Journal of
Information Technology & Software Engineering

Rahbari, J Inform Tech Softw Eng 2014, 4:2
DOI: 10.4172/2165-7866.1000135

Research Article Open Access

Help the Genetic Algorithm to Minimize the Urban Traffic on Intersections

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Abstract

Control of traffic lights at the intersections of the main issues is the optimal traffic. Intersections to regulate traffic flow of vehicles and eliminate conflicting traffic flows are used. Modeling and simulation of traffic are widely used in industry. In fact, the modeling and simulation of an industrial system is studied before creating economically and when it is affordable. The aim of this article is a smart way to control traffic. The first stage of the project with the objective of collecting statistical data (cycle time of each of the intersection of the lights of vehicles is waiting for a red light) steps where the data collection found optimal amounts next it is. Introduced by genetic algorithm optimization of parameters is performed. GA begin with coding step as a binary variable (the range specified by the initial data set is obtained) will start with an initial population and then a new generation of genetic operators mutation and crossover and will Finally, the members of the optimal fitness values are selected as the solution set. The optimal output of Petri nets CPN TOOLS modeling and software have been implemented. The results indicate that the performance improvement project in intersections traffic control systems. It is known that other data collected and enforced intersections of evolutionary methods such as genetic algorithms to reduce the waiting time for traffic lights behind the red lights and to determine the appropriate cycle.

Keywords: Urban traffic; Petri net; Genetic algorithm

Introduction

The Goal of this project is to obtain the optimal cycle traffic lights at the intersection. To find time for each cycle of the traffic lights are red, yellow and green is the average number of waiting cars at behind of a red light. Traffic Modeling with Petri nets in CPN TOOLS software simulations has been conducted. Data collection was performed at various times as the objectively reasonable sample has been collected. The results of the genetic algorithm is used to optimize the design so that the chromosome based on 14 parameters (5 for the intersection lighting cycle time, cycle time 5 to the second intersection lights, light, on the intersection of the first two, to wait for an average of vehicles and two average cars waiting at a red light to the second intersection), coding (how to convert binary digits the actual amount of decimal and vice versa), mutation operators (to create diversity in the population), crossover (to converge to the optimal) fitness function (assessment of chromosomes in population) and elitism selection (to select the number of inhabitants to move to the next generation) are described in detail in the relevant sections.

All system controls the timing of traffic lights after crossing lights as decision variables in the objective function in order to meet minimum system requirements. The decision variables include the proportion of green time of each phase, cycle length, number of phases, the offset is. Various objective functions such as energy loss, reducing delays, reducing the number of vehicles stopped at the intersection, reduce the length of queues, increase safety, etc., is considered the beginning of the traffic light control system for different types of systems have been created under as controls when the controls have been categorized prematurely [1]. Other divisions such as independent monitoring, control and accountability varies depending on time of day and traffic controls exist. This is set in Table 1 is presented. Variable three generations of light-controlled junctions in a variety of computer programs with a view to expanding the use of computer processors are included. This controls how a software system, based on information received from computed for vehicles and pedestrians, and other inputs to recognition of designer (eg weather conditions) are determined. Table 2 presents a set of best known and most widely used of these systems are discussed [2]. In[3] a traffic control signal to adjust their schedule. This is a discrete time model optimized for signd areas marked provides a real-time embedded controller and the controller signal timing based on technical constraints, physical and specifies operations. In [4] proposed a system for wireless traffic light controller both manual mode and automatic. Manual control of traffic lights to change with the traffic police to provide with the push of a button on the streets for a Green Mark provides. In automatic mode traffic light controller board, LED sequence according to a predetermined pattern, and latency changes that will help the police to be able to dynamically change the flow of traffic. In [5]. a fuzzy logic based smart traffic light simulator design presented. Traffic junction simulator hardware is to overcome the problems of working in a real environment to develop and test the controller performance. Simulation results using traffic lights with light controller based on fuzzy logic is compared for constant and controller. The results showed that the controller reduced the waiting time at red lights. In [6]. the effects of traffic lights at intersections to optimize evacuation routes were investigated. They believed that an intersection with traffic lights consist of a series of sketches of the windows when the term is assigned. Considering the delay and the capacity allocated to each intersection in the direction of discharge flow path, Compound labeling algorithm for the minimum cost network traffic is proposed. In numerical examples with different latencies compared Evacuation Routes which showed that the proposed method can be a good result considering the time of his discharge in path optimization.

In [7] of the network traffic signal control strategy is presented. They propose a model to simulate the UTNS where the road network topology dynamically directed graph is given by CTM cell transfer model of traffic flow and transport modeling is and then a state feedback control law is designed to achieve stable agreements under which the proposed control system.

In [8] a distributed and adaptive traffic signal control to provide

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Received September 01, 2014; **Accepted** October 31, 2014; **Published** November 10, 2014

Citation: Rahbari D (2014) Help the Genetic Algorithm to Minimize the Urban Traffic on Intersections. J Inform Tech Softw Eng 4: 135. doi:10.4172/2165-7866.1000135

Row	Cars at a red light TL1		By a red light TL2		The number of cars at a red light TL3		The number of cars at a red light TL4	
	Count/Hour		Count/Hour		Count/Hour		Count/Hour	
1	33	19:00	25	19:00	35	19:00	5	19:00
2	25	19:05	30	19:05	25	19:05	10	19:05
3	26	19:10	33	19:10	28	19:10	8	19:10
4	36	19:15	40	19:15	21	19:15	12	19:15
5	22	19:20	34	19:20	27	19:20	11	19:20
6	26	19:25	35	19:25	28	19:25	14	19:25
7	30	19:30	40	19:30	29	19:30	16	19:30
8	28	19:35	38	19:35	26	19:35	18	19:35
9	38	19:40	42	19:40	32	19:40	15	19:40
10	35	19:45	40	19:45	35	19:45	22	19:45
11	40	19:50	39	19:50	29	19:50	23	19:50
12	48	19:55	48	19:55	31	19:55	20	19:55
13	46	20:00	46	20:00	38	20:00	28	20:00
14	49	20:05	49	20:05	41	20:05	31	20:05
15	51	20:10	45	20:10	45	20:10	26	20:10
16	58	20:15	51	20:15	48	20:15	33	20:15
17	55	20:20	55	20:20	51	20:20	36	20:20
18	62	20:25	46	20:25	54	20:25	33	20:25
19	54	20:30	50	20:30	55	20:30	38	20:30
20	60	20:35	54	20:35	58	20:35	37	20:35

Table 1: Number of cars behind traffic lights at each intersection

Light Cycle 1		Light Cycle 2		Light Cycle 3		Light Cycle 4	
TL1	Sec	TL2	Sec	TL3	Sec	TL4	Sec
G	38	G	40	G	60	G	22
Y	5	Y	5	Y	5	Y	5
R	50	R	40	R	30	R	66

Table 2: Line Cycle in intersections

a realistic traffic simulation. This method of traffic control algorithms based observations suggest that the traffic generated by sensing devices existing local communication between traffic lights and driving convenience. This method allows features to be updated frequently to adapt to the current traffic demand. Given the proposed adaptive system simulation environment CUMO, overall network performance garnered a higher level. Several applications of hybrid Petri Net is presented in the various articles. The oil industry and oil pipelines, in [9] to model the transmission lines and oil storage tanks using HPN described in [10] a short time to transport crude oil to refineries in Port through transmission lines is presented. Also in [11] for the automated online fault monitoring using hybrid Petri net is done. For intercity traffic problem, in [12] traffic and car speed in a road tunnel with HPN models and interventions to prevent accidents in the tunnel is presented [13] a model based on hybrid Petri net for the Category movement intercity trains and avoid collisions with each other and the train crossings cross- other vehicles on rail tracks designed. As well as numerous works by using hybrid Petri nets for modeling, control and optimization of network traffic have been done. For example, in [14] model of an urban intersection using hybrid Petri nets have gained. In this model, the associated status indicator corresponding to a given area's streets, neighborhoods have been applied consistently 4 to isolate areas of our neighbors. In [15] a typical intersection using a method similar to [16] have modeled. In this paper, the optimal timing of traffic lights at each phase of the streets leading to the intersection number of vehicles expected to be calculated. In the next cycle, the information flows from the streets into the streets leading to the intersection of the current cycle, is obtained.

In [17] the intersection of the model with hybrid Petri nets attached to each block consists of a hybrid Petri net is simulated. The block consists of hybrid Petri nets as a time delay which represents the movement of vehicles between the two intersections leading to the street. In [18] addition to modeling the hybrid Petri nets, with the introduction of the concept as a way to obtain the shock wave, the flow discontinuities between flows vehicles when there are such intersections is presented.

The petri net

Petri net is a powerful tool for modeling concurrency and provides more context than queuing networks. In addition to the structure and behavior of Petri nets are a formal, graphical display that is why they are modeled by easy. One reason for the success of Petri nets is their simplicity, but the simplicity is sometimes difficult to model complex systems. Many features have been added to the basic model of Petri nets to the modeling, it will increase and can be used in various fields. Petri nets graphically displayed to illustrate the theoretical concepts of Petri nets is very useful. Petri net structure of Petri nets to provide a graph in which there are two types of nodes. The barriers in the form of a circle (O) and line (|) indicate that abrasive tracks are places and marker lines. These places the tracks are connected to each other by transition. Transfer from one place to another place, indicating that it will be passed as output and if it draws an arc from a place to a transition indicates that it will be the entrance to the pass [19].

One of the concepts that should be considered in the evaluation of the performance of talk time. Colored Petri nets in the concept of Global at the time of the element name defined. It expresses the values that are at the disposal of the model. This time can be an integer or a real number representing the discrete time which represents the time has come. Besides being include every nut, some referable, can be applied to any bead that amount of time. This amount of time is called time stamp. time stamp represents the first time that the beads can be used.

In a colored Petri net is based on the time when the bolts are in place and guard the entrance of a transfer of the transmission is established in this case, the desired transformation is activated. But for this transition can be sure that the fire is in a state of readiness. When transfer is in standby mode, the transmission input housings beads are smaller or equal to the current time. For an event that takes r time units into a colored Petri net model. The corresponding transition event, which took thousands of stamp seals for nut production output r time units larger than the global time at which the transfer occurred. This means that the pieces produced by r time units are not available. Time based on colored Petri nets, while the current model, no transition was not ready, Time to pull the system down to at least one transition is in standby mode. Various tools that can support this kind of network software Design / CPN named. Using the graphical user interface of the software, can be colored Petri net models can be easily traced. You can also use this animation software (stepwise implementation) of colored Petri net models, Create a state space model of colored Petri net, to model the behavior of a user-defined query and create output files for the model simulation results are also provided. CPN models are the benefits that can be mentioned the following:

Due to the hierarchical model can be drawn from these techniques can be combined to obtain or reuse of models can be used. For each transition can be defined as the time it takes to fire the bolts can be given that any time a character is also, useful tool for evaluating performance and other issues related to time. Place combines a natural

way to combine hierarchical colored Petri nets model is. Timing of the transition in the Petri net: To create a time delay in the transition from the Transition Place the following steps should be taken: Defines the color of the closet:

No = with R | G | Y timed;

Define the variable as

Var a: No; Figure 1 Modeling by Petri Net

The Place for No and study of a defined type. Place the required amount of sample R @ + 5, from 5 to start the transition and the transition in the Transition can the formula for the passage of time @ 10+ write transition the passage of any 10. CPN Tools for modeling software proud 4 traffic lights in two intersections are shown in Figures 2-4. To design such a model, we first create an empty Petri nets. Place the tool bar and then put it on the network by using the Style tool to the red, green and yellow in it. Transition between Places to put some transition state. The next phase of traffic lights cycles using the Arc tool connects us. We do this for both lights. Then, using whatever tools Yellow Arc of Transition transitions of traffic lights using the tool called X that represents the intersection Place, the connect them. Is required on each arc is a variable whose type was defined as the amount of our No. The optimal values of the genetic algorithm to optimize the lights that have earned the tool between any two Place in Transition (@ + x), we write to you indicate a time delay switch the lights from one state to another.

Optimization using genetic algorithms

Genetic algorithm to simultaneously consider multiple points of the search space and thus increases the chances that converge to a local maximum, decreases. Search in more conventional ways, the decision rule governing this case serves to move from one point to another in a matter of searching this way can have a maximum bite. Because they may converge to a local maximum. But the whole population of the genetic algorithm (strings) to produce and test each point individually by combining quality (content) of spots, a new population, which includes the improvement of has the form. Apart from doing a search, consider the same number of points in the genetic algorithm, which makes it adaptable to parallel machines because of the evolution of each point, is an independent process. The genetic algorithm only requires information on the quality of the solutions produced by each set of variables. If some optimization methods require derivative information or even need to have a complete understanding of the structure of matter and variables. Because genetic Algorithm not require such specific information on the issue is thus more flexible than most search methods. The genetic algorithm is a search method, which is to guide the search for methods of use random selection will vary. Although the decision as to define methods of accident and chance, but the search space is not a random walk. Genetic algorithms are suitable for the crash exploit a priori knowledge they use to solve the nearly optimal to quickly reach it.

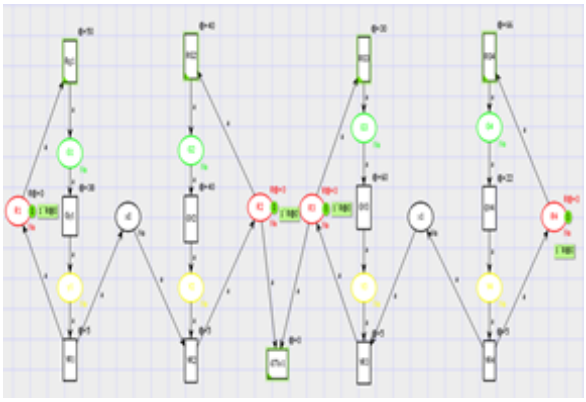


Figure 1: Modeling by Petri Net

The coding problem and a fitness function to determine the barrier population over generations by using the operators of selection, mutation and cutting, elitism is to involve the local optimal solutions [20]. Elitism in the replacement of a case is done. The coding of chromosomes and the problem in Genetic Algorithms is shown in Figure 2. Coding Problem in Genetic Algorithms because the chromosomes are composed of a number of genes in the gene is considered a digit between is zero and 10. Xi is the number of parameters (x1, x2, and X14) and 8 bits for each parameter is selected. For example, to convert decimal number from 1 to 8 bits, the bits x1 and convert the decimal number from 9 to 16, the value of x2 as well as X14 ..

- 2 lights with different colors
- green (G), orange (O), or red (R)
- Any integer means the time (in seconds) of each cycle is a light in the intersection.
- The binary chromosome becomes.

Fitness function: Fitness Changes in the genetic algorithm as the fitness function, the objective function is considered. In this case the fitness function is based on an average cycle time of traffic lights. This function has 14 parameters which are specified range of values [21]. Linespace function in Matlab software the specified range is divided into 100 so that the fitness value is used calculation. This function has a minimum and maximum value and the boundary value of the chromosome is randomly generated value between these two values to be given. Limit values based on data obtained from the data collection phase of the two intersections Flowers and knowledge of governmental requirements. These values include cycle time lights at two intersections and the number of cars waiting for the red light is back. Since genetic algorithms are used to calculate the maximum amounts referred to reverse the charges.

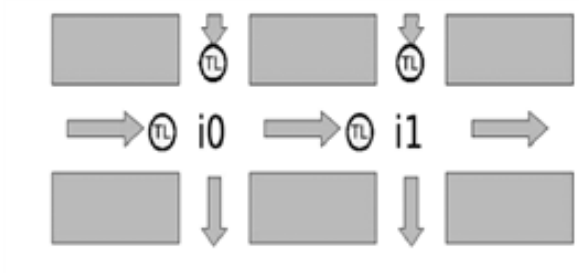
Definition of fitness function:

Fitness(gen) = ((x1(gen) + x2(gen) + x3(gen) + x4(gen) + x5(gen))*(x11(gen) + x12(gen)) + (x6(gen) + x7(gen) + x8(gen) + x9(gen) + x10(gen))*(x13(gen)+x14(gen))) / 14 ;

Average time to complete cycle lights at both intersections with the number of cars waiting behind a red light, according to the following parameters are determined.

Parameters x1 x2 x3 x4 x5 for the first 5 stages of the cycle crossing lights, x6 x7 x8 x9 x10 parameters for the 5 stages of the second intersection lights cycle time parameters for the number of cars waiting behind x11 x12 TL0 and TL1 red lights at the intersection of First and parameters the number of cars waiting for the red lights x13 x14 TL2 and TL3 are at the second intersection. The total cycle time for each intersection lights on top of the total number of cars waiting for the red lights would be multiplied The total cycle time for each intersection lights on the total number of cars waiting for the red light becomes multiplied by the average of these values is calculated.

Selection operator: The selection of parents in genetic algorithms to further its chances of reproduction of the members that have higher



110 ... 111	101... 011	010 ... 101	111 ... 101
x13 x14	x11 x12	x6 x7 x8 x9 x10	x1 x2 x3 x4 x5
The number of cars waiting for the red lights at the crossroads TL3 and TL4 II	TL1 and TL2 number of cars waiting for a red light at the intersection of	5 stages of the cycle time of the second crossing lights	5 stages of the cycle time of the first crossing lights

Figure 2: Coding Problem in Genetic Algorithms

fitness. There are several ways to do this. A technique that is commonly used selection method using a wheel. The implementation of this method is as follows: A - the fitness of all members of the population and thus the suitability of the call stack. (B) a randomly generated number n, so that it is a number between zero and total fitness. (C) The first member of the population that add elegance to the fitness of the population of the former is larger than or equal to n restore [22]. Effects of parental choice back wheel of a parent is randomly selected. Although the selection process is random, the chance that each parent is selected is directly proportional to its fitness. The balance in the number of generations the genetic algorithm with the lowest fitness of the disposal and the release of genetic material in the most graceful members of help. It may be the worst member of the population can be chosen by the algorithm (because anyway there is a random element in the algorithm). In the population acts of violence, however, are negligible and the assumption that members of a generation, the next generation is much more likely to desorption. However, after many generations, the members of the population are excreted. Parents should be careful in the process of selecting a range of fitness levels should be positive integers.

Crossover operator: The performance of this operator and mutation operator causes the fibers produced during reproduction, the parents are different disciplines. In nature, this function occurs when two parents exchange portions of their corresponding fields and genetic algorithms, operator communication, exchange of genetic material between the parent sequences to the child (discipline) create there. There are several types of exchange operator. But the most famous exchange operator used in genetic algorithm is a function of a point [23]. The genetic algorithm is the operator in the manner described below may apply (Figure 3). To be able to use this function need to have two fields. The selection operator is applied to the current population of the two strands of the double-take then do a test to determine the probability that the exchange operator acts on two fields it or not. This test is done using a heterogeneous coin, this means that the probability (P crossover) milk and with probability of crossover line comes from. For example, if the applied field with a tap on the coin exchange operator, we assume that we have thrown a coin into the milk. Then enter the next phase of the implementation of the exchange operator, we generate a random number between one and the length of the string. After determining the location of the integer that represents the exchange of strings two strands of the location of this specifies the number of broken and distal parts are interchangeable with each other. All parts are separated from each other are connected to the new string is obtained.

Mutation operator: The operator is also one of the operators of genetic algorithms and the ability to use genetic algorithms to find near-optimal solutions increases. Mutations, random changes in the value field is a special situation. By applying this operator characteristic that is absent in the parent population, is created. Because mutations alter a gene, i.e. if the value is zero, and vice versa if it is a zero. So why the change is characterized by a series of premature convergence and to not be perfect. Because one of the causes of premature convergence of the population is members of the same mutation causes the same probability of being members of the new population is much reduced. The implementation of this function is described below (Figure 4). Mutation Operator this operator, unlike the exchange operator to compare two strings needed to cover a range of needs, after the exchange operator acts on two fields and two new strings to the operator of mutations to the double-stranded is applied to either separately. The method is applied to the individual elements of a string, mutation testing is done. If this test is successful, the status is changed from one to zero or from zero to one, and the so-called mutations. Test the possibility of using heterogeneous coin with probability (P crossover) milk and with probability line comes with a coin toss will be done and if the milk is collected bit value of the mutation the [24]. As noted above, the probability for each state of a field test should be performed. In other words, for every mutation released once the coin is heterogeneous with regard to the outcome, finds little bit mutation or a mutation goes no further.

Elitism: With regard to a possible value can be a percentage of the population without mutation and crossover operators are transferred to the next generation. This amount is likely to vary depending on the values that make up the result set. Genetic algorithm performance is significantly dependent on the different stages of the skins. For instance, each of the following: improve the efficiency of the routing issues.

Genetic algorithm settings: During several performances, the best parameter values of the genetic algorithm are obtained as follows. Total population = 20, number of generations or iterations = 200, length = 80 chromosomes, the number of parameters: 10, Pm: probability of mutation equal to 0.02, Pc: probability of crossover operator is equal to 0.5, elitism rate: 0.02 times the risk of elitism.

Simulation and Results

To evaluate the proposed approach to data integrity requirements that is listed below. Assists the intersection of knowledge and statistical data are collected in sampling. At each intersection of the 20 samples taken at different times. Samples so that the number of cars waiting behind a red light at the intersection of the two traffic lights at each intersection with traffic lights there are a total of 4. The data collected are given in the following tables (Table 1). Number of cars behind traffic lights at each intersection (Table 2). Line Cycle in intersections. The simulation results were compared to a standard amount of fitness is. In this diagram the horizontal axis and the vertical axis represents the number of generations of genetic algorithm is the fitness values. Comparing the Best Value for the symptoms red, medium blue with pluses and worst of green Light, fitness values over generations in the chart are completed (Figure 5). Charts the best, average and worst fitness values based on a generational advance

Charts the best, average and worst fitness values based on generational progression downward based on a function of cycle time and number of cars waiting for the red lights mutation_rate = 0.2;

crossover_rate = 0.5; So the simulation fitness of the best values to the next generation of 85 is achieved in the second half generation algorithm has converged to a solution. In the second half of the difference between the best and average generation is observed that due to the relatively high rate of mutation is a mutation. According to my tests, this figure is considered one of the best solutions, the values of the basic parameters related to the shape of the table below. Other comparison criteria of simulation-based cycle time and number of cars waiting to be lowest. Since the normalization values are based on values between zero and one is shown in Figure 6.

The normal values for the variables x1 to x14 after applying the genetic algorithm is as follows: These values are arranged from top to bottom as descending. Due to the number of duplicate values are rounded to two decimal places are. Since the end of the next generation of genetic algorithms converge to the optimum solution is therefore indicates duplicate values for parameters relevant achieve the best results.

Compared with related works: Fitness based on increased fitness on the best, average and worst fitness values [25] (Figures 6 and 7) are based on the best fitness values. In both figures the horizontal axis represents the number of generations of the GA. The result is then compared to

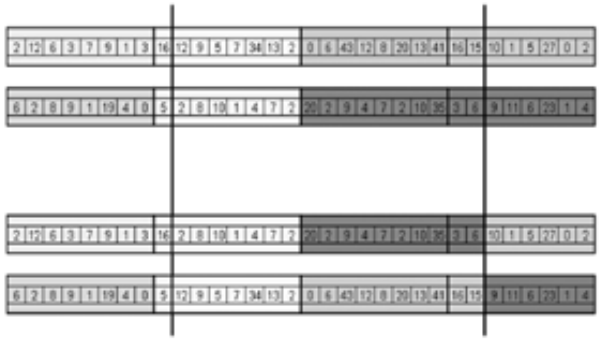


Figure 3: A view of the intersection operator

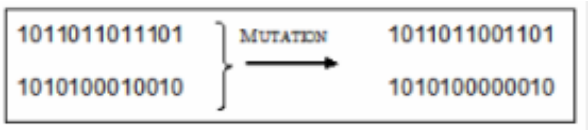


Figure 4: Mutation Operator

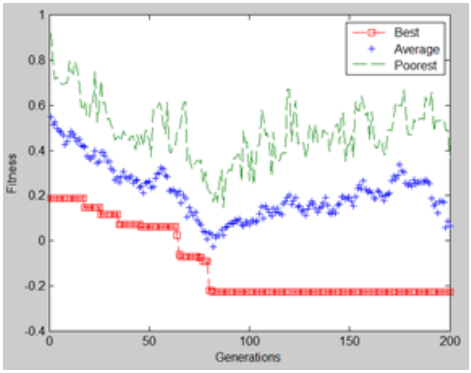


Figure 5: Charts the best, average and worst fitness values based on a generational advance

the project after 85 generations the best solution convergence is done. But the article again after 10,000 generations, better solutions may also be found (Figure 8). The horizontal axis in (Figure 8), the numbers of parameters x1 to x14 is and the vertical axis represents the difference seated normalized values obtained from simulation and actual values is even in the worst case [26], the difference between 0.77 percent and 23 percent error. The difference is 1.00, the best value reaches zero. In Figures 4-8, each of the numbers on the horizontal axis, such as AT, BT and ... represent actual values and the values obtained from the simulations. The vertical axis is the percent difference between these two values. Each vertical bar represents the number 10 is the cycle time for traffic lights. Results: In the worst case, the project is 23% of actual flow and the difference in average and worst case scenarios the difference is very small, almost zero. The aim of the project is due to algorithms that better results were reached.

Conclusion

The main problem in optimal control traffic control traffic lights at the crossroads, or in many other places. Intersections to regulate traffic flow of vehicles and eliminate conflicting traffic flows are used, are important elements of an urban traffic network. As bad as traffic lights control, causing severe traffic congestion. So one of the most challenging issues in the field of traffic lights controlling the traffic management is. Optimal timing of urban intersection traffic lights with intelligent and advanced installation and reduced delay, queue length, Stop vehicles, resulting in reduced fuel consumption and mitigate the effects of pollution and environmental degradation due to excessive stopping vehicles is a traffic light intersection.

Modeling and simulation are widely used in industry. In fact, the modeling and simulation of an industrial system is studied before creating economically and when it is affordable. The aim of this thesis was to provide a smart way to control traffic. With the objective of collecting statistical data, a data set obtained by the genetic algorithm optimization is the next step. The optimal output of Petri nets CPN TOOLS modeling and software have been implemented. It is known that other data collected crossings and Evolutionary techniques such as Genetic algorithms are applied to reduce the waiting time of the traffic lights are red lights and determine appropriate cycle. Rates of mutation and crossover operators in genetic algorithm should be such that the initial generation of diversity in the population increases the high mutation rate and the convergence rate are needed to end generations of crossing rate is high. In this project, two criteria were used to compare results. First measure the fitness levels of members of the different generations of the genetic algorithm and the second criterion is the optimal value of each parameter is introduced in the coding stage. Due to the convergence of genetic algorithm to the optimal solution after 85 generations and no change can be concluded that ate parameters like mutation and crossover rate as well as the fitness function was performed correctly. The graphs are presented and compared to the results of this project and other articles based on objective data, Chart based on minimum levels of fitness as well as the actual data and the data obtained from the simulations indicate that this is the approach taken in this project would achieve better results. Benefits: Petri net modeling tool is suitable for simulating the traffic lights at intersections. Colored Petri Nets is a type of a variable when it is used in this project as well; leading to accurate simulation of traffic is close to reality. Petri nets together to study the fractionation system feasible. Application of Petri Net tool is so broad that it is designed in Matlab software. Petri net-based control systems using the event resulting in the stabilization and synchronization can occur based on our review. The example

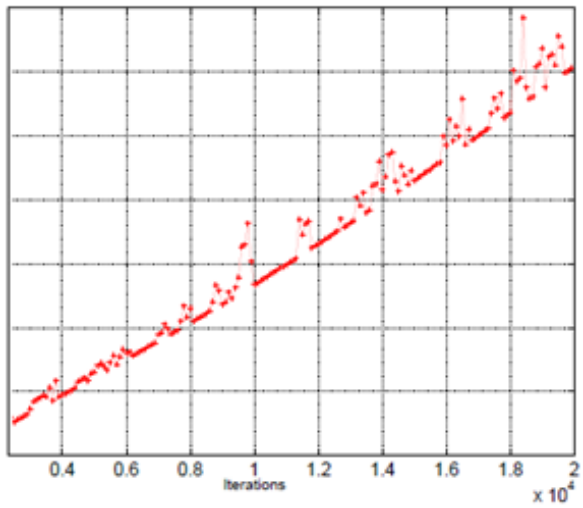


Figure 6: Fitness based on increased fitness

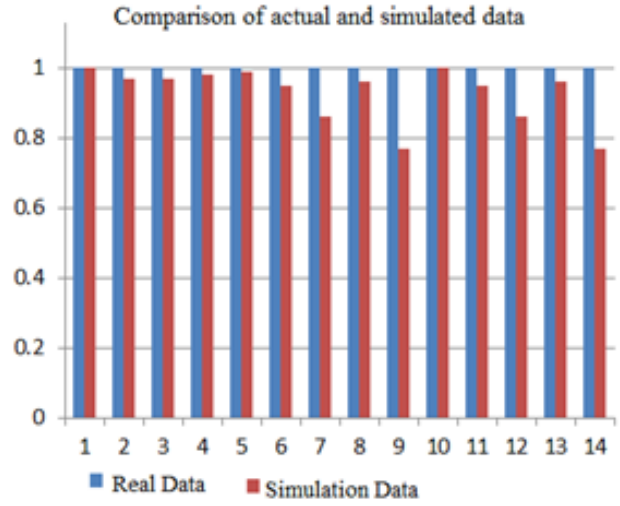


Figure 7: Comparison of actual and simulated data of the project

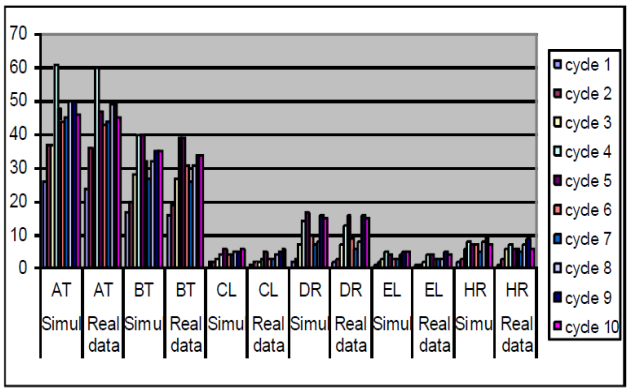


Figure 8: Comparison of actual and simulated data in article 2

shows that the Petri Net is a simple and convenient tool for modeling complex systems, which is very useful for the study of concurrency and uncertainty. Using the model of Petri nets can be provided on the results of several intelligent algorithms to be evaluated. Evolutionary algorithms such as Genetic selection of the best answers will win instead of only one answer.

Disadvantages : The problem of finding a set of statistical data so that the data set as an objective of the project is compiled. Obtaining the proper fitness function of trial and error is required to find the best solutions so that it is necessary to adjust the parameters of the problem as a chromosome and fitness function in a specific way they fit. Suggestions Since genetic algorithms may get stuck in local optimum answers happens it can be combined with Simulated Annealing algorithm to obtain the best results. Combination of Genetic Algorithm and Simulated Annealing gradual hardening stay together because of their good characteristics, it seems logical operations. Way to combine the two is used; consider the appropriateness of mutation rates in genetic algorithm and the parameter setting of an evolutionary algorithm is cooling temperature. The combination of these two algorithms can be such that the temperature is initialized based on the population and the number of generations, the next steps are repeated. A couple of choices aimed at parents and mutation operators are applied on the cut. Aimed to replace it with a requirement to produce two children under the age of each child-parent with the worst fitness value will be substituted. The combination of Soft Computing techniques to other evolutionary methods and techniques of artificial intelligence strategy is suitable for such problems. Depending on the type of problem that was addressed in this project, one of the appropriate algorithms for solving multi-agent algorithms that due to large number of lights in each section of a city controlled by separate agents will eventually is combined optimization methods. All of these projects can be proposed algorithm and other algorithms proposed in the implementation of the CPN Tools, but it would require too much time. Therefore, it is suggested that the results of statistical data optimized algorithm in CPN Tools software used in this project as the work is done.

References

1. Zhonghe H, Yangzhou C, Jianjun S, Xu W, Jizhen G (2013) "Consensus based Approach to the Signal Control of Urban Traffic Networks ". Procedia - Social and Behavioral Sciences 96: 2511-2522.
2. Madireddy M, Coensel B. De, Can A, Degraeuwe B, Beusen B, et al. (2011) "Assessment of the impact of speed limit reduction and traffic signal coordination on vehicle emissions using an integrated approach". J Transport and Environment 16: 504-508.
3. Mc Kenney D, White T (2013) "Distributed and adaptive traffic signal control within a realistic traffic simulation". Eng App Arti Inte 26: 574-583.
4. Dotoli M, Fanti MP, Meloni C (2006) "A signal timing plan formulation for urban traffic control". Cont Eng Prac 14: 1297-1311.
5. Barzegar S, Davoudpour M, Meybodi MR, Sadeghian A, Tirandazian M (2011) "Formalized learning automata with adaptive fuzzy colored Petri net; an application specific to managing traffic signals". Scientia Iranica 18: 554-565.
6. Basile F, Chiacchio P, Teta D (2012) "A hybrid model for real time simulation of urban traffic". Cont Eng Prac 20: 123-137.
7. Corman F, Ariano AD, Hansen IA, Pacciarelli D (2011) "Optimal multi-class rescheduling of railway traffic". Journ Rail Trans Plan Managemen 1: 14-24.
8. Mu H, Yu J, Liu L (2011) "Evacuation Routes Optimization with Effects of Traffic Light at Intersections". Journ Trans Sys Eng InfoTechnology 11: 76-82.
9. Dezani H, Bassi RDS, Marranghello N, Gomes L, Damiani F, et al. (2014) "Optimizing urban traffic flow using Genetic Algorithm with Petri net analysis as fitness function." Neuro computing 124: 162-167.
10. Di Febbraro A , Sacco N (2014) "On Evaluating Traffic Lights Performance Sensitivity via Hybrid Systems Models". Proce Soc Beh Sci 111: 272-281.
11. Fang F C, Xu W L, Lin K C, Alam F, Potgieter J (2013) "Matsuoka Neuronal Oscillator for Traffic Signal Control Using Agent-based Simulation." Proc Comp Sci 19: 389-395.

12. Kaakai F, Hayat S, Moudni A El (2007) “A hybrid Petri nets-based simulation model for evaluating the design of railway transit stations”. Simul Model Pract Theory 15: 935-969.

13. Bazzan A LC, de Oliveira D, da Silva B C (2010) “Learning in groups of traffic signals,” Eng Appl Artif Intell 23: 560-568.

14. Fanti M P, Giua A, Seatzu C (2006) “Monitor design for colored Petri nets: An application to deadlock prevention in railway networks”, Control Eng Pract 14: 1231-1247.

15. Becher T (2011) “A New Procedure to Determine a User-oriented Level of Service of Traffic Light Controlled Crossroads”. Procedia - Soc Behav Sci 16: 515-525

16. Ding ZJ, Sun XY, Wang BH (2012) “Violating traffic light behavior in the Biham-Middleton-Levine traffic flow model”. Procedia Eng 31: 1072-1076.

17. Dahal K, Almejalli K, Hossain MA (2013) “Decision support for coordinated road traffic control actions”. Decis. Support Syst 54: 962-975.

18. Formanowicz D, Sackmann A, Formanowicz P, Błazewicz J (2007) “ Petri net based model of the body iron homeostasis”. J Biomed Inform 40: 476-485.

19. Blazewicz J, Formanowicz D, Formanowicz P, Sackmann A, Sajkowski M (2009)“Modeling the process of human body iron homeostasis using a variant of timed Petri nets.” Discret Appl Math 157: 2221-2231.

20. Rahbari D (2013) “High Performance Data mining by Genetic Neural Network”. Int J CSBI Vol 5.

21. Rahbari D (2013) “Hybrid Evolutionary Game Theory in QoS Routing of Wireless Mesh Networks”. IJWAMN, Volume 4.

22. Rahbari D (2014) “A Novel approach in Classification by Evolutionary Neural Networks”. IJCSNS 4: 33- 52.

23. Rahbari D (2014) “Digital handwritten recognition by optimized neural networks”. IJBRITISH 13: 35-43.

24. Rahbari D (2014) “A Novel approach in Classification by Evolutionary Neural Networks”. IJCSNS 4: 33-52.

25. Medina JS, Moreno MG, Ugarte NAD, Royo E R (2008) “Simulation times Vs. Network Size in a Genetic Algorithm Based Urban Traffic Optimization Architecture”.

26. Ganiyu RA, Olabiyisi SO, Omidiora EO, Okediran O, Alo OO (2011) Modelling and simulation of a multi-phase traffic light controlled T-type junction using timed colored petri nets. AJSIR 2: 428-437.