Robot Designing using FPGA

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Abstract

FPGAs are alternate possibility to the existing microprocessor-based systems. This project is a proof-of-concept for use of FPGA as control device for robots.

Implementation

3 channel analog line sensor is interfaced with the on-board ADC. Depending on the orientation of the robot on the line, the FPGA controls the speed of the motors using Pulse Width Modulation. Motor with positional encoders are used to enable movements using the same.

Device Utilization

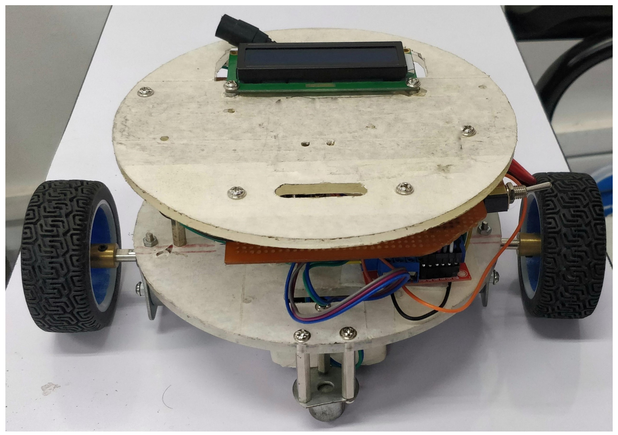
Look-up Table: 1638

Logic Elements: 1,781 / 22,320

> LCD Interface: 1662

> ADC Interface: 64

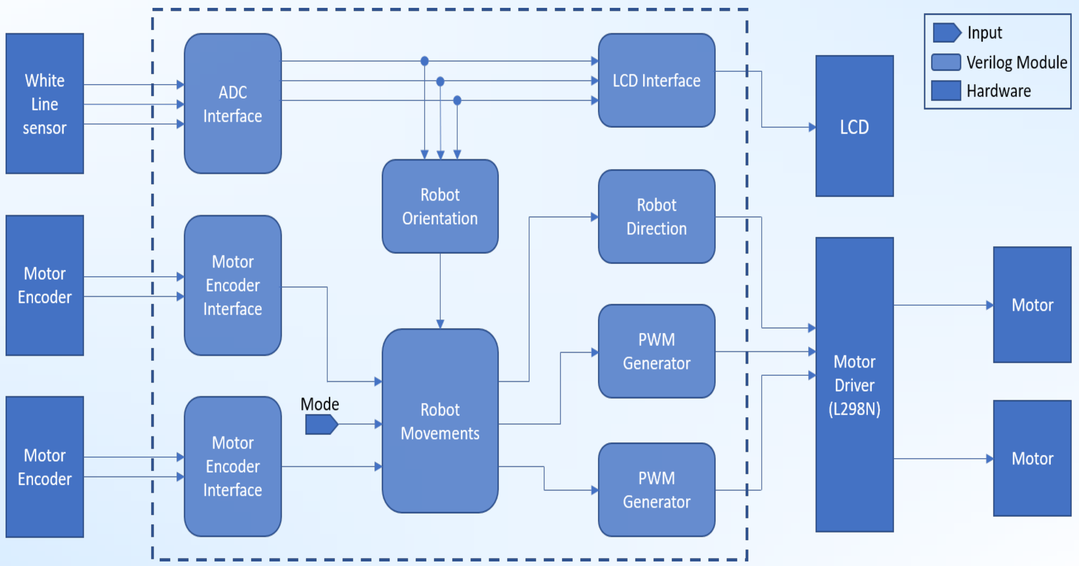
> PWM Generator: 17



Objectives

To interface basic building blocks of a robot with DE0-Nano FPGA board. The robot should be able to perform simple functions like line following and display line sensor readings on the LCD.

RTL Block Diagram



Major Challenges

1. Timing constraint in interfacing LCD.
2. Calculating motor velocity using the encoder inputs.