ISSN: 2063-5346
Section A-Research paper

Intelligent System Based On Genetic Algorithms. Case: Vehicular Traffic Control. Perú

[1] *Mg. Julissa Elizabeth Reyna-González, [2] Mg. César Wilfredo Rosas Echevarria [3]Dr. Miguel Angel Vásquez Castro,
[1] Professor at the Universidad Nacional Hermilio Valdizan,[2] Professor at the Universidad Nacional Hermilio Valdizan,[, [3] Professor at the Universidad Cesar Vallejo
[1] *jreyna@unheval.edu.pe,[2] crosas@unheval.edu.pe[3] miguelito_1605@hotmail.com,

Abstrat: This project seeks to provide a possible solution to the problem of vehicular traffic in the city of Huanuco. Taking advantage of the infrastructure of traffic lights, streets, alleys, avenues, and other routes for this work will focus on the search for alternate routes thus avoiding vehicular traffic or saturation of traffic routes for an adequate traffic flow. The behavior of the traffic flow in the exits and entrances to the city will be experimented and a genetic algorithm will be proposed for the search of routes taking into account the time schedules and reports, as well as the use of Google Maps so that it contributes to reduce the time lost in traffic
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Keyword: Genetic Algorithm, Vehicular Traffic.

I. INTRODUCTION

Today, in the international context, the growth of the automobile fleet has generated a notable increase in the number of vehicles in circulation of such magnitude that it even exceeds the growth of the population itself. As an obvious consequence, the motorization of the country's economic and social life (measured by the number of vehicles in circulation per inhabitant) has made notable progress, especially in recent years. The registration of motor vehicles has had an exponential increase that has resulted in the main cities of the country gradually becoming more difficult to transit.

According to the National context in the city of lima has found reports of increased vehicular traffic according to information from the Ministry of Transport and Communications, the vehicle fleet in Peru since 2012 has grown on average 7%, reaching in 2016 to 2'661,719 vehicles circulating in Peru. In addition, Metropolitan Lima (including Callao) is the region that has more vehicles circulating on its roads (1'752,919 vehicles), due to data observed 66% of vehicles that exist in the vehicle fleet in all Peru, that is to say more than half of cars that there are in the country circulate on the roads and highways of our capital; being cars (807,529 units) the ones that are circulating the most, followed by station wagons (284,251 units) and rural vans (236,502 units). In Lima there are some 1,200 traffic-light intersections, of which only 380 have fiber optics and are controlled from a central office of the Municipality of Lima. The rest operate at their own free will or by the district municipalities without any level of coordination. In addition to this, urban growth in Lima lacks planning and urbanizations have grown next to industrial companies. The districts with this problem are: Surquillo, San Isidro, La Molina, Lima Cercado and Callao. According to the Traffic Department of the National Police, a total of 242 points in Metropolitan Lima and Callao were identified as critical due to the high flow of vehicles. And according to the NGO Luz Ámbar, one of the reasons for the vehicular chaos in the capital is the lack of order in the traffic light system at intersections.

According to the local context of the city of Huánuco. According to reports from Dirtepol Huanuco, an average of 25,000 vehicles circulate daily in the city of the "best climate in the world", including motorcycles, tricycles and automobiles. Of the total, around 13,500 are registered and work with municipal authorization and the rest are still in the informal sector, causing traffic congestion on the city's main streets. Traffic is congested during rush hour, mainly in the center of the city, especially on Jr. Ayacucho, Jr. Huallaga, Jr. San Martin, Jr. Dos de Mayo, Jr. Abtao, Jr. Huallayco, Av. Universitaria, Carretera Central, among others. The flow of vehicles and people takes place on very narrow sidewalks (1 to 1.5 meters) and on intersections with little road capacity, generated by car parking, independently operated traffic lights, street commerce, poles and others. The percentage of growth or increase of private and public vehicles in Huánuco has registered about 80 vehicles in various categories, of which 71.15% are minors and 28.85% are light and heavy vehicles.

Through the use of genetic algorithms it can be assumed that the solution to a problem is an individual that can be

ISSN: 2063-5346
Section A-Research paper

represented by a set of parameters, which are known as the genes of a chromosome, which can be structured as a value in binary format.

Therefore, the general objective is to develop a genetic algorithm for the improvement of vehicular traffic in the city of Huanuco, and the specific objectives, (1) Identify the restrictions of vehicular traffic in the city of Huanuco, (2) Design a genetic algorithm that provides a feasible solution for the development of alternative routes in the city. (3) Design a database to determine the requirements needed to improve vehicular traffic in the city of Huanuco.

II. METHODS

Design and area of study

Non-experimental design is used because the variables will not be manipulated, the type is descriptive because the way to improve the performance of existing genetic algorithms that support road reordering was analyzed.

Population

The population involved in the development and the objective of the study was taken into account, made up of the transport of small vehicles as well as trimobiles and collectives in Amarilis, Pillco Marca and Huánuco, with a database of 17,000 authorized trimobiles.

The sample was obtained with a 95% confidence level and a 5% error, with 376 trimesters.

Variables, instruments and procedures

The variables observed were: the integrated system based on genetic algorithms (independent variable) and vehicle traffic (dependent variable). The technique used to collect information was through a questionnaire that was applied to a number of users of vehicular transport, drivers and other actors of vehicular traffic in the city of Huánuco, as well as research to obtain data published by the entities in their corresponding web pages.

III. RESULTS

Table1
Vehicle traffic restrictions

Restrictions		N°	%
Reason of origin of the chaos	Narrow streets	62	16.5
	Disorder of vehicles	203	54.0
	Roads in poor condition	47	12.5
	T. A	64	17.0
Operation of traffic lights	Good performance	52	13.8
	Poor performance	257	68.4
	No opinion	67	17.8
Time lost due to congestion	1 hour	127	33.8
	2 to 5 hours	87	23.1
	3 to 5 hours	118	31.4
	No delay	44	11.7
Time of day of major traffic congestion	Peak hours	240	63.8
	All day	87	23.1
	No opinion	49	13.0

Table 1 shows that the most frequent cause of vehicular chaos is vehicular disorder. Most of the traffic lights are in poor condition, and the time lost during traffic chaos is 1 hour, more frequently during rush hour.

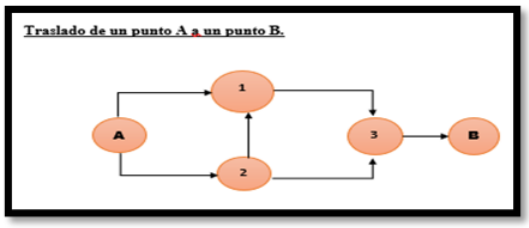
Table 2
Area of greatest vehicular chaos in the city of Huanuco

	N°	%
Central Street (near plazas, shopping malls and parks)	185	49.2
Entrances and exits to the city	74	19.7
No opinion	44	11.7
All streets	73	19.4

Figura 1. Grafos algortimo

ISSN: 2063-5346
Section A-Research paper

Figura 2. Diseño del algoritmo



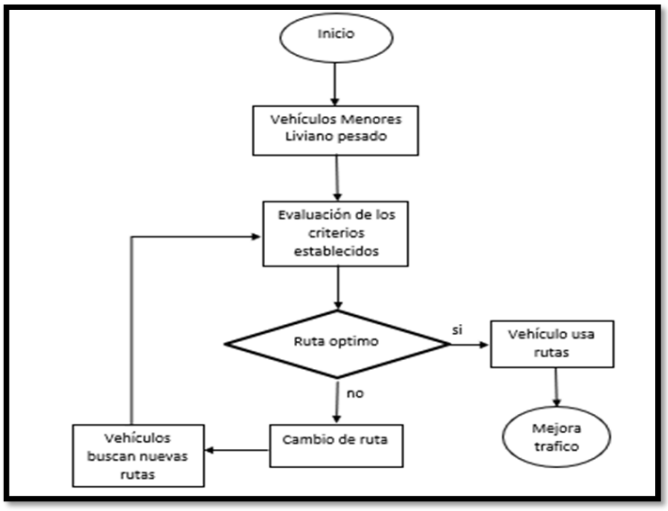
pseudocode
The Simple Genetic Algorithm.
BEGIN /* Simple Genetic Algorithm */
Generate an initial population.
Compute the evaluation function of each individual.
WHILE NOT Finished DO
BEGIN /* Produce new generation */
FOR Population size/2 DO
BEGIN /*Reproductive Cycle */
Select two individuals from the previous generation, for the cross (probability of selection proportional to the evaluation function of the individual).
Crossing with a certain probability the two individuals obtaining two offspring.
Mutate both offspring with a certain probability.
Compute the evaluation function of the two mutated offspring.
Insert the two mutated offspring into the new generation.
END
IF the population has converged THEN Finished: = TRUE
END
END

IV. Discussion

The objective of the research work was to determine the influence of vehicular transport congestion on health in the city of Huánuco, 2020. The research design is non-experimental, cross-sectional, descriptive and quantitative, whose purpose was to establish vehicular transport congestion.

From the data obtained from the research; in relation to vehicular transport congestion affecting health, according to the perceptions in relative terms constituted by drivers of combi, cab, motorcycle cab and motorcycle cargo, major cargo dump trucks, and combi transport in the city of Huánuco, the main cause that generates traffic is: 54. The main cause of traffic is: 54.3% is the vehicular disorder found in the city, 34.3% is generated by the narrow streets that the city has in some parts of the city, 2.8% is generated by the poor condition of the roads in the main streets of the city and surrounding areas.

Vehicular congestion is also caused by the massive increase in the number of vehicles, which has the effect of causing congestion during the hours of 6:00 a.m. to 8:30 a.m. and 6:00 p.m. to 8:00 p.m., resulting in the loss of time during



the trip, mainly due to the increase in the number of vehicles,

ISSN: 2063-5346
Section A-Research paper

specifically cars, due to economic growth and incorrect road infrastructure, and irrational use by vehicles, which is not attended to by the authorities on duty.

Transportation congestion in the city of Huánuco, generated mainly by the increase in the number of vehicles due to the population's accessibility and the decrease in prices in the local, regional and national markets.

The accelerated migration from rural areas to the capital of the department in the last decades commits us to preserve the cities so that their spaces provide a good quality of life, allowing adequate conditions for the mobility of people.

Vehicle transportation is continually increasing in the city of Huánuco. The resulting congestion has become a concern of the citizens, and the existing methods for urban transport vehicle congestion is insufficient.

Vehicular chaos due to the excessive number of vehicles on narrow roads is a daily occurrence, mainly in the cities of Huánuco, which have the highest concentration of population; passengers are condemned to deal with the difficulty of transportation, wasting time in traffic jams.

The concentration of vehicles on different roads at certain hours, transportation companies affect health and the environment, and the laws contribute in part to the improvement of urban transportation, road education on rules and actions contribute to the behavior of drivers and pedestrians.

On the other hand, one of the disadvantages is the informality of urban transport companies, since they are hidden actors and their operation is deplorable.

The municipality of different districts of the city of Huanuco is the one that provides the circulation permit and routes to the urban transport companies, these units are owned by individuals who register them in the company, but do not assume responsibilities on health and environment in the city of Huanuco, likewise the inconvenience of an urban transport system is worsening as society becomes more urban and economically more prosperous, both circumstances that aggravate the vehicular traffic in the city of Huanuco.

V.CONCLUSIONS

- After carrying out the traffic analysis, it can be affirmed that the proposal fulfills the defined objectives. Through the implementation of a genetic algorithm, it has been possible to obtain a report containing the best configuration of the transport lines.

- A general review of the state of the art in genetic algorithms is presented with emphasis on their application to optimization problems in networks as well as within the framework of sequencing problems, exposing the most used chromosome representation structures.

- The behavior of the GAs is analyzed and compared with the results obtained from the surveys. As a result of these results, it can be concluded that the study presents alternative ways to solve optimization problems. In the particular case of the problem of finding the optimal route in a network, it has the additional advantage of selecting not only the best chromosome but also establishing solutions.

- Genetic algorithms play a good role in optimization problems involving networks. Each case explores some different characteristic of the GA. Thus the algorithm works by trying to predict the response of a processor that is required to migrate a task, find an optimal location of measuring instruments or a minimum-cost connection scheme in a packet-switched network.

- One difference is in the way the chromosome is represented, which in some cases results in some modifications to the crossover and mutation operators.

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