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Controlling of Induction Motor

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Abstract: ***This paper describes how to use an Arduino Uno to regulate the speed of an induction motor and create an energy-efficient, smooth control system. Due to their affordability and adaptability, induction motors are frequently utilized in industrial drives; nevertheless, the range of speed control available with stator control is limited. Controlling the firing angle and utilizing power electrical gadgets can help fix this issue. The goal is to use stator control to regulate the induction motor's speed. This hardware provides a signal to the microprocessor, which manages the power supply to the electronic devices. Through the use of an Arduino Uno to adjust the firing angle of a semiconductor power device, the motor's stator winding's terminal voltage can be controlled.***

Keywords: Arduino Uno, Three Phase Induction Motor, TRIAC, WIFI

I. INTRODUCTION

A lot of motors are employed in everyday life. An electric motor is now a required power source in many commercial and residential settings. It ranges from thousands of horsepower to fractional horsepower. There is a broad range of functions and performance requirements for these motors. The induction motor's speed is adjusted by an external resistor or DC voltage when speed variation is required. To give appropriate speed fluctuations beyond energy conservation, and to prevent the induction motor from squandering slip power through the use of a slip recovery scheme. A mix of PC hardware, programming, and mechanical components with real-time computing limitations is called an embedded system. It is intended to carry out several functions, such as accessing and managing data in a variety of electronics-based systems, electrical and electronic circuits, and kits that use embedded technology.

II. THE PROPOSED MODEL BLOCK DIAGRAM

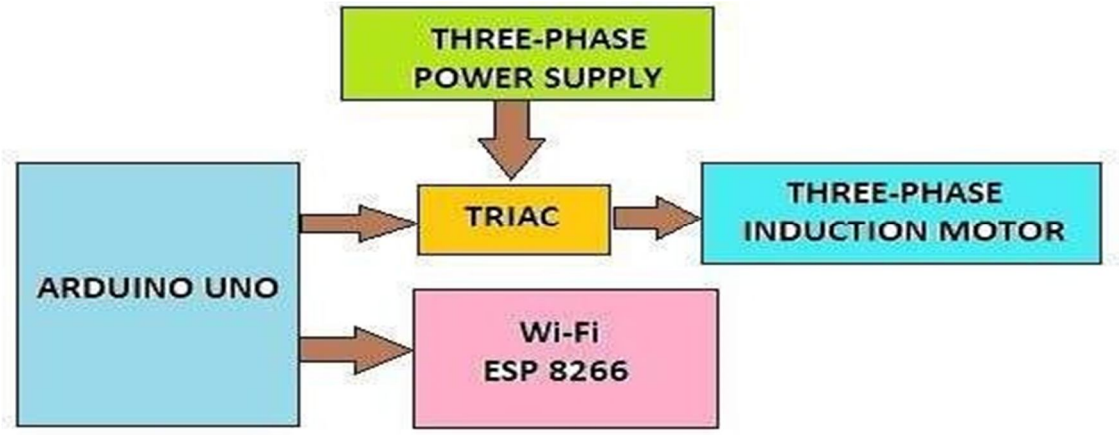


Fig.1. Block diagram of proposed model

In this undertaking one should utilize one receiver and one transmitter to control three phase induction motor speed.
The Receiver module:

- Three-phase Induction motor
- TRIAC
- Wi-Fi (ESP8266)
- Arduino Uno

The transmitter is android application just like given

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A. TX: TELNET APP

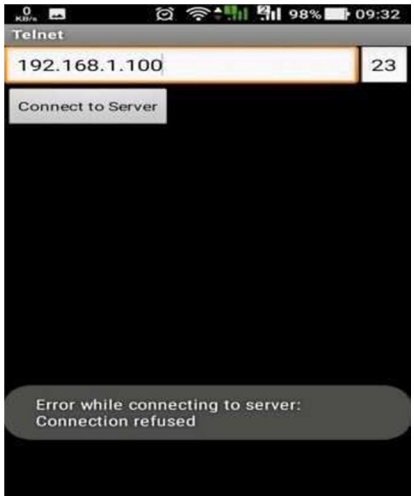


Fig.2. TELNET Application

B. Working of the Three-Phase Induction Motor

Nowadays controlling the induction motor speed with wireless communication is fundamental, In this paper controlling the three-phase induction motor with an android or iOS application by giving the commands in a telnet application. To exercise this the information from the application it will provide for the controller, and TRIAC will give the expected voltage to the motor. Commands as input motor will run at various speeds.

III. HARDWARE AND SOFTWARE REQUIREMENTS

A. Hardware devices

The following pieces of equipment are required for this project:

The open-source ARDUINO Uno microcontroller is a programming and PC equipment organization that assembles and manufactures single-board microcontrollers and its units for constructing intelligent devices and computerized gadgets that can recognize and manage obstacles in the real world. Everything required to sustain the microcontroller is contained in it. The components of the framework are categorized as opensource hardware and software, which are permitted by the GNU Lesser General Public License (LGPL) or the GNU General Public License (GPL) [1], enabling anybody to construct Arduino sheets and program transport communication. Arduino sheets are available commercially in pre-assembled forms or as DIY kits that don't require assistance. The Arduino's programming is the primary effect of the design.



Fig.3. ArduinoUno

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1) WiFi Module (ESP8266)

Representation: With its integrated TCP/IP protocol stack, the ESP8266 Wi-Fi Module is a free SOC that enables Wi-Fi connectivity for any microcontroller. The ESP8266 can offload all Wi-Fi arrangement constraints from another application processor or promote an application.

ESP8266

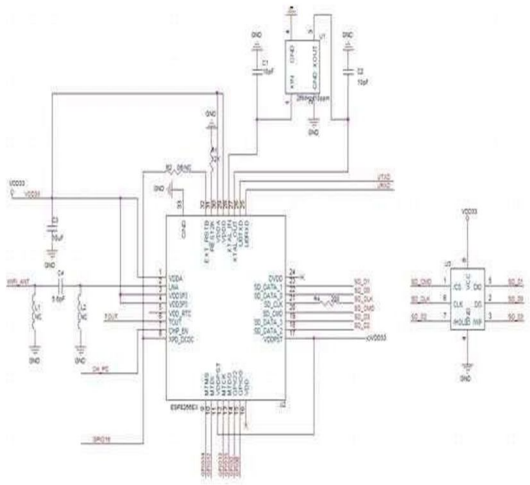




Fig.4. WI-FI Module

Through its GPIOs, this module can be connectedto sensors and other application-specific devices with minimal enhancement and minimal stacking during runtime thanks to its capacity limitation and ability to handle onload up. Because of its high level of on-chip connecting, an irrelevant PCB zone is anticipated to be included along with external equipment, such as the front-end module.

2) A Hard Product of ESP8266



Fig.5. ESP8266 Scheme

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Utilization of ESP8266

Smart power plugs Home automation Meshnetwork Industrial wireless control, Wearable gadgets Wi-Fi location-aware gadgets Security ID labels Wi-Fi position system beacons. ESP8266 module as follows

- Vcc = 3.3V (needs around 300-400mA peak)
- Gnd = - ve ground
- CH_PD = Chip enable so always +ve
- RST = ground to reset
- GPIO0 = normally floating; however, this should begrounded when you start the update.
- GPIO2 = abnormal state
- UTXD = Tx information associate with RX on FTDI/Serialinterface
- URXD = Rx information associate with TX ofFTDI/Serial interface

3) Electronic Characteristics

Current Consumption: The going with current usage relies upon 3.3V supply, and 25□ surrounding, using inward controllers. Estimationsare done at radio wire port without SAW channel. All the transmitter's estimations rely upon 90% commitment cycle, persistent transmit mode.

4) Three Phase Induction Motor

A Three-Phase Induction motor is basically a consistent speed motor which makes it difficult to control its speed. The speed control of induction motor is achieved by reducing the efficiency and low power factor. Interface section includes step-up transformer and motor, AC is fed to step-up transformer which converts 12 Volts to 220 Volts which drives motor. Generate two pulses at 5 and 6pins of Arduino and send these two pulses to the input. The change in delay between the pulses is in user's hand.

Synchronous Speed

$N= 120F/P$

Where, f = recurrence and P is the quantity of shaftsThe speed of acceptance engine is given by,

$N= N_S (1-S)$

Where, N is the speed of the rotor of an acceptance engine, N_S is the synchronous speed, S is the slip. The torque created by three phase induction motor is given by, $T= (3/2P_I N_S) X (SE_2R_2/R_2+ (SX_2))$

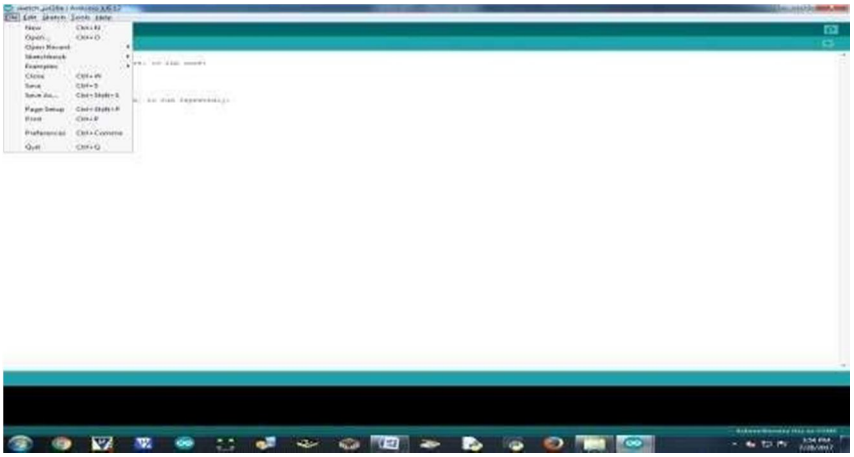
The Speed of Induction Motor is changed from both Stator and Rotor Side. The speed control of three phase induction motor from stator side is as follows:

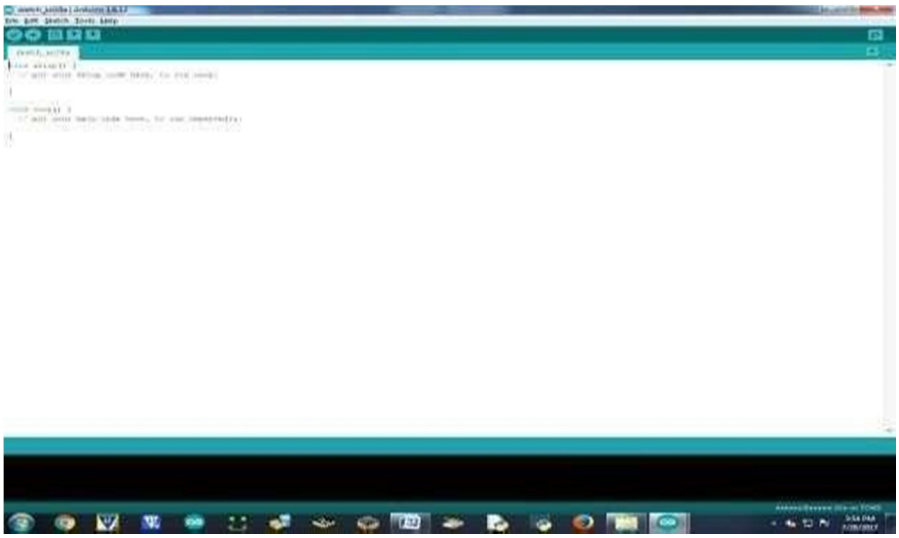
- V/f control or recurrence control.
- Changing the quantity of stator posts.
- Controlling supply voltage.
- Adding rheostat in the stator circuit.

The speed controls of three phase induction motor fromrotor side are additionally named:

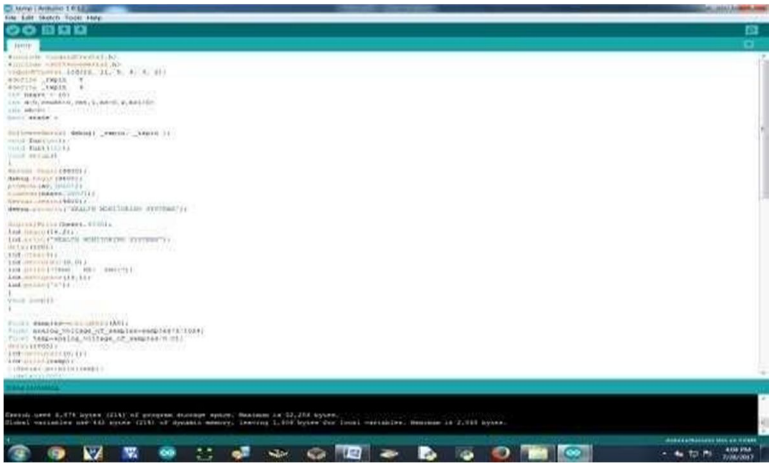
- Adding outer protection on rotor side.
- Cascade control technique.
- Injecting slip recurrence emf into rotor side.

IV. CONTROLLING INDUCTION MOTOR USING ARDUINO





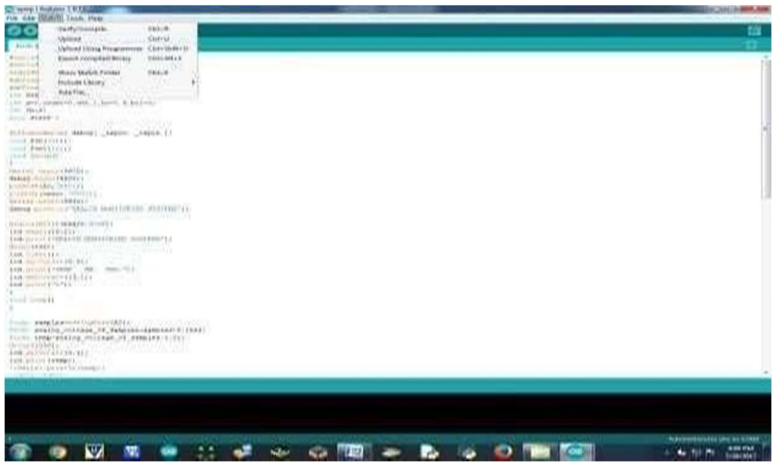
1) *Step-1:* Open Arduino IDE
2) *Step-2:* Select a File Menu option.
3) *Step-3:* and Select new File and begin composing thecode for venture in that record
4) *Step-4:* After composing code for assemblage select theSketch alternative on menu bar and select confirm/order (CTRL)



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5) *Step-5:* After composing code for arrangement select the Sketch choice on menu bar and select confirm/compile(CTRL)andit appears underneath any blunders if there Wise Done assembling Underneath the Arduino IDE



V. RESULT

The Speed Control of Three Phase induction motor by using Arduino board with the help of telnet client terminal iOS application by using smartphones in following steps:

1) Establish the connection between module and mobile through a Wi-Fi connection by entering IP addressand port number.

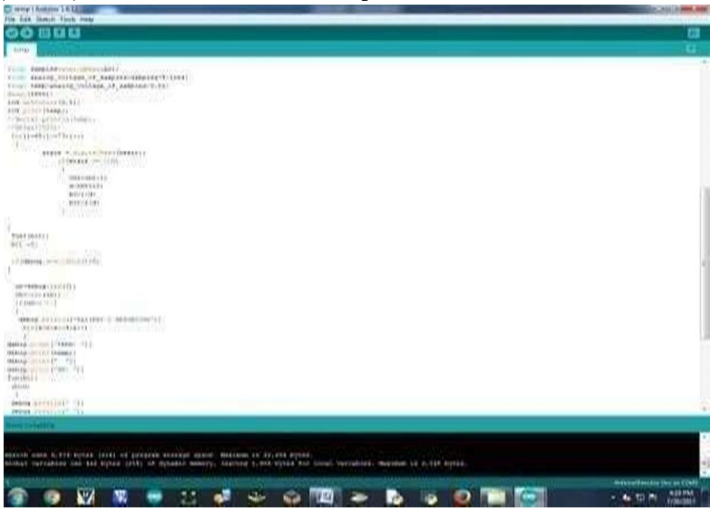


Fig.6. TELNET iOS Application

2) Speed variations can be done by giving followingcommands as input:'&' is used to increase speed to 100%.

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3) Step-6: After effectively gather code for (ON). transferring the code into Arduino board select the '@' is used to reduce the speed to 75%. draw and upload (CTRL) '#' is used to reduce the speed to 50%. '$' is used to reduce the speed to 25%.



4) Step-7: After effectively transferring code IDEappears beneath done transferring



Fig.7. Input Commands

VI. CONCLUSION

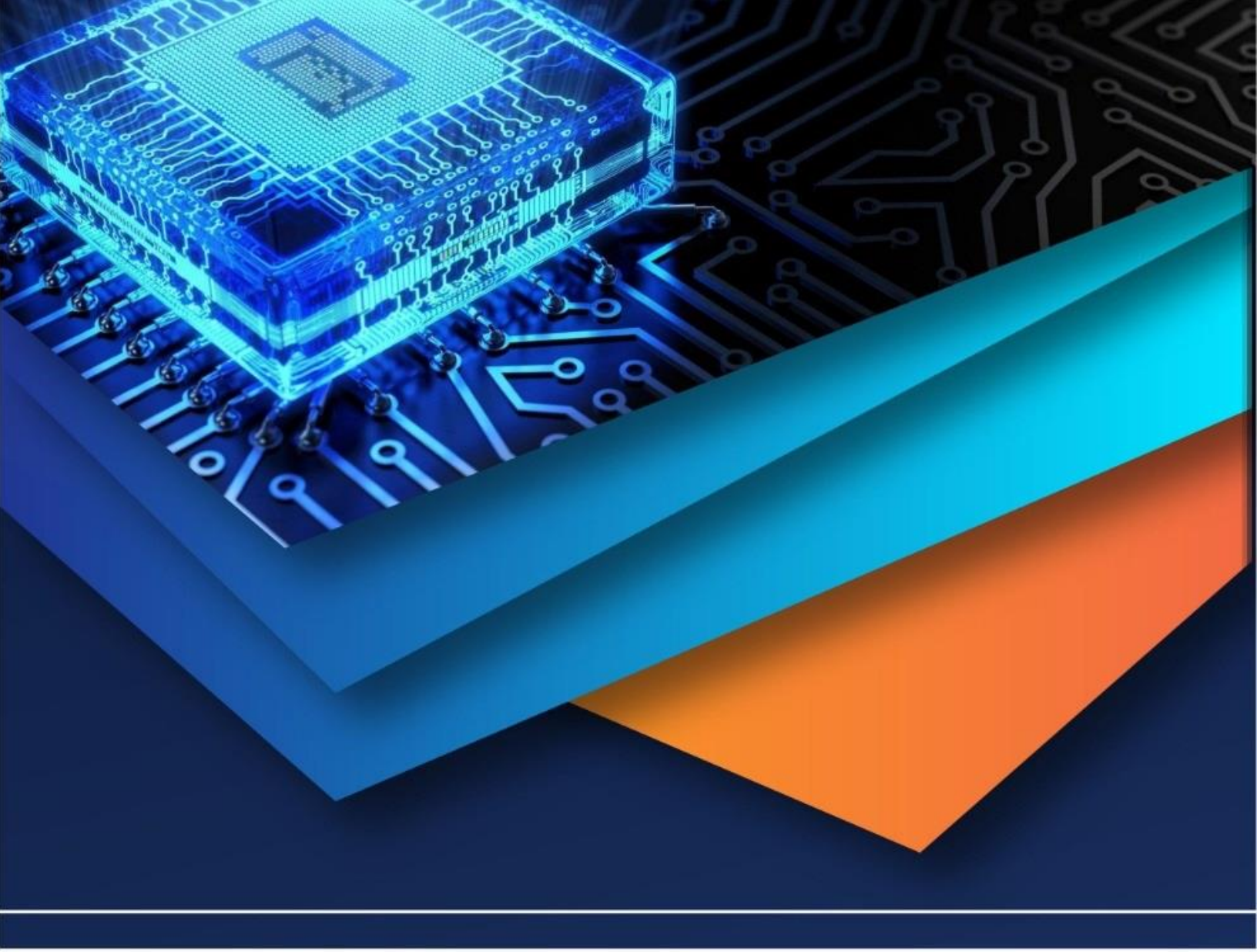
Three-Phase Induction motor gives an essential and minimal effort alternative for speed control, and the start of Three-Phase Induction motor acknowledgement. It can provide efficient speed control in emergency cases. Huma effort can be reduced. Acknowledgement motors are incredible machines for application requiring extensive speed control. The ordinary working extent of a regular selection motor is bound to less than 5% slip, so the prerequisite for different speed controls rises. Torque-Speed attributes for different procedures for speed control of a Three-Phase Induction motor can be achieved and inspected by making MATLAB codes. In factor rotor protection, the most extraordinary electromagnetic torque is self-sufficient of rotor protection, thusly, when the rotor security is extended, the best electromagnetic torque is unaffected yet the speed at which it happens can be particularly controlled.

In factor stator protection, increase in a repeat grow the torque-speed relation a decrease in repeat reduces the torque-speed relation of the motor, in factor stator voltage, fluctuating the terminal voltage will change the working speed yet with additionally a variety of working torque. To the extent as far as extension of speed variations, it is not critical therefore this strategy is suitable for small motors. In steady volts/hertz control, the supply voltage and the supply repeat can be changed with the ultimate goal that the proportion remains consistent the transition stays steady as well. In this way, special working zones for different paces and torques can be obtained and further varied synchronous speed can be obtained with relatively same significant torque, in this way the motor is completely utilized, likewise, there is a better way than the average extent of speed control. To achieve higher speed and torque, a lesser number of shafts is required and to achieve lower speed and torque, the number of shafts should be extended, Finally, it is prescribed that any of the speed control procedure be completed in a model. Energy can be saved and reduce energy crisis in the country.

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