

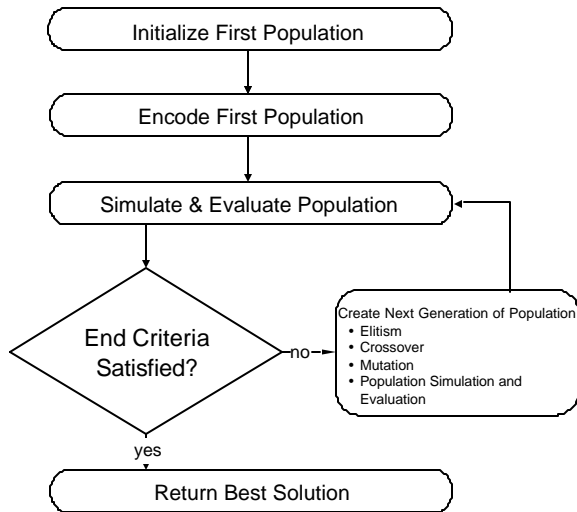
# VISGAOST - VISSIM-BASED GENETIC ALGORITHM OPTIMIZATION OF SIGNAL TIMINGS

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VISGAOST - Program which uses a Genetic Algorithm to optimize signal timings based on their evaluations in VISSIM. VISGAOST is the first optimization tool which can optimize controller's Transit Signal Priority (TSP) settings. VISGAOST can optimize basic signal timing parameters (i.e. cycle length, green splits, offsets and phase sequences) simultaneously (or separately) with the TSP settings. Virtually any VISSIM performance measure can be used as objective function. For example, VISGAOST can optimize signal timings to reduce pollutant emissions reported by VISSIM ( currently only optimization software which can optimize signal timings to reduce traffic emissions in the network). The list of special VISSIM features also include the optimization of: phasing sequence, multiple coordinated systems and uncoordinated intersections, fully-actuated isolated intersections, and multiple time periods.

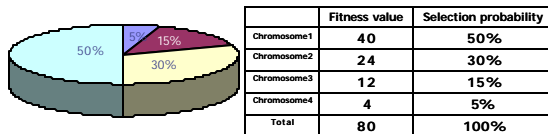
## Basic Algorithm



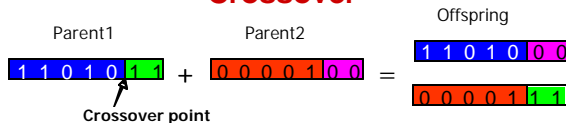
### Binary Encoding

	Before encoding	After encoding
Parameter value	$13 = 0 \cdot 2^5 + 0 \cdot 2^4 + 1 \cdot 2^3 + 1 \cdot 2^2 + 0 \cdot 2^1 + 1 \cdot 2^0$	001101

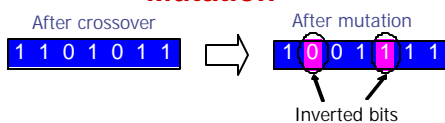
### Roulette Wheel Selection



### Crossover



### Mutation



## VISGAOST Dialog Windows

**Optimization Input Parameters**

- Lower Cycle Length: 40
- Upper Cycle Length: 150
- Simulation Period: 1800
- Number of Random Seeds: 5
- Cycle Length
- Offsets
- Splits
- Phase Sequence
- Number of stops
- Total delay
- Optimize  Total travel time
- Throughput
- Performance index
- Continuation
- Save

GA parameters | Open file | Run

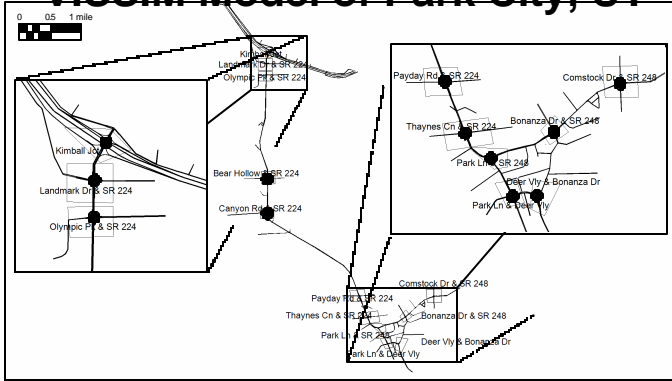
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**Genetic Algorithm Parameters**

- Number of Generations: 50
- Number of Timing Plans: 30
- Mutation Probability: 0.03
- Crossover Probability: 0.50
- Random Seed: 5
- Convergence Threshold: 0.001

OK

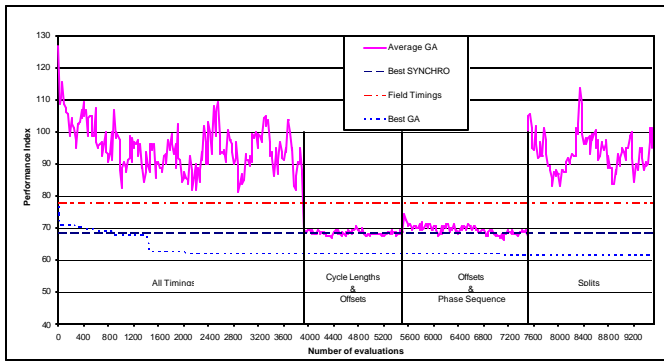
# VISSIM Model of Park City, UT



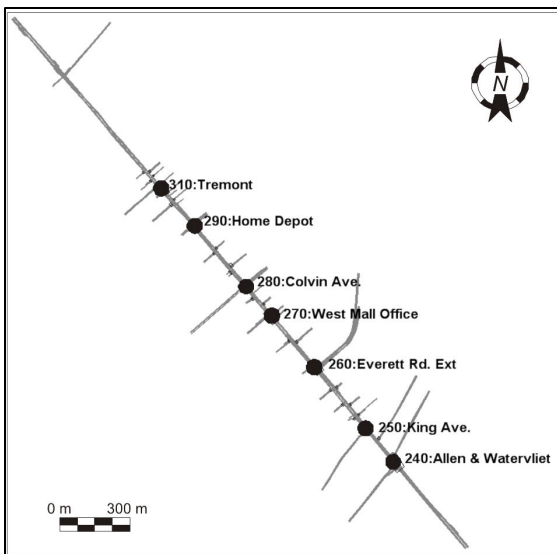
# Results - 100 Simulation Runs

Scenario 1: 15-min	Field	SYNCHRO		VISGAOST		
peak intersection						
traffic	Mean	St. Dev	Mean	St. Dev	Mean	St. Dev
Performance Index	75.63*	5.39	71.48^	6.17	63.3^*	3.9
Delay (hours)	54.52*	3.11	49.17^	3.44	46.78^*	2.19
Stops	7600*	869	8031^	1164	5946^*	662
Throughput (veh)	2183*	28	2200^	26	2219^*	28
Scenario 2: 15-min	Field	SYNCHRO		VISGAOST		
peak network traffic	Mean	St. Dev	Mean	St. Dev	Mean	St. Dev
Performance Index	73.38*	5.32	70.67^	8.64	59.07^*	3.66
Delay (hours)	53.09*	3.13	48.82^	5.37	43.54^*	2.17
Stops	7303*	838	7864^	1667	5589^*	582
Throughput (veh)	2204*	26	2214^	49	2257^*	29
Scenario 3: 1-hour	Field	SYNCHRO		VISGAOST		
peak network traffic	Mean	St. Dev	Mean	St. Dev	Mean	St. Dev
Performance Index	271.4*	16.8	299^	55.14	227.46^*	12.06
Delay (hours)	194.21	12.35	193.47	25.58	164.47^*	6.27
Stops	27792*	2590	37985^	12173	22677^*	2157
Throughput (veh)	8556	73	8553	101	8599^*	38

# Optimization of Signal Timings



# Central Ave. Albany, NY in VISSIM



# Optimization of TSP & Basic Signal Timings

