Control of AC Motor using Labview

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Abstract: **This paper proposes the control of AC motor using LABVIEW. In today's world the industrial applications can be done by using remote control. Lab view is one of the useful software which is used for monitoring and controlling the systems in industries. The induction drive system fed with inverter which is having different types of controllers, can be used to perform different actions like speed control, forward and reverse directions of the motor and along with that motor can be stopped. These things can be done by using the LABVIEW programming. It is a human machine interface (HMI)design software which is user friendly and we can easily interface hardware.**

Key words: LABVIEW, Induction motor, HMI, PLC

I. INTRODUCTION

Now-a-days, induction motor is one of the important and useful drive motor for many industrial applications.The main problem occurs during the designation of an engineering system .It needs more Hardware Circuits. Then we have to go for more wiring connections. At that case it is impossible to design the distance control of the system, why because if more hardware's is there then more wiring is needed. And also the design needs modification and improvement along with time, then that hardware has to be replaced which is not sustainable.

As the technology is improving day by day, the LABVIEW[1] software made the engineering design easy and the hardware material required is decreased why because in this case the total design is implemented in software.

LABVIEW can be generally used in the industries for controlling induction motor inverter fed variable drive system. Now the distance control is possible, we can also use different communication devices such Ethernet control in between the computer and the Induction motor. The Lab VIEW can be used for several applications in industries which are virtual instrument instead of using heavy and real instrument in order to control the induction motor.
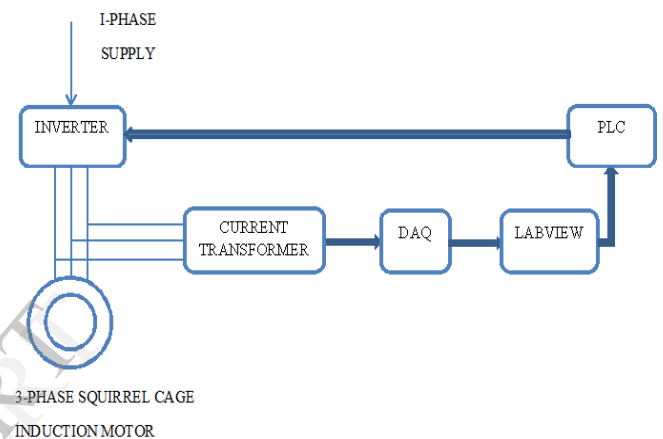
BLOCK DIAGRAM

Fig 1: speed control of AC motor

II. PROJECT DESIGN CONFIGURATION AND PREPARATION

A.LABVIEW

The acronym for Lab VIEW [2] is Laboratory Virtual Instrumentation Engineering Workbench. And it isused in the form of graphical representation for producing flexible and measurable designs,controlling and testing applications with less amount of cost.By using Lab VIEW one can interact with the signals of the real world in order to analyse the data for more information which is meaningful, and the result or output can be seen by using web, report and display. Irrespective of experience in programming the user can work easily and fast with lab view.

In Lab VIEW we use G programming where G indicates graphical. And it can also be called as dataflow programming because in order to execute the designed program it will depend on the block diagram structure. If we compare LABVIEW and text programming, LABVIEW is more flexible and user friendly why because here we can develop the program and can be connected with relevant blocks through wiring.The programs in LABVIEWare named as virtual instruments, or VI, due to their appearance and mode of operation of the instruments like oscilloscope and multi- meters. In LABVIEW we are having loops like

for, while loops and case structure, sub blocks i.e sub VI etc.

B. NI OPC Server

The NI OPC server is having fins they are OMRON FINS which allows communication between the LABVIEW and PLC. By using the OMRON FINS we can set the server with different tags which are to be created and can be linked to the registers of PLC. These tags can be called as OPC tags. By using this server we can monitor the status of the PLC.TheInterfacing or communication between the two can be made easy when those OPC tags are created. As the FINS makes the tags to configure correctly.

C. Variable Frequency Drive

In order to control the speed of the motor we can use the frequency control method. Here the frequency can be changed by using the variable frequency drive called as Inverter. And also the inverter here can be used to convert single phase to three phase.

D. DAQ

The DAQ card used here is NI DAQ USB 6221. Here the motor information will be given to the LABVIEW through the DAQ. From there the information will be sent to the LABVIEW. From there the information will be given to the inverter and the inverter is connected to the motor.

III. IMPLEMENTING THE PROCESS

Here we need to control the three phase squirrel induction motor. Controlling means forward and reverse directions of the motor and also to stop the motor. For that we need to interface or we need to create communication between the PLC and LABVIEW why because here we are using LABVIEW as the external third party software means here the implementation of software will be done. For that reason only we are performing start and stop operations of the motor in any direction i.e forward or reverse direction in LABVIEW.

A. Implementationof VI Design

Here in VI we need to do the start, stop in forward or reverse directions and control of the motor. It can be done by using two steps. First we need to select direction of motor by pressing the push button which can be in any direction and the here we are using 120 degrees mode for forward and reverse directions of the motor.After developing software part in VI, before implementing it we need to check first that all the hardware parts are switched on or not. Then by using NI OPC the program will be implemented.

B. Startand Stopof the Motor

Here we are using LABVIEW program to start and stop the motor. In LABVIEWwe are using the case structure for the different operations like stop of motor and also forward and reverse directions of the motor. For stop

of motor we are using case 3 in program. The stop of the motor program in LABVIEW is shown in [fig2] below.
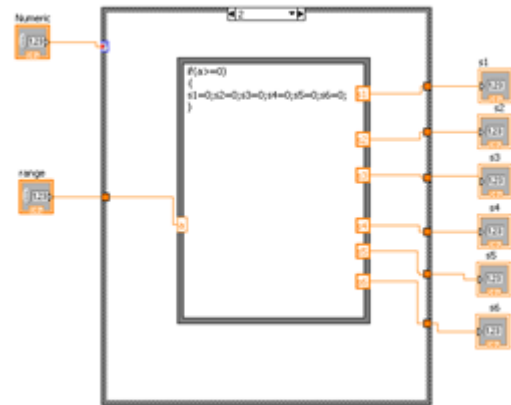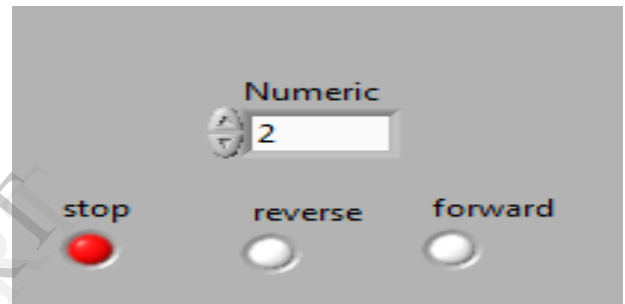

Fig 2: Stop of the motor

C. Motor Forward Direction

The motor forward direction[Fig 3] can be done by using 120 degree mode. Here we are considering the switching interval as 60 degrees. And the outputs will be the switches from s1 to s6. The output of the switches depends on the switching mode if switching operation mode is from 0 to 60 then the outputs will be s1=1, s2=0, s3=0, s4=0, s5=0, s6=1. Like that other modes also have different outputs. The different outputs for different switching can be shown in the below [table 1]. And also the program is written in LABVIEW for executing the forward operation of the motor.

TABLE 1: Forward Direction of the Motor

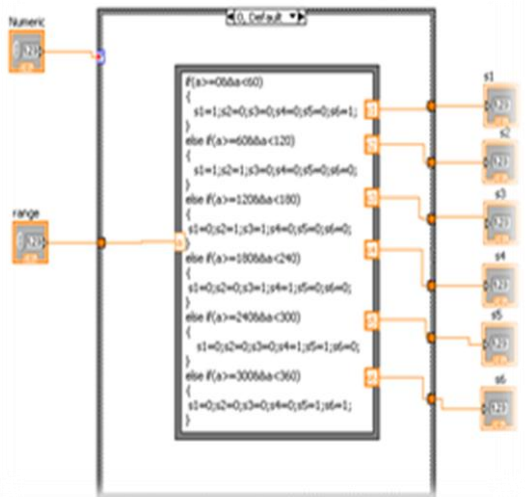| Switching Interval	S1	S2	S3	S4	S5	S6
0 to 60	0	1	1	1	1	0
60 to 120	0	0	1	1	1	1
120 to 180	1	0	0	1	1	1
180 to 240	1	1	0	0	1	1
240 to 300	1	1	1	0	0	1
300 to 360	1	1	1	1	0	0

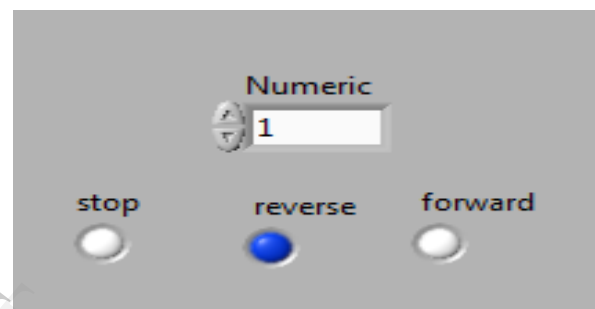Fig3: LABVIEW Program for forward direction of motor
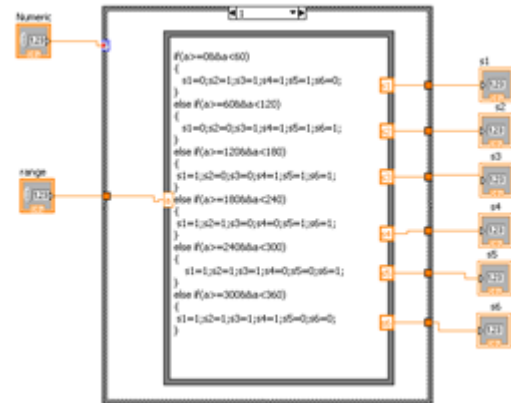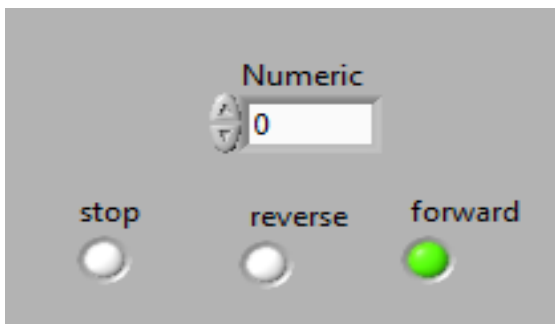
Fig 4: LABVIEW Program for reverse direction of motor

D. Motor Reverse Direction

The motor reverse direction[Fig 4] can also be done in the same way by using the 120 degrees mode. The difference between the forward and reverse direction is simply the switches will be reversed means in forward direction s1=0 in reverse direction it will be s1=1. So if we see for 0 to 60 degrees it is s1=0, s2=1, s3=1, s4=1, s5=1, s6=0.The table for reverse direction of the motor is shown below [Table 2].

IV.TESTING AND VERIFICATION

Once when the process is implemented, we can test the process to check whether it is working properly or not.
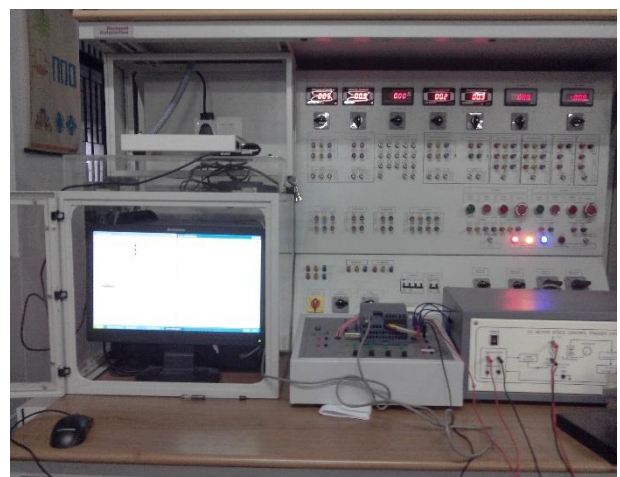
V. EXPERIMENTAL SETUP

Fig 5: Front view of the project

Table 2: Reverse direction of the motor

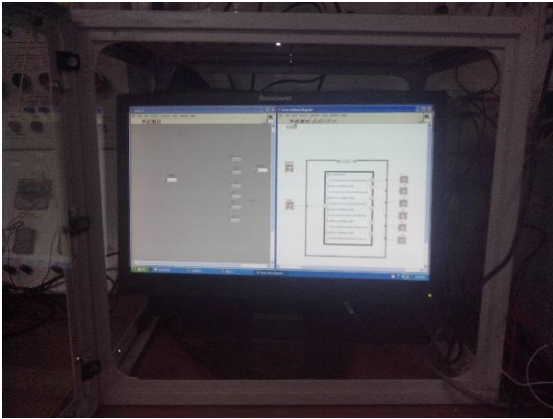| Switching Interval	S1	S2	S3	S4	S5	S6
0 to 60	1	0	0	0	0	1
60 to 120	1	1	0	0	0	0
120 to 180	0	1	1	0	0	0
180 to 240	0	0	1	1	0	0
240 to 300	0	0	0	1	1	0
300 to 360	0	0	0	0	1	1

Fig 6: lABVIEW setup

Fig8:Induction motor running in forward direction.

VI. CONCLUSION

Here we are using labVIEW for implementing the program which is a human machine interface and it is used for taking appropriate decisions, and it has various applications. Moreover it can be easily understandable and economical. The objective of our paper reverse and forward directions of the motor can be done by using labview.

ACKNOWLEDGMENT

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