

# T-Junction Traffic Controller Design

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## 1 Introduction

Design of an intelligent traffic control system for T-junctions with:

- Independent traffic light control for two directions (T1 and T2)
- Pedestrian walk signals with warning buzzer
- Emergency vehicle priority
- Turn signal management

## 2 Design Architecture

### 2.1 State Machines

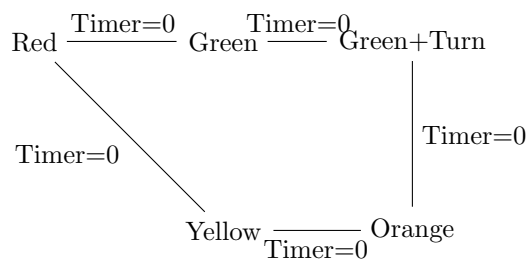


Figure 1: State machine diagram for each traffic direction

### 2.2 Key Features

#### 2.2.1 Turn Signal Management

- Added special state (GREEN\_WITH\_TURN)

- T1 gets right turn signal, T2 gets left turn signal
- Turn phase occurs after main green phase
- Ensures no green light conflicts between T1 and T2

### 2.2.2 Emergency Handling

- Asynchronous detection (immediate response)
- 10-time unit hold period
- Left emergency stops T1 only
- Right emergency stops both T1 and T2

### 2.2.3 Safety Interlocks

- T2 checks T1 state before turning green
- Minimum yellow/orange times for safe transitions
- Physical impossibility for conflicting green lights

## 3 Timing Diagram

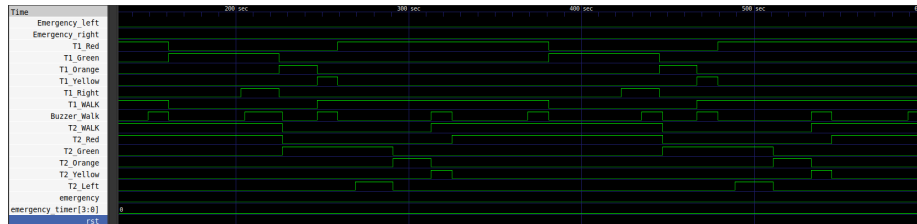


Figure 2: Example timing sequence showing normal signal phases

## 4 Implementation Details

### 4.1 Parameters

Parameter	Value (time units)
Red Time	60
Green Time	20
Turn Time	10
Yellow Time	5
Orange Time	10
Emergency Time	10
Buzzer Time	5

## 4.2 Verilog Module Breakdown

- Two independent but synchronized state machines
- Asynchronous emergency override
- Combinational output logic
- Configurable timing parameters

## 5 Conclusion

The design meets all requirements while ensuring:

- Safe operation through state machine interlocks
- Responsive emergency handling
- Clear turn signal indication
- Predictable timing behavior