



ELP 831

IEC LAB – 1

Sensor And Adaptation Unit

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1 Introduction

1.1 Design library name

Display_Timer

1.2 People involved in the block

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2 Function

2.1 Brief overview

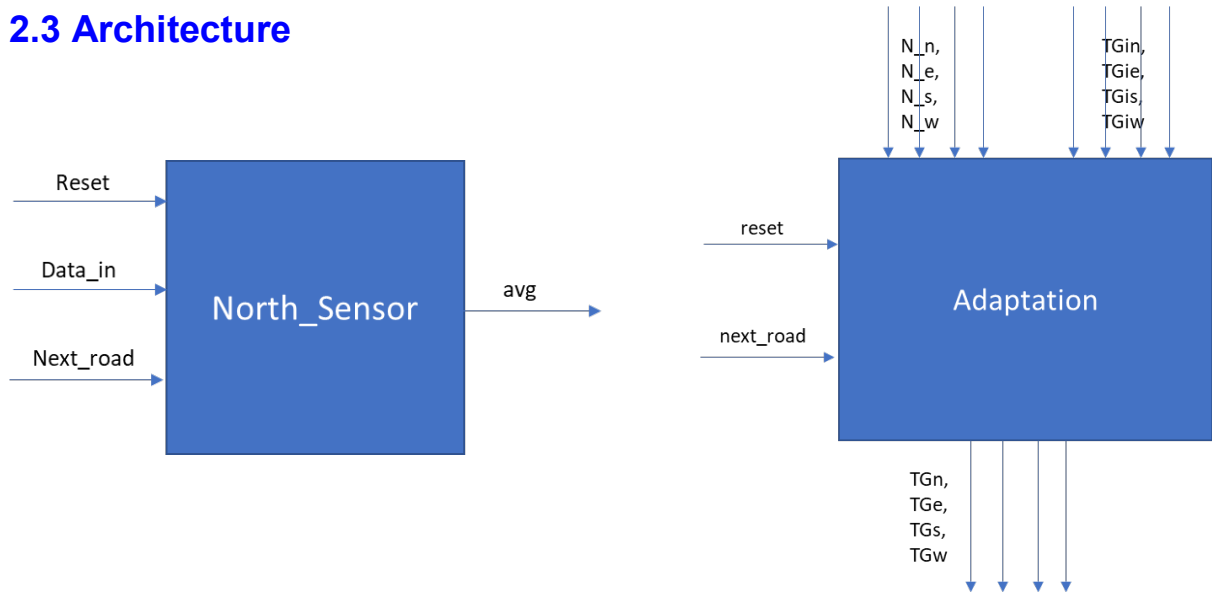
There are two different types blocks – the adaptation unit and the sensor units. There are 4 sensor units – north, east, south and west. They sense the current number of vehicles at their corresponding road and calculate the average number of vehicles at the road for the past 64 cycles. The adaptation unit takes in these average values from the sensors as well as TGx values and outputs updated TGx values.

2.2 Interfaces

Signal Name	Bus Size	I/O	Description	Logical Grouping
North_Sensor				
reset	1	input	Reset signal input	
next_road	2	input	Next road value	
data_in	8	input	Number of vehicles sensed at current cycle	
avg	8	output	Average at north road over last 64 cycles	
East_Sensor				
reset	1	input	Reset signal input	
next_road	2	input	Next road value	
data_in	8	input	Number of vehicles sensed at current cycle	
avg	8	output	Average at east road over last 64 cycles	

South_Sensor				
reset	1	input	Reset signal input	
next_road	2	input	Next road value	
data_in	8	input	Number of vehicles sensed at current cycle	
avg	8	output	Average at south road over last 64 cycles	
West_Sensor				
reset	1	input	Reset signal input	
next_road	2	input	Next road value	
data_in	8	input	Number of vehicles sensed at current cycle	
avg	8	output	Average at west road over last 64 cycles	
Adaptation				
reset	1	input	Reset signal input	
next_road	2	input	Next road value	
N_n	8	input	Ni value at north road from north sensor	
N_e	8	input	Ni value at east road from north sensor	
N_s	8	input	Ni value at south road from north sensor	
N_w	8	input	Ni value at west road from north sensor	
TGin	8	input	Green light duration at north road	
TGie	8	input	Green light duration at east road	
TGis	8	input	Green light duration at south road	
TGiw	8	input	Green light duration at west road	
TGn	8	output	Updated value of TGin	
TGe	8	output	Updated value of TGie	
TGs	8	output	Updated value of TGis	
TGw	8	output	Updated value of TGiw	

2.3 Architecture



2.4 Detailed functional description

There are 2 different units – 4 sensor modules and one adaptation unit module:

- **Sensors:** The four sensor modules are north_sensor, east_sensor, west_sensor, and south_sensor. Each sensor takes in the value of the next road and new vehicle count at the corresponding road and outputs an average of the number of vehicles at that road over the past 64 cycles.

It employs one shift register to store and update values over the 64 cycles and another to perform the division operation to obtain the average.

- **Adaptation:** This is the adaptation unit. It takes in the average vehicle count at each road from the sensors, current green light duration values at each road and the value of the next road and outputs the updated green light duration values for each road.

3 Verification Strategy

Tools and Version

Tool used is Xilinx Vivado 2020.1.

4 Tests Specification

The modules perform as expected under:

- Normal operation

5 Bugs known at submission date

None