ - Airgap power developed due to the forward field

$\omega$ - Angular speed

$W_2$ - Auxiliary winding

$\Phi_b$ - Backward flux

$s_b$ - Backward slip

$\omega_b$ - Base speed

$e$ - Battery voltage, Back emf

$I_{sc}$ - Blocked rotor current

$\Phi_{sc}$ - Blocked rotor phase angle

$W_{sc}$ - Blocked rotor power

$V_{sc}$ - Blocked rotor voltage

$X_C$ - Capacitive reactance

$a_{11}$, $a_{12}$, $a_{13}$, $a_{21}$ - Constants

$a_{22}$, $a_{23}$, $a_{31}$, $a_{32}$,

$a_{33}$, $a_{41}$, $a_{42}$, $b_1$, $b_2$,

$b_d$ - Core loss component of currents

$d$ - Desired output

$d$ - Desired output vector of a trained network

$D_6, D_7, D_8, D_9$ - Diodes

$I_{dr}$ - Direct axis component of rotor current

$I_{ds}$ - Direct axis component of stator current

$k$ - Duty-Ratio
$Z_{eq}$ - Equivalent impedance
$X_{eq}$ - Equivalent reactance
$R_{eq}$ - Equivalent resistance
$R_0, R_4$ - Equivalent resistances corresponding to the iron loss
$E$ - Error
$\delta_0, \delta_k$ - Error signal vectors
$\beta$ - Extinction angle
$I_{05}$ - Fifth harmonic component of output current
$V_{05}$ - Fifth harmonic component of output voltage
$\alpha$ - Firing angle
$\Phi$ - Flux
$\Phi_f$ - Forward flux
$s_f$ - Forward slip
$I_{01}$ - Fundamental component of output current
$V_{01}$ - Fundamental component of output voltage
$g$ - Gate terminal
$L$ - Inductance
$X_L$ - Inductive reactance
$u$ - Input function
$z$ - Input vector for multilayer network
$V_i$ - Input voltage
$IN_1, IN_2, IN_3, IN_4$ - Inputs
$K_i$ - Integral gain constant
$I_1, I_3$ - Iron-loss and magnetizing components of the no-load current
$L_3$ - Leakage inductance of rotor referred to the stator
$L_1$ - Leakage inductance of the stator
$X_2$ - Leakage inductive reactance of the rotor referred to the stator
$X_1$ - Leakage inductive reactance of the stator

$\eta$ - Learning coefficient

$I_L$ - Load Current

$T_L$ - Load torque

$I_{1m}, I_{3m}$ - Magnetizing component of currents

$L_4$ - Magnetizing inductance of the stator

$X_0$ - Magnetizing inductive reactance of the stator

$W_1$ - Main winding

$E_{\text{max}}$ - Maximum Error

$\Phi_m$ - Maximum flux

$M$ - Modulation index

$J$ - Moment of inertia

$i_m$ - Motor current

$I_0$ - No load current

$\Phi_0$ - No load phase angle

$W_o$ - No load power

$V_o$ - No load voltage

$\xi$ - Number of different patterns types

$U$ - Number of elements in the learning set

$H$ - Number of hidden neurons

$I$ - Number of input neurons

$K$ - Number of output neurons

$A$ - Number of patterns of type 1

$p$ - Number of pulses per half cycle

$Q$ - Number of separable regions in the input space

$r$ - Number of training patterns

$T_{\text{off}}$ - Off time

$T_{\text{on}}$ - On time

$\text{Out}$ - Output
\( y, f(u) \) - Output function
\( Y \) - Output vector of the hidden layer
\( O \) - Output vector of the output layer
\( V_0 \) - Output voltage
\( V_b \) - Output voltage due to backward field
\( V_f \) - Output voltage due to forward field
\( M_p \) - Peak overshoot
\( \varnothing \) - Phase
\( P \) - Poles
\( K_p \) - Proportional gain constant
\( K_i \) - Proportionality constant
\( V_p \) - Pulse width modulated output voltage
\( I_{qr} \) - Quadrature axis component of rotor current
\( I_{qs} \) - Quadrature axis component of stator current
\( \omega_{\text{rated}} \) - Rated angular speed
\( H_r \) - Rated Power
\( R \) - Resistance
\( I_2, I_4 \) - Rotor currents referred to the stator
\( \Phi_r \) - Rotor flux
\( X_r \) - Rotor reactance
\( r_r \) - Rotor resistance
\( R_2 \) - Rotor resistance referred to the stator
\( R_3 \) - Rotor resistance referred to the stator due to the backward field
\( R_3 \) - Rotor resistance referred to the stator due to the forward field
\( \dot{\omega}_r \) - Rotor speed
\( s \) - S domain variable
\( I_{07} \) - Seventh harmonic component of output current
$V_{07}$ - Seventh harmonic component of output voltage
$\dot{s}$ - Slip
$a$ - Slope of the linear function
$\theta$ - Space angle
$N$ - Speed
$x, x_1, x_2, x_3, x_4$ - State space variables
$I$ - Stator current
$\Phi_s$ - Stator flux
$X_s$ - Stator reactance
$R_1$ - Stator resistance
$r_s$ - Stator resistance
$V_s$ - Supply voltage
$S, S_1, S_2, S_3, S_4$ - Switches
$S_5, S_6, S_7, S_8, S_9$ - Switches
$N_s$ - Synchronous speed
$n_s$ - Synchronous speed
t - Time
$T$ - Torque
$T_m$ - Torque developed by the motor
$P_1$ - Training pairs
$B$ - Viscous friction
$V_2$ - Voltage across the backward field rotor resistance
$V_1$ - Voltage across the forward field rotor resistance
$V_{ab}$ - Voltage across the rotor reactance due to the forward field
$V_{ji}$ - Weight matrix
$V, W$ - Weight vector
# ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>AC</td>
<td>Alternating Current</td>
</tr>
<tr>
<td>ADC</td>
<td>Analog to Digital Converter</td>
</tr>
<tr>
<td>ALU</td>
<td>Arithmetic and Logic Unit</td>
</tr>
<tr>
<td>ANN</td>
<td>Artificial Neural Network</td>
</tr>
<tr>
<td>APWM</td>
<td>Asymmetrical Pulse Width Modulation</td>
</tr>
<tr>
<td>BPN</td>
<td>Backpropagation Network</td>
</tr>
<tr>
<td>BPNN</td>
<td>Backpropagation Neural Network</td>
</tr>
<tr>
<td>CPU</td>
<td>Central Processing Unit</td>
</tr>
<tr>
<td>CSD</td>
<td>Constant Speed Drive</td>
</tr>
<tr>
<td>D fingers</td>
<td>Data Pointer</td>
</tr>
<tr>
<td>DPH</td>
<td>Data Pointer High</td>
</tr>
<tr>
<td>DPL</td>
<td>Data Pointer Low</td>
</tr>
<tr>
<td>DAC</td>
<td>Digital to Analog Converter</td>
</tr>
<tr>
<td>DC</td>
<td>Direct Current</td>
</tr>
<tr>
<td>EEPROM</td>
<td>Electrically Erasable Programmable Read Only Memory</td>
</tr>
<tr>
<td>EPROM</td>
<td>Erasable Programmable Read Only Memory</td>
</tr>
<tr>
<td>FFT</td>
<td>Fast Fourier Transform</td>
</tr>
<tr>
<td>FPGA</td>
<td>Field Programmable Gate Array</td>
</tr>
<tr>
<td>GRNN</td>
<td>General Regression Neural Network</td>
</tr>
<tr>
<td>H/L</td>
<td>Hidden layer</td>
</tr>
<tr>
<td>I/L</td>
<td>Input layer</td>
</tr>
<tr>
<td>IPF</td>
<td>Input Power Factor</td>
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<tr>
<td>I/O</td>
<td>Input/Output</td>
</tr>
<tr>
<td>IPT</td>
<td>Instantaneous power Theory</td>
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<tr>
<td>IGBT</td>
<td>Insulated Gate Bipolar Transistor</td>
</tr>
<tr>
<td>IC</td>
<td>Integrated Chip</td>
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<tr>
<td>Acronym</td>
<td>Definition</td>
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<tr>
<td>MATLAB</td>
<td>Matrix Laboratory</td>
</tr>
<tr>
<td>MOSFET</td>
<td>Metal Oxide Semiconductor Field Effect Transistor</td>
</tr>
<tr>
<td>μF</td>
<td>Microfarad</td>
</tr>
<tr>
<td>NN</td>
<td>Neural Network</td>
</tr>
<tr>
<td>op-amp</td>
<td>Operational Amplifier</td>
</tr>
<tr>
<td>OEC</td>
<td>Optimal Efficiency Control</td>
</tr>
<tr>
<td>O/L</td>
<td>Output layer</td>
</tr>
<tr>
<td>PAC</td>
<td>Phase Angle Control</td>
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<tr>
<td>PACC</td>
<td>Phase Angle Controlled Chopper</td>
</tr>
<tr>
<td>PNN</td>
<td>Polynomial Neural Network</td>
</tr>
<tr>
<td>PFC</td>
<td>Powerfactor Correction</td>
</tr>
<tr>
<td>PrNN</td>
<td>Probabilistic Neural Network</td>
</tr>
<tr>
<td>PC</td>
<td>Program Counter</td>
</tr>
<tr>
<td>PI controller</td>
<td>Proportional, Integral controller</td>
</tr>
<tr>
<td>PID controller</td>
<td>Proportional, Integral and Derivative controller</td>
</tr>
<tr>
<td>PWMC</td>
<td>Pulse Width Modulated Chopper</td>
</tr>
<tr>
<td>PWM</td>
<td>Pulse Width Modulation</td>
</tr>
<tr>
<td>RAM</td>
<td>Random Access Memory</td>
</tr>
<tr>
<td>EA</td>
<td>Rate of change of Error as the Activity level of unit is changed.</td>
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<tr>
<td>RET</td>
<td>Return</td>
</tr>
<tr>
<td>RMS</td>
<td>Root Mean Square</td>
</tr>
<tr>
<td>SPIM</td>
<td>Single Phase Induction Machine</td>
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<tr>
<td>SPWM</td>
<td>Sinusoidal Pulse Width Modulation</td>
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<tr>
<td>SFR</td>
<td>Special Function Register</td>
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<tr>
<td>SMM</td>
<td>Symmetrical Multiple Modulation</td>
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<tr>
<td>i.e</td>
<td>That is</td>
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<tr>
<td>THD</td>
<td>Total Harmonic Distortion</td>
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<tr>
<td>TRIAC switch</td>
<td>Triode AC Switch</td>
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<tr>
<td>Abbreviation</td>
<td>Description</td>
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<tr>
<td>VSD</td>
<td>Variable Speed Drive</td>
</tr>
<tr>
<td>VSVV</td>
<td>Variable Speed Variable Voltage</td>
</tr>
<tr>
<td>VVVF</td>
<td>Variable Voltage Variable Frequency</td>
</tr>
<tr>
<td>VLSI</td>
<td>Very Large Scale Integration</td>
</tr>
<tr>
<td>v/f</td>
<td>voltage / frequency</td>
</tr>
<tr>
<td>ZCD</td>
<td>Zero Crossing Detector</td>
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