H-Bridge Control

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ABSTRACT

The aim of experiment to understand use of L-298 bridge by controlling using TIVA board. H-bridges are used in bidirectional motor drives.

I INTRODUCTION

In this experiment, we are using the L298 motor driver to control inductive loads, including relays, solenoids, DC motors, and stepper motors. The L298 is a monolithic integrated circuit available in 15-lead Multiwatt and PowerSO20 packages. It features two enable inputs that allow for independent control of the device, regardless of the input signals. The emitters of the lower transistors in each bridge are interconnected, and the corresponding external terminal can be utilized for the connection of an external sensing resistor [1].

II TASKS

The experiment consists of several tasks, outlined as follows:

- Setup of the TIVA board
- Configuration of the L298N motor driver
- Development of a PWM program to drive the L298N
- Placement of resistors across the H-bridge and testing the circuit

TIVA Board Setup

The TIVA board, in conjunction with Code Composer Studio (CCS) available from ti.com, offers a user-friendly development environment. CCS seamlessly integrates with the Arm GNU Compiler (GCC), facilitating the compilation of C code and its execution on the TIVA board.

L298N Setup

Since the L298 motor driver does not include internal diodes, external diodes must be added to the circuit. Additionally, external decoupling capacitors are necessary for both the logic and load supply. Figure 1 illustrates the internal schematic of the H-bridge.

PWM Program to Drive L298N

A PWM (Pulse Width Modulation) program is developed to control the L298N motor driver.

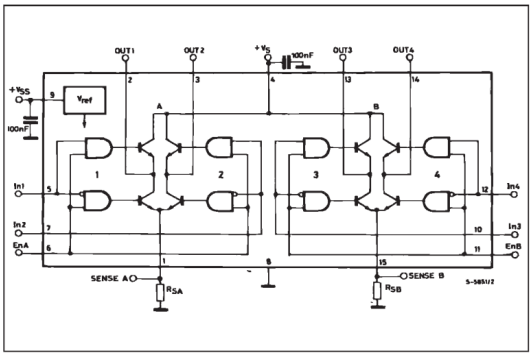

Figure 1: Logic Block Diagram of L298N [1]

Place Resistors Across the Bridge and Test

For testing the circuit, a 10 ohm, 10 watt dummy load resistor is used. PWM signals are generated using a signal generator, and the duty cycle is varied. The voltage across the load resistor is observed on an oscilloscope. In Figure 4, a pulse with a 60% duty cycle is applied, and the corresponding voltage across the load resistor is shown in Figure 5.

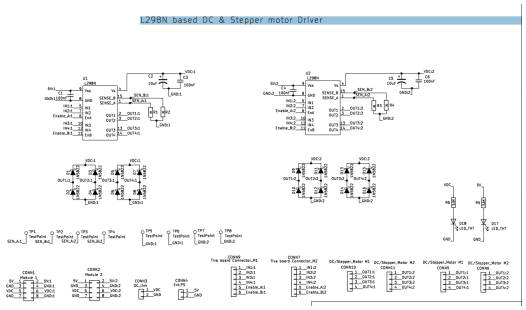

Figure 2: Schematic of L298N H bridge driver board

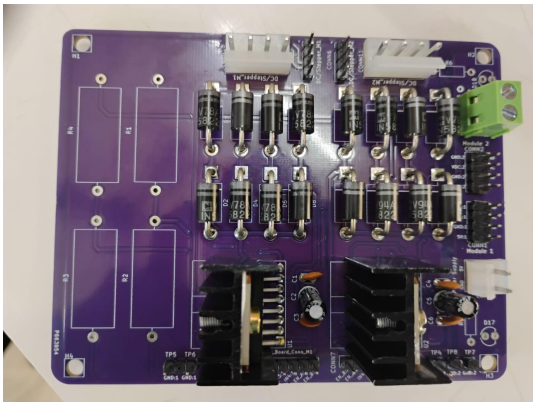

Figure 3: L298N H bridge driver board

Figure 4: PWM signal from source generator with duty cycle 60%

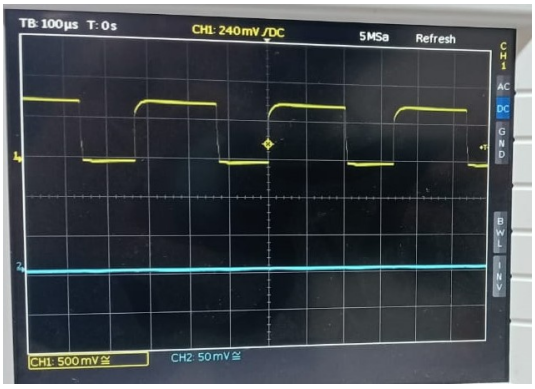

Figure 5: Voltage observed across load resistor

Figure 6: PWM signal from source generator with duty cycle 10%

Figure 7: Voltage observed across load resistor

Figure 8: PWM signal from source generator with duty cycle 40%

Figure 9: Voltage observed across load resistor

III CONCLUSIONS

In all cases, there was a slight variation in voltage across the load resistor, i.e., not a perfect PWM. This may be due to parasitic capacitance.

REFERENCES

[1] STMicroelectronics. L298N Dual H-Bridge Motor Driver. *Data Sheet*, 1997.