

Traffic light controller using FPGA

FPGA Lab & IDP

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Introduction

- Traffic Lights: commonly known as traffic signals, signal lights etc and technically known as traffic control signals are signalling devices positioned at road intersection, pedestrian crossings and other locations to control competing flows of traffic.

- Traffic Lights: commonly known as traffic signals, signal lights etc and technically known as traffic control signals are signalling devices positioned at road intersection, pedestrian crossings and other locations to control competing flows of traffic.
- Three standard colors are used for traffic lights they are
 - Green - Allow the traffic to proceed in the direction denoted
 - Yellow - Provide a warning that the signal will change from red to green and therefore start the vehicle
 - Red - Prohibit the traffic from proceeding

Why use FPGA?

- FPGA (Field Programmable Gate Array): This is an IC that contains an array of logic cells that can be programmed by user.
- FPGA has many advantages over microcontroller in speed, number of input and output ports & performance.
- FPGA is cheaper solution when compared to ASIC which is too costly and time consuming for small scale production
- In general, traffic lights on main roads are controlled with a fix-time control system which may lead to traffic congestions during rush hours
- VHDL is preferred especially for FPGA design because VHDL can be used to describe and simulate operation of digital circuits

Objectives

- Transform word description of the protocol in to a Finite State Machine transition diagram.
- Implement simple Finite State Machine using VHDL
- Simulate the operation of FSM
- Implement the design on to a FPGA

State Table

- The three lights (Green , Yellow , Red) cycle through the six states as shown in the table

State	North-South	East-West	Delay
0	Green	Red	5
1	Yellow	Red	1
2	Red	Red	1
3	Red	Green	5
4	Red	yellow	1
5	Red	Red	1

Table: Table showing different states and there corresponding delays

State Diagram

