

Assumptions

1. Every vehicle (car) has 2 axles
2. Wheelbase is 2.5m
3. Speed limit is 60kmh, but can be exceeded
4. The B event always follows an A event on UP lane
5. Cars cannot use wrong lane (no overtaking)

Deductions

1. Average delay D (ms) between axles is given by
$$60000 \text{ (m)} / 3600000 \text{ (ms)} = 2.5 \text{ (m)} / D \text{ (ms)}$$
$$D = 2.5 * 3600000 / 60000$$
$$D = 2.5 * 60 = 150\text{ms}$$

Exception scenarios

1. Cars arrive from opposite directions 'simultaneously' (OK)
2. A car travels through excessively slowly (IGNORED - INVALID SEQUENCE)
3. A sensor fails to activate (IGNORED -INVALID SEQUENCE)
4. A vehicle passes DOWN through the UP lane (IGNORED - INVALID SEQUENCE)
5. Opposing car enters just before first exits (LIKELY IGNORE BOTH CARS)

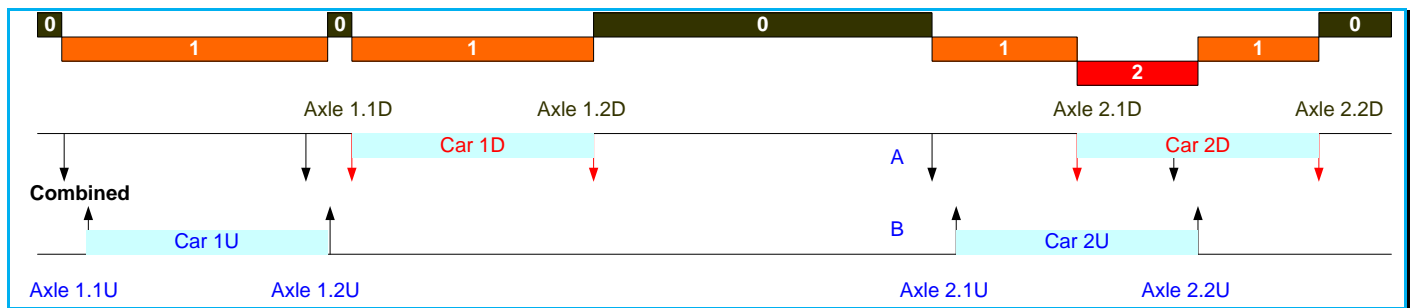
Notation

Symb	Significance	Delta-t
A	Sensor A triggered	-
B	Sensor B triggered	-
!	Minimal delay (A & B in sequence)	Under 5ms
-	Short delay (Cars overlapping)	5 to 75ms
_	Normal delay (Axles of one car)	75 to 1500ms Normal 150

Scenario Descriptions

Sequence	Narrative
A!B_A!B	Single crossing in UP direction
A_A	Single crossing in DOWN direction
A!B-A-A!B-A A!B-A_A!B!A	Overlapping crossings, UP then DOWN
A-A!B-A-A!B A-A!B_A!A!B A-A!B_A!B!A	Overlapping crossings, DOWN then UP
A!A!B_A!A!B A!A!B_A-A!B A!A!B_A!B!A A!A!B_A!B-A A!B!A_A!A!B A!B!A_A-A!B A!B!A_A!B!A A!B!A_A!B-A	Coincident crossings (order is irrelevant, can change during crossing)

Timing example



State transition analysis

	STATE	EVENT	Action	NEW STATE
0	IDLE	*B		ERROR
0	IDLE	*A	Initialise Start Timer DOWN	DOWN_1
1	DOWN_1	!A	Initialise Start Timer UP	CC_1
1	DOWN_1	-A	Initialise Start Timer UP	OL2_1
1	DOWN_1	_A	Record a DOWN crossing	IDLE
1	DOWN_1	!B	Initialise Start Timer UP	UP_1
2	UP_1	!A		CC_2
2	UP_1	-A		OL1_1
2	UP_1	_A		UP_2
3	UP_2	!B	Record UP crossing, reset	IDLE
4	OL1_1	*A		OL1_2
5	OL1_2	!B	Record UP crossing	DOWN_2
6	OL2_1	!B		OL2_2
7	OL2_2	-A	Record DOWN crossing	OL2_3A
7	OL2_2	_A		OL2_3B
8	OL2_3A	-A		UP_2
9	OL2_3B	!A	Record DOWN crossing	UP_2
9	OL2_3B	!B	Record UP crossing	OL2_5
10	OL2_5	!A	Record DOWN crossing, reset	IDLE
11	CC_1	!B		CC_2
12	CC_2	_A		CC_3
13	CC_3	*A	Record DOWN crossing	UP_2
13	CC_3	!B	Record UP crossing	DOWN_2
14	DOWN_2	*A	Record DOWN crossing, reset	IDLE
15	ERROR	none	Log INVALID SEQUENCE, reset	IDLE

There are 16 states and 5 operational functions

The major scenarios are DOWN only, UP only, Overlapping, Coincident Crossing

Crossing record details

ID	Day	Time	Direction	Speed
Sequential #	1,2,...,5	Seconds after MN	UP (AB:AB) DOWN (A:A)	Divide 2.5 by delta-t to get metres/msec Convert to kmh