

Actuation of AC and DC load using MATLAB GUI and Serial Communication

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Abstract— This research/study is to show how even using a single system it is possible to drive different motors simultaneously. Nowadays it is seen that to drive motors for example Ac motor, dc motor, servo and stepper motor, each motor needs a separate drive which in other words make it a single application oriented system. Therefore problem that will be solved using multi motor drive would be that instead of using separate drive/system for every single motor this can be done using a single drive/system and this system consists of Relay card , H bridge and tip 120 MOSFET drive that drives dc motor , solid state relays to control ac motor , sbto811 for control of stepper motor and all this will be interfaced with a microprocessor .This way it will require less materials compared to using separate system for separate drives which in turn will lead to cost reduction also would reduce size of system.

Key words: Ac motor, Dc motor, Stepper motor, Servo motor, Matlab hmi, Atmel Atmega 328 , H bridge , Tip 120 MOSFET

I. INTRODUCTION

Power electronics is one of the most useful fields that is emerging in modern times .After going through different situation/condition and environments in normal day to day life , especially in industries related to electrical/electronic/power electronics, came to a conclusion or could say found that most of such industries used a single system/drive to drive/operate a motor for a specific application , for example single system used to drive servo motors in industries such as robotics , used in conveyer belts , in camera for auto focusing , solar tracking system , metal cutting system and so on and similarly other motors are driven using separate system [1][2].

So basically from all the observations that were made, it was clear that for every single application /work based on characteristics of motors , every time a new system or different was to be used as current system/drive does not support working of different motor drives all together at once [3][4] .Therefore came up with a solution to design different motor drives using a single system which would operate by interfacing different drives with microprocessor using relay card , Solid state relays , H bridge , Tip 120 MOSFET , Arduino for interfacing all these motors like Ac motor , Dc Motor , stepper and servo Motor and components with each other [5-7].

In the Proposed work the control unit is an Arduino board. The four motors are connected to the Arduino board with the help of different connect units. The four motors connected are Ac, Dc, stepper and servo motor. The dc motor is connected through the Arduino board with the help of a relay. Two relays are used for the dc motor. One of the relay is used for direction of the motor and the other relay is used for the speed of the motor. The ac motor is connected with the Arduino with the help of an H bridge. The direction of the ac motor is controlled with the h bridge. The stepper motor is connected to the Arduino board with the help of a solid state relay which acts as a high functioning switch. A keypad is connected to the board for control of various parameters such as speed, direction etc of the motors. A led display is connected to the board for viewing the various readings [8][9]. A software interface is used which is synthesized with the Matlab software.

Block diagram of the proposed system with the explanation of each and every block is mentioned along with the hardware and software used in the system is, its implementation, result and the outcome of the processed system[6].

II. BLOCK DIAGRAM

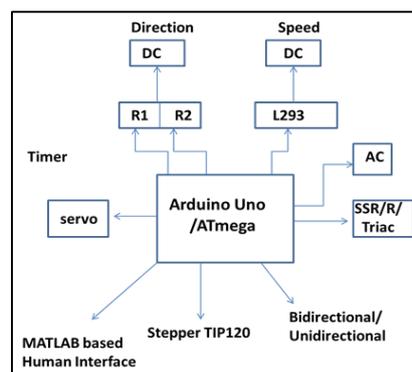


Fig. 1: System Block Diagram

The Block diagram of the proposed system is shown in figure 1. It consists of an Arduino Microcontroller, Relays r1 and r2 , L293D H-bridge , Solid state Relay , Tip 120 MOSFET , Ac motor ,Dc motor , Servo motor and Stepper Motor . Whole system is interfaced using Matlab software, controller receives data from Matlab and this received data is analyzed and further forwarded, which triggers the electro mechanical relays and other components used which are solid state relays , Tip120 MOSFET drive. This way it demonstrates a simple process of serial communication used in this system. Thus the system is interfaced and implemented using MATLAB and Serial Communication.

III. SOFTWARE AND HARDWARE USED IN THE SYSTEM

A. Software used and its basic function:-

Name of software	Function
Arduino IDE	The whole system is controlled using Arduino Uno Microcontroller .It is Used for programming and uploading the code the Arduino Uno board that is connected to the computer using a USB cable.
Matlab	User interface is made using Matlab through which the entire system is controlled.

Table 1:

B. Hardware used in the system

Name of the Hardware	Functions
Relay card	It is a simple switch which is used to operate both electrically and mechanically.
TIP 120 Mosfet drive	This is used to control the speed of DC Motor
Solid State Relay	It is an electronic switching device that switches on or off when small external voltage is applied across its control terminals
H- bridge	An electronic circuit which will enables the voltage to be applied across a load in either direction
Atmel atmega 328	It is a microcontroller which we used in Arduino board for interfacing and control
AC Motor	An electric motor which is driven by an alternating current (AC) in our system
DC Motor	To convert direct current electrical power into mechanical power/works on DC current.
Stepper Motor	It move in discrete steps and have multiple coils that are organized in groups called 'phases'.
Servo Motor	It is a rotary actuator or linear actuator which we used for precise control of angular or linear position, velocity and acceleration.

Table 2:

IV. PURPOSE /GOALS OF THE PROJECT

- With the help of the Universal/Multi Motor drive it would be easy and less time consuming to drive different motors on a single board
- This will also lead to reduction of prices as all the work would be done using a single circuit/board rather than using different ones for different motors.
- Using this will also lead to less use of resources.
- By using the multi drive it can be possible to drive different Motors such as Ac Motor , DC Motor , Servo Motor and Stepper Motor at same time

V. IMPLEMENTATION

A. DC Motor Interfacing with Arduino

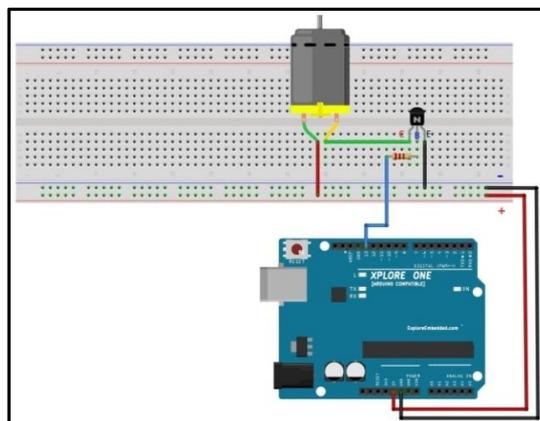


Fig. 2: DC motor interfaced with Arduino

B. AC Motor interfaced with Arduino

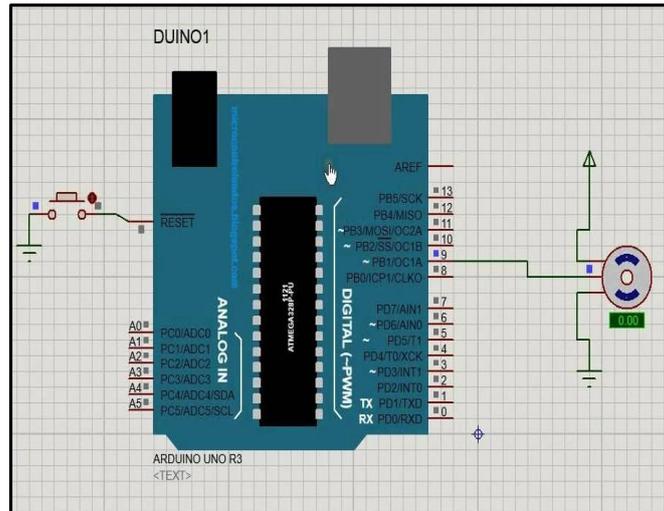


Fig. 3: AC motor interfaced with Arduino

C. Stepper Motor interfaced with Arduino

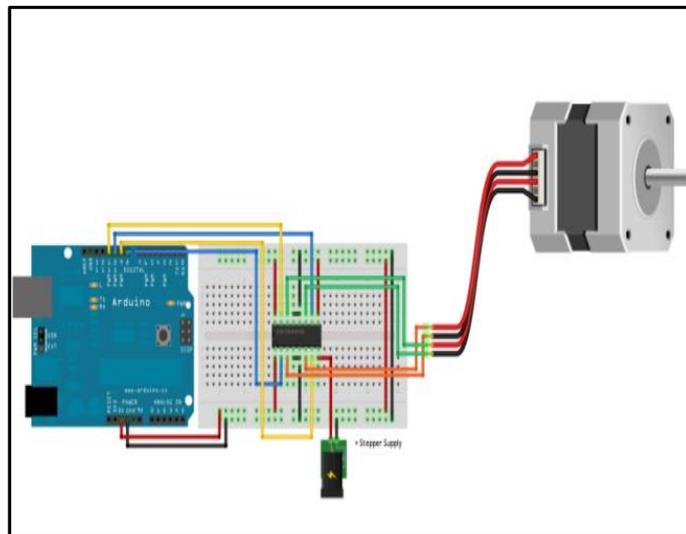


Fig. 4: Stepper motor interfaced with Arduino

D. Servo Motor Interfaced with Arduino

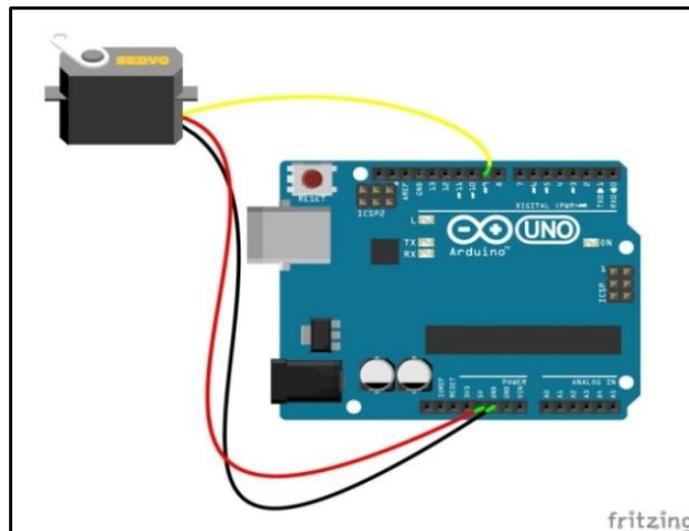


Fig. 5: Servo motor interfaced with Arduino

VI. FINAL RESULT

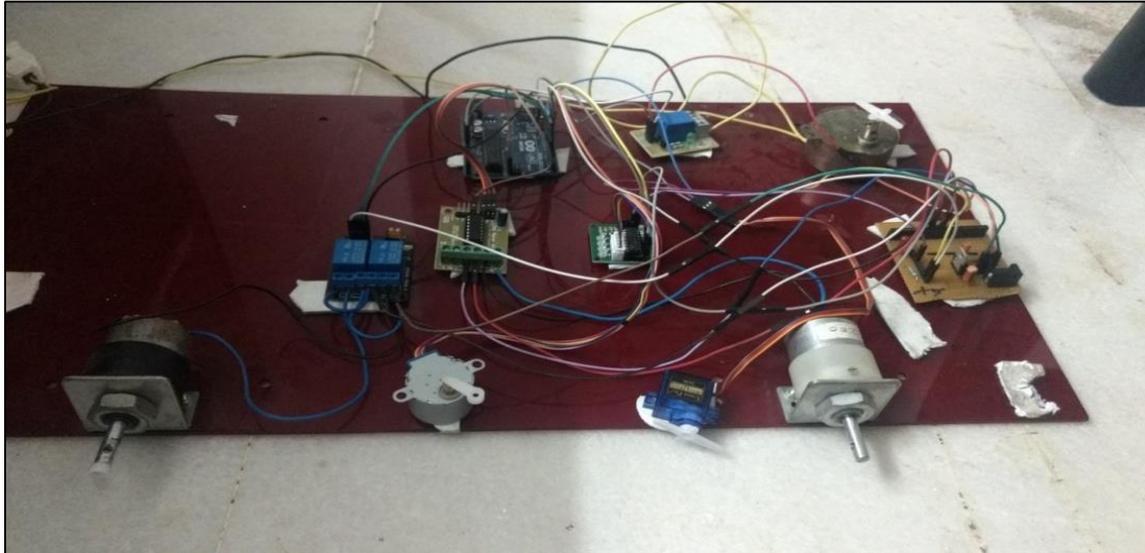


Fig. 5: All motors interfaced with Arduino

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