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Improving best route using intelligent Ad Hoc system

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ABSTRACT

This study aims to studing possibility transferring data with short time, without or liitle cost and minimum lost of data This study attempts to find a system with high performance in sending and receiving message between nodes minimum lost with information using a genetic algorithm to improve this advantage. Main problem of our study with the system is how to decrease (cost and time) and improve it by intelligent function with GA create two or more back up of distributed node depend on time; route calculation saves as a backup map to direct switch without any delay when simulation execution indicated good result. Simulation results are carried out for both algorithms using MATLAB. The goal of our paper is process of data transferring with the most important three factors less expensive, less time and the least possible loss of transferred data.

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1. Introduction

A wireless net is a new technique that makes the users connect and provided the data between them anywhere. Wireless networks are classified to infrastructure less (ad hoc) and infrastructure network [1]. The infrastructure network is wired and fixed gateways. The portable mobile connects with the network. When the mobile moved to another area, it will disconnect from previous and connect with another network that in its range [2], which called handoff. Bluetooth is a new wireless network and helps the mobiles to connect and transform the data called ad hoc networks. Mobile networks don't need infrastructure. The mobile network is a horizontal and quick network; it could be utilized in all conditions [3]. An ad hoc network is established for military purposes after 1990 combined with Bluetooth and wireless LAN [4]. At 1997 several interesting internet groups are using Mobile Ad hoc Network with the work regulate protocols because they thought that the protocols doing the work more efficiency [5]. Nowadays, more than (50) protocols are using in the wireless network such as ad hoc network that related with mobile nodes. Ad hoc network is several portable computers can connect outside the direct wireless. Ad hoc networks didn't need centralized management or infrastructure and characterized by such as inexpensive, easy access, quick [6].

2. Ad Hoc

In computer network, Ad Hoc is means is a wireless network and don't need an infrastructure, sometimes called spontaneous network. Reverse some of the other networks that required infrastructure such as Wireless Local Area Network (WLAN) and cellular network [7]. In the network that required infrastructure it could send the packets to another node using the access point. The access point can provide local network and make the distributed nodes in its area can be connected. If there any dropin connection, the nodes will lose

the network. Many reasons making access point's services are lost such as install access point required a long time and cost factor, therefore it is necessary to build a network by using these nodes, called the ad hoc network [8]. It only needs transceiver and equipped without infrastructure, and it can do its communication with other nodes. The nodes can connect with other nodes that exist in another area in the infrastructure based wireless network and transferring the data [9]. The ad hoc networks are not effective if compared with a large network such as infrastructure network wherever; the node has a limited range if the nodes ranged are combined, that would produce large data transmission area [10].

3. Genetic Algorithms (GA)

The cell is the primary unit of living organisms. The entire cell has the same chromosomes. The chromosomes carry the genetic material and encoding the body, wherever it consists of genes [11]. The gene encoded the protein. For example, a particular gene is encoding the colour of eyes (blue, brown). Each gene has a site (locus) in the chromosome [12].

3.1 Concepts of GA

The Genetic Algorithms are means natural selection and natural genetics. GAs simulated the processes in natural evolution. The process was included operates on chromosomes (the element can encode the living being structure) [13]. The GA is searching among a population of points, and it differs from other search methods. Also, it uses data of the objective function without gradient data. The traditional ways use gradient data; wherever the transition of the GA is probabilistic [14]. It was used as a general optimization of the algorithm. Furthermore, it provides methods for searching in the irregular area and could Appling it for optimization of the machine learning applications, optimization of the function, parameter estimation [15].

3.2 Fitness Function

Genetic algorithms are useful for solving large or maximization problems. The maximization problems are converted to minimization problems. The fitness function as shown in equation 1 is derived from the objective function and used in successive genetic operations. For example, fitness pheromone is used in determining reproductive properties. The fitness function could represent an objective function for minimization problems; the following transformation is possible.

$$f(x) = \frac{1}{1+f(x)} \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

This transformation is converting a minimization problem to a maximization problem [16].

3.3 Basic Genetic Algorithm Operators

1- Elitism

Our study has great chance, if try to form new population by mutation or crossover, that resulting losing the chromosomes. Elitism is new method creating copies the best chromosome [17]. Elitism prevents losing the best-found solution therefore, it very rapidly in the performance of GA [18].

2- Selection

Chromosomes are elements selected and moved among the generations from parents to a new generation. Theory of Darwin's evolution is explaining selection by the individual that can survive and create a new generation. Many of methods of the selection including the most common methods are roulette wheel method [18].

- **Roulette Wheel Selection**

  The fitness is determined and chooses the parents wherever it was done selecting the best chromosomes. Figure 1 is showed roulette wheel methods depend on the percentage of the chromosomes and it placed accordingly to its fitness.

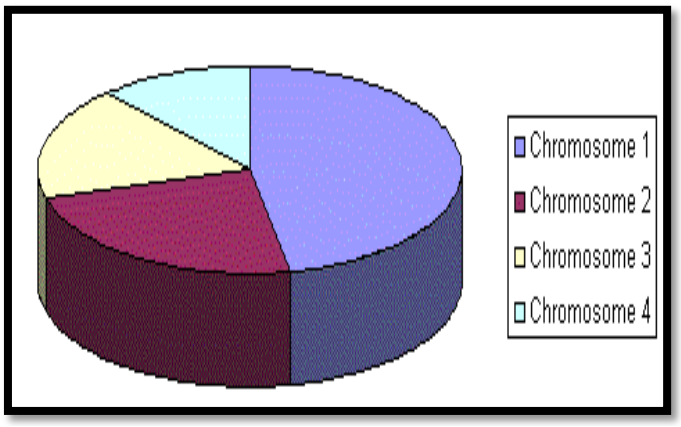

Fig. 1: Roulette Wheel Selection [18]

Then a small ball is thrown there to select the chromosome. A chromosome with bigger fitness will have a bigger chance to be selected more times.

3- The crossover

It is formed from mixing two strings to form another better string. The recombination creates new ones in new generations by mixing genetic material from two ones. The good strings in a population have larger of the copies. Exchanging the data among strings will create new strings.
The parent is participating in produce new strings (children). Exchanging all bits randomly is performed as Figure 2 [19].

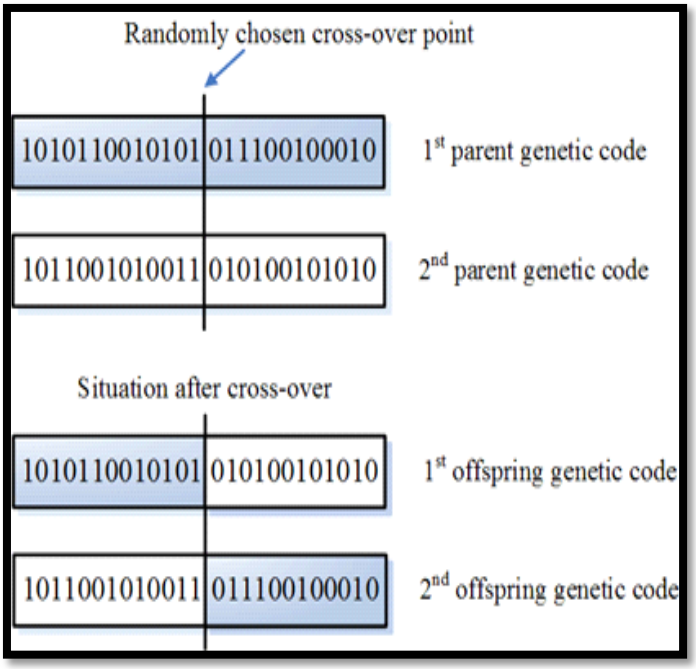

Fig. 2: operation of crossover in one site crossover operation [7]

The process is done randomly. Right portions are chosen for exchanging the strings to produce new strings. The new two places are different if compared with old strings as Figure 3. The information between the strings is transfered better than the parents [19].

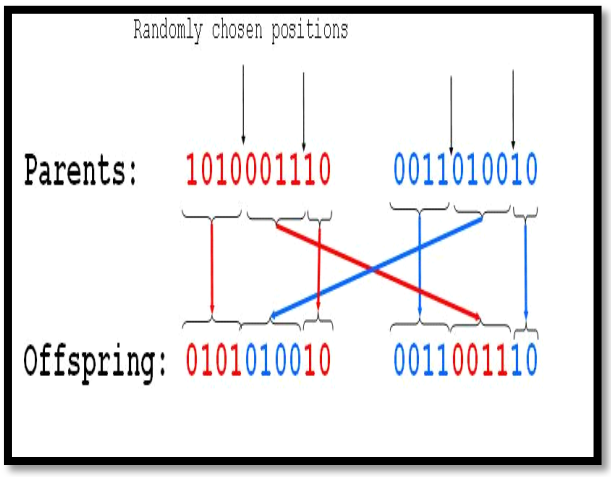

Fig. 3: Two site crossover operation [19]

4- The mutation

The mutation will create new data randomly. The mutation is a factor producing new diversity in the population to create new individual. The mutation makes the chromosomes changed Figure 4.

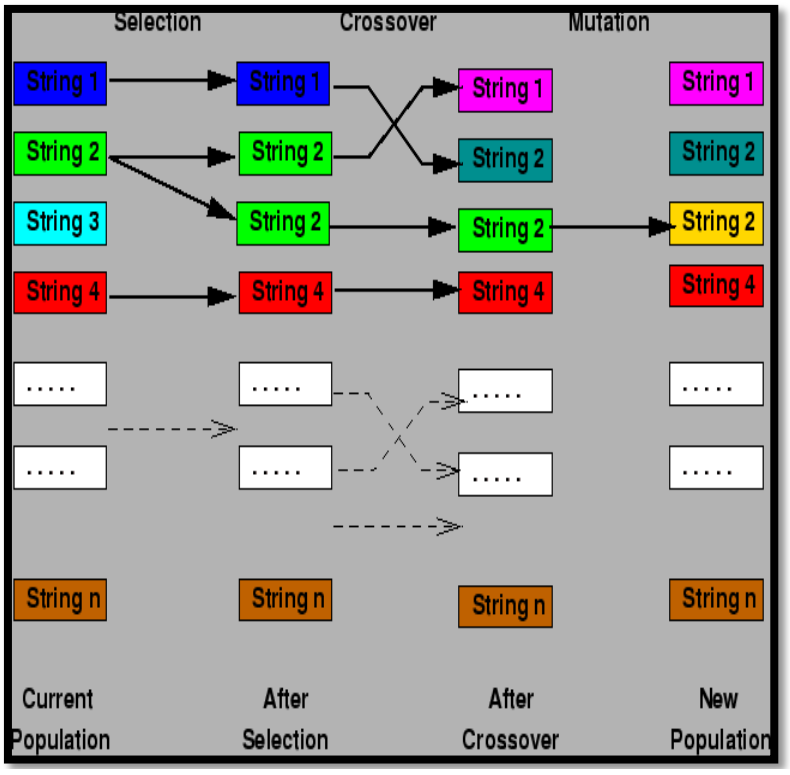

Fig. 4: The basic GA operations [7]

Mutation is any randomly change in genetic data. It works at a bit level; if the coping of bits from string to another string that represents changing and called mutation. The probability of mutation is called P_m. If the number is limited between (0 and 1), [20] then the bit become inverted. Therefore the zero converts to one and one convert to zero. That will cause bit diversity by scattering the occasional points. The mutation is used for creating point changing. For example, see Figure 5 [21].

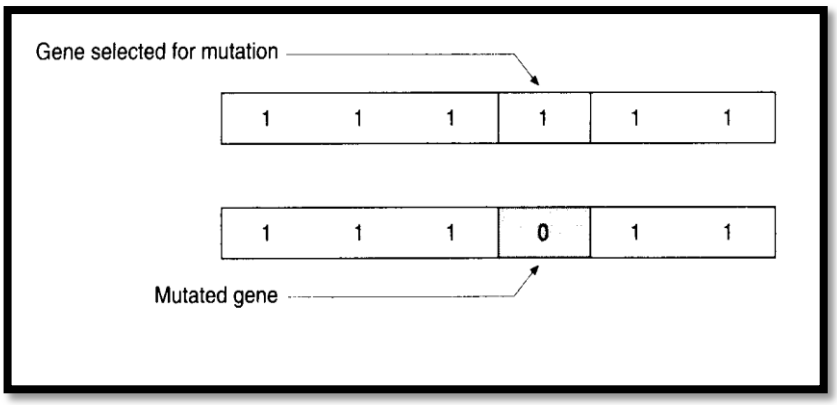

Figure (5): Mutation operation [8]

If Appling of the operators on the population, it will create a new population. The new population is generating new other populations for reaching optimum cases. The values of the individual's objective function are determined by strings decoding. [22-25] The values represent the fitness of the new generation's solutions. Each cycle called generation, the improvement during the generations [21,26].

4. Implementation

The performance of the Genetically-trained Ad hoc Network to identify different nonlinear dynamical systems is evaluated here. As the performance index to be minimized by the GA, the MSE criterion was employed. For the simulation tests performed here, the parameters of the real-coded GA were set to the following values. Population size is 1000 for the first group test and 200 for the second group test Maximum number of generations is 1000, mutation probability (P_M) 0.08 and area size 10 and it was implemented in the Matlab environment.
From several simulation tests, the above GA parameters settings were found to be the best values that provide the best training for all Ad hoc networks considered in this work.

4.1 Simulation Results with disabled of the barge

Case study 1: The value parameters coded GA for the figure 6 is:

Number of barges: 45
Number of generation: 1000
Population size: 1000
Mutation Probability: 0.08

The red barge is the actual barge that selects the best course (3,4,5,6,7,8,9,10,11,13,14,15,16,17,19,20 21,22,23,24,25,27,28,29,31,32,34,38,40,42,44) mixed with seven black barge that form the secondary towers (Emergency) are (1,2,12,26,18,41,43 45) and there are five barge which are stopped its colored green (31,37,35,33,39) as shown in figure 6 and cost evaluation with number of barges 45 shown in figure 7.

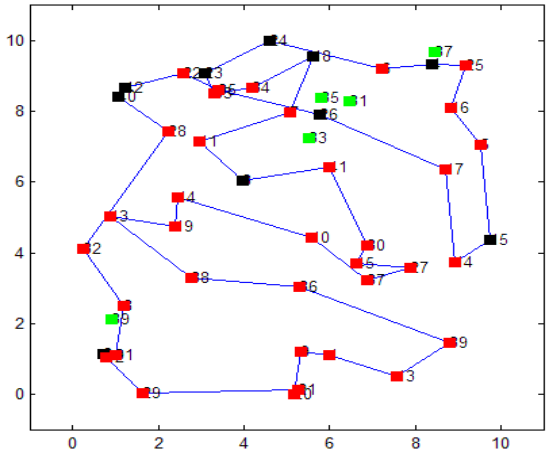

Figure (6): Generation 1000 best path length 75.3605 with number of barge 45

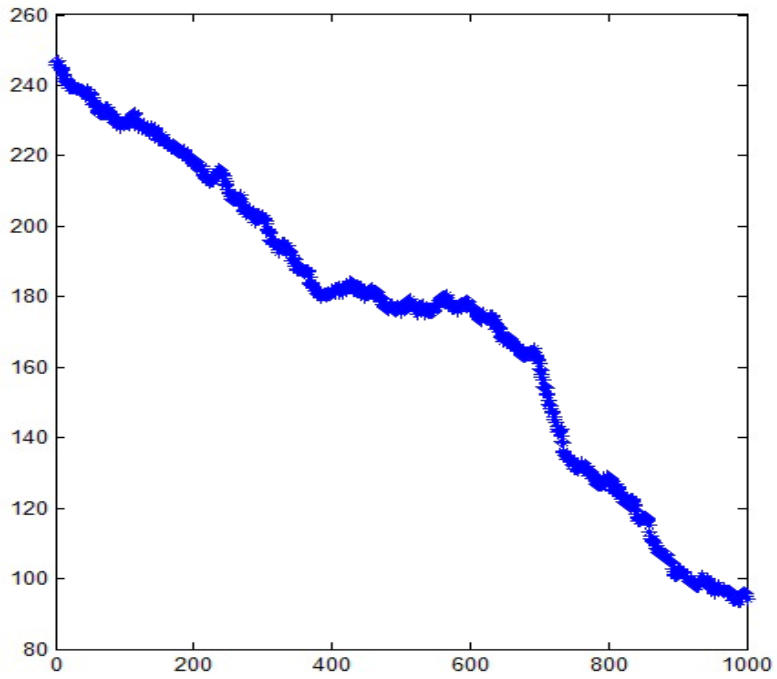

Figure (7): Show the cost evaluation with number of barge 45

Case study 2: The value parameters coded GA for the figure 8 is:

Number of barges: 66
Population size: 1000
Generation number: 1000
mutation probability: 0.08

The red barge is the actual barge that selects the best course (1, 3, 4, 5,6 ,7, 8, 9,10, 11,13, 14, 15, 16, 20, 21, 23, 24, 25, 27, 30, 32, 36, 38, 40, 41, 42, 43, 44, 45, 46, 47,48 ,49, 50 51, 52,53, 54,55, 56,57, 58,59,60,61,61,63,64,65,66) mixed with ten black barge that forms the secondary towers (Emergency) are (28,18,22,12, 2,17, 19,34,26,29), and there is five barges which are stopped are coloured green are (39,31,37,35,33) as shown in figure 8 and cost evaluation with number of barges 66 shown in figure 9.

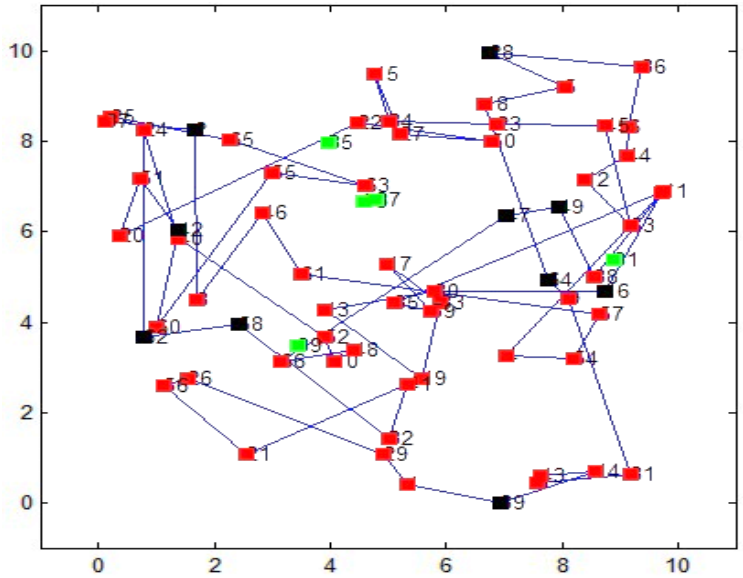

Figure (8): Generation 1000 best path length 136.9495 with number of barge 66

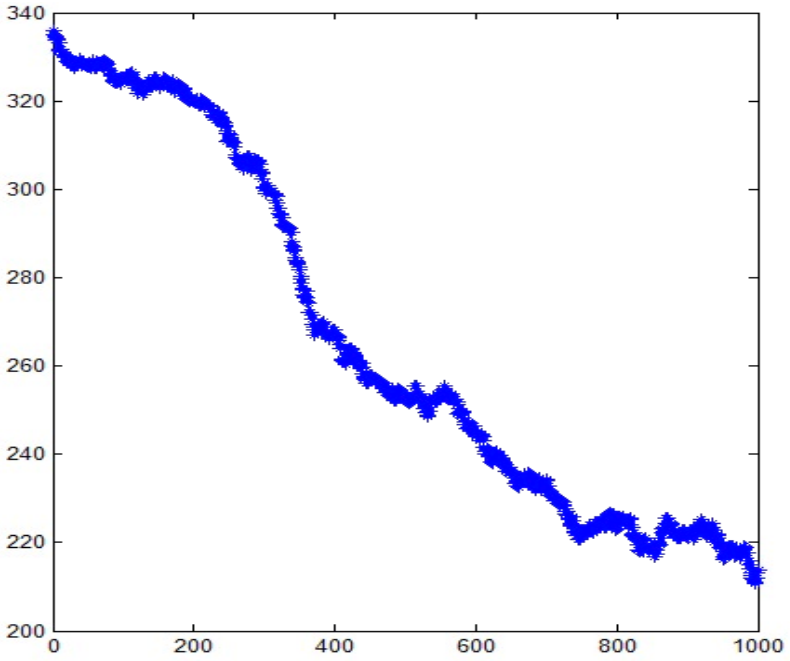

Figure (9): Show the cost evaluation with number of barge 66

Case study 3: The value parameters coded GA for the figure 10 is:

Number of barge: 45
Population size: 200
Generation Number: 200
mutation probability: 0.08

The red barge is the actual barge that selects the best course (1, 2, 3, 4, 5, 9, 12, 13, 14, 16, 17, 18, 19, 21, 21, 22, 25, 26, 27, 28, 29, 30, 32, 34, 36, 38, 40, 41, 42, 43,44,45) mixed with eight black barge that form the secondary towers (Emergency) are (6,7,8,10,11,15,23,24) and there are five barge which are stopped are colored green are (35, 37, 39, 33, 31) as shown in figure 10 and cost evaluation with number of barges 45 shown in figure 11.

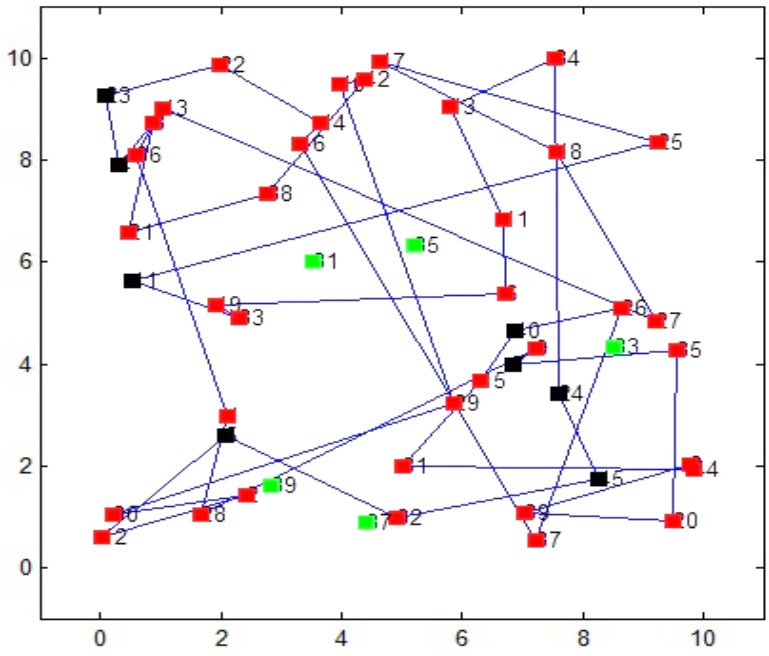

Figure (10): Generation 200 best path length 143.5724 with number of barge 45

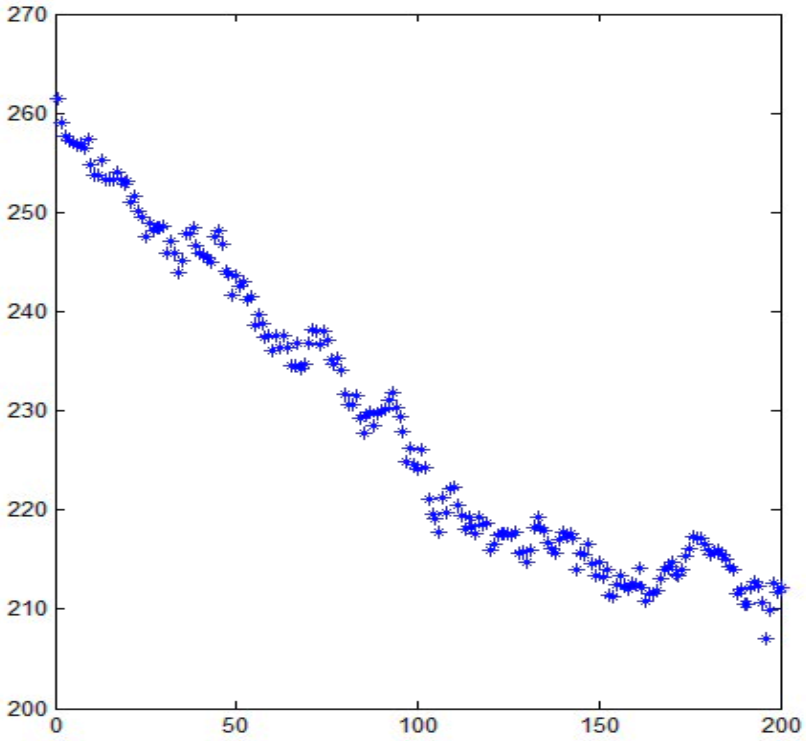

Figure (11): Show the cost evaluation with number of barge 45

Case study 4: The value parameters coded GA for the figure 12 is:

Number of barge: 66
Population size: 200
Generation number: 200
mutation probability: 0.08

The red barge is the actual barge that selects the best course (1,2,3, 4,5,6, 7,8,9,11, 14,17, 19, 24, 25, 28, ,30,34, 36,38,41,42, 43,44,45,46,47,49, 50,51,52, 53,54,56,57,58,59,60,61,62,63,64,65,66) mixed with twelve black barge that form the secondary towers (Emergency) are (15,16, 10,12, 20,22, 23,26,32,40,48) and there are five barge which are stopped are colored green are (31,33,35,37,39) as shown in figure 12 and cost evaluation with number of barges 66 shown in figure 13.

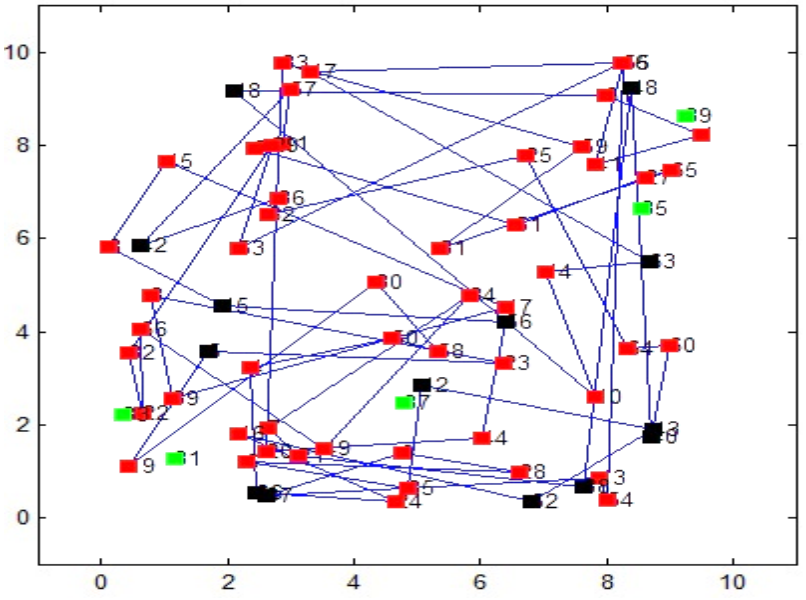

Figure (12): Generation 200 best path length 235.0194 with number of barge 66

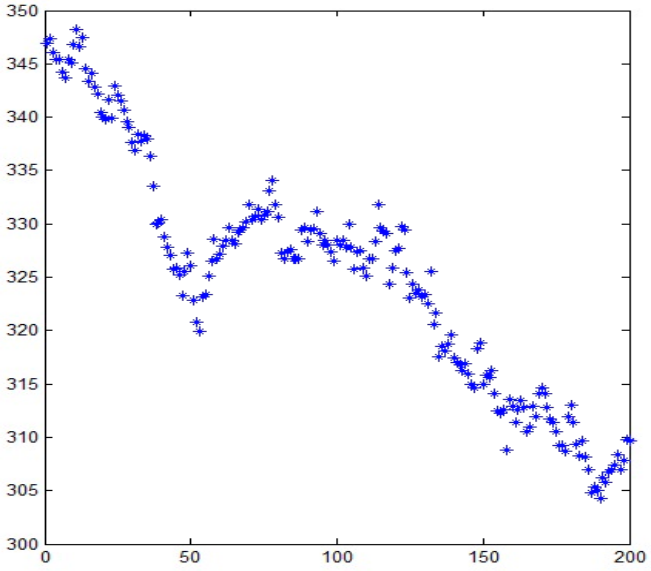

Figure (13): Show the cost evaluation with number of barge 66

5. Discussion and Conclusions

Through our work, this study have been able to obtain several nodes that can perform a high-performance system in communication ways to take advantage of time and short track. And create secondary towers that can perform the functions of the emergency node and take advantage of the genetic algorithm and continue to work and reduce the errors resulting from the collapse of the network regardless of the error that occurs during the failure of the node and this will make the system can maintain the path.

6. Recommendations and Future Work

It is possible to develop the system by integrating it with the network of military aircraft, where the error rate is very few. In addition to reducing the time and cost and choosing the most appropriate way compared to the rest of the systems. The system can link the boundaries of thirty-five towers where it can't move because the system will have a coefficient So our study suggest a way to get more by improving genes using techniques that can count between valid chromosomes.

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