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Taguchi Method Based Node Performance Analysis of Generous TIT- for-TAT Cooperation of AD-HOC Networks

Noor Kareem Jumaa[1], Auday A.H. Mohamad*[2], Abbas Muhammed Allawy[3], Ali A. Mohammed[4]
[1]Univertcity of Technology, Computer Eng. Dept., Baghdad, Iraq
[2]Al-Mustansiriyah University, Electrical Engineering Department, Baghdad, Iraq
[3]Federal Public Service Council, Baghdad, Iraq
[4]Imam Ja'afar Al-Sadiq University, Computer Technology Engineering Department, Baghdad, Iraq

Correspondance
*Auday A.H. Mohamad
Al-Mustansiriyah University, Electrical Engineering Department, Baghdad, Iraq
Email: auday.mohamad@uomustansiriyah.edu.iq

Abstract
Ad-Hoc networks have an adaptive architecture, temporarily configured to provide communication between wireless devices that provide network nodes. Forwarding packets from the source node to the remote destination node may require intermediate cooperative nodes (relay nodes), which may act selfishly because they are power-constrained. The nodes should exhibit cooperation even when faced with occasional selfish or non-cooperative behaviour from other nodes. Several factors affect the behaviour of nodes; those factors are the number of packets required to redirect, power consumption per node, and power constraints per node. Power constraints per node and grade of generosity. This article is based on a dynamic collaboration strategy, specifically the Generous Tit-for-Tat (GTFT), and it aims to represent an Ad-Hoc network operating with the Generous Tit-for-Tat (GTFT) cooperation strategy, measure statistics for the data, and then analyze these statistics using the Taguchi method. The transfer speed and relay node performance both have an impact on the factors that shape the network conditions and are subject to analysis using the Taguchi Method (TM). The analyzed parameters are node throughput, the amount of relay requested packets produced by a node per number of relays requested packets taken by a node, and the amount of accepted relay requested by a node per amount of relay requested by a node. A Taguchi L9 orthogonal array was used to analyze node behaviour, and the results show that the effect parameters were number of packets, power consumption, power constraint of the node, and grade of generosity. The tested parameters influence node cooperation in the following sequence: number of packets required to redirect (N) (effects on behaviour with a percent of 6.8491), power consumption per node (C) (effects on behaviour with a percent of 0.7467), power constraints per node (P) (effects on behaviour with a percent of 0.6831), and grade of generosity (ε) (effects on behaviour with a percent of 0.4530). Taguchi experiments proved that the grade of generosity (GoG) is not the influencing factor where the highest productivity level is, while the number of packets per second required to redirect also has an impact on node behaviour.

Keywords
Ad-Hoc, generous tit-for-tat, grade of generosity, Taguchi, throughput.

I. INTRODUCTION

The standard of 802.11 defines an "Ad-Hoc" mode along with a "Radio Network Interface Card (NIC)" that allows an Independent Basic Service Set (IBSS) network configuration to run. Accordingly, IBSS does not have access points. The devices of the users could communicate with each other di-

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rectly using the peer-to-peer method. So, ”Ad-Hoc mode” permits users to automatically configure a temporary wireless Local Area Network (LAN). With Ad-Hoc mode, the file can be easily transferred from one computer to another. These applications do not require the installation of an access point and cables to function [1].

A wireless ad hoc network, or mobile ad hoc network, stands for a variety of decentralized wireless networks. The network represents Ad-Hoc because it is not affected by pre-existing infrastructure, such as routers in wired systems or access points in wireless networks [2,3]. Ad-Hoc networks possess the characteristics of fast setup time, improved performance, limited network access, and difficult network management [1, 4, 5]. Thus, Ad-Hoc networks are difficult to manage. Ad-Hoc requires user-level management, which requires a certain overhead packet number of transmissions over a wireless LAN, which again tends to be in Ad-Hoc mode far from the largest and most massive network applications, Enterprise wireless LAN applications. In ad hoc wireless networks, nodes interconnect with remote terminals using intermediate nodes as relays. As wireless nodes are limited by power, it may not always be in the node’s interest to accept relay requests. Instead, in the case of all nodes choosing not to spend energy on the relay, the network’s transmission rate will drop intensely. These two extreme scenarios (full cooperation in addition to non-cooperation) have been detrimental to the user’s interests. In this research article, we deal with the matter of computer collaboration in ”Ad Hoc networks”. The nodes are assumed to be rational; that is, their attitude has been precisely specified based on self-interest. Every node is related to the smallest lifetime of restrictions. The optimal throughput for a node can be determined by providing these lifetime restrictions and the supposition of rational behaviour. Accordingly, we suggest an accessible and distributed acceptance algorithm named Generous Tit-for-Tat (GTFT). Nodes that decide whether to accept or reject the relay request [6, 7] are based on the approval algorithm.

The Taguchi method has been used on many different topics to achieve different goals. However, authors are rarely used in the ad-hoc network domain. This article used TM to study and analyze the parameters affected by Ad-Hoc node behaviour and its collaboration performance using the GTFT strategy and best node performance. The Taguchi method was applied to analyze the node throughput rates φ and ψ.

This article is organized into nine sections. Section II. provides a brief survey of the literature on relevant works; Section III. discusses the GTFT strategy; Section IV. discusses the Taguchi DOE; Section V. describes the simulation; Section VI. contains improved node behaviour resulting from the Taguchi experiments; Section VII. presents the results of GTFT nodes; Section VIII. concludes this article; and the final section shows references used.

II. LITERATURE SURVEY

Reference [1], the author simulates a GTFT collaboration strategy with one relay node between source and destination and tests the behaviour of an Ad-Hoc network contains four nodes. Their simulation model constitutes and highlights the GTFT algorithm’s importance and advantages that avoids self-respect in the network. Their method specifies that this method of representing node is useful to the system. From now on, the network additional throughput will be greater with the corresponding power restriction. Reference [7], the authors implemented several collaboration strategies for ad hoc networks. Their results prove that GTFT was preferable because GTFT decreases the fraction of power spent by nodes in relaying but at once, allowing nodes to give out many packets throughout their lifetime. Reference [8], the researchers combined optical Mobile Ad-Hoc Network (MANET) architecture with auxiliary routing optimization using Taguchi method combined with cross-layer approach to solve routing challenges especially MANET-based wireless domain Quality of Service (QoS) feature in the case of Internet integration and the results of the investigation of the solution present an effective QoS method Effective with reduced contrast that can help as an alternative to mobile internet access for mobile phone users. Reference [9], a classification study explains the best performance in terms of transmission strategy under limited information. The paper proposed a transmission strategy (so-called SARA) Pareto rule for ICARUS and GTFT in order of usefulness, rate of packet forwarding, as well as power consumed by the network. Significant gains are revealed; one very substantial result is that the power consumed by the network can be divided by 2 as the packet forwarding problem and the power control problem are handled mutually.

III. GENEROUS TIT-FOR-TAT (GTFT)

The GTFT algorithm follows game theory as defined by the financial aspect. It is in line with the principles that users will implement a specific policy based their observed views of other users’ decisions. In a different way than others, mentoring procedures, GTFT doesn’t operate on the incentive-based model. The node is not satisfied with the default currency when it returns a data packet. Alternatively, they are incentivized to send the packet of data since they anticipate other nodes to interact destructively and license their requests later in case, they don’t cooperate to evolve the packets as frequently as they should; last variation, GTFT is a routing algorithm of session based [1, 3]. In GTFT, the time has been split into periods. The session occurs during the slot period. Decisions of routing are made one session each time rather than at the level of packet. Before the source node transmits any packets, firstly, it will issue a session request. Then, relays are specified to either accept whole relay requests to the session or not to accept them at all. The nodes reject session requests either if they have promoted sessions more than the optimal Pareto value or if the rate at which they tolerate sessions (less than the generosity score, ε) is major than the rate at which other nodes comply with their session requests. In another expression, if the value of generosity was greater, the nodes would be more willing to receive the session request even though they did not receive a similar amount of assistance in response. Next, nodes are divided based on their strength and limitations. The power constraint is defined as the ratio between the initial allocated powers of a node with its predictable life (i.e., the slots number) [1, 7]. The equivalent power (energy) constraint linked with the present session can then be fine from a node with lower energy (power) shrinkage. This is due to a node with more power constraints has no incentive to work more prolifically in advancing packets because it distinguishes that other nodes with less constraints of power are unable to exchange in type. For a specified period, a node could be a source, a relay, or a destination. A node consumes energy as a source and relays it to others. The entire amount of energy that a node expends as a source and relay will be retained by its power constraints [1, 10]. This is explained in (1) [1].

$$\sum_{j=1}^{k} e^{s}{}_{pj} + e^{r}{}_{pj} \ \le P_{\ class\ (p)} \tag{1}$$

Where: es j is the average energy consumed for each slot as a source, er j is the average energy spent for each slot as a relay, K stands for the total number of sessions, j is the current session and class (p) stands for the power class p constraint.
GTFT has the advantages of the vital (dynamic) algorithm. Ratio of the packets forwarded to other nodes does not depend only on the settings of initial power but also on the state of the network. If the rates of another nodes accepting relay requests are lower than the similar node that will receive them, the node will be modified and thus forward fewer data to others at some point [1, 11].

IV. TAGUCHI METHOD

This article aims to present the problem of improving GTFT node behaviour as a series of experiment design tests based on Taguchi's method for designing experiments. According to optimization theory, an experiment is a series of tests in which the inputs are changed according to a certain procedure to determine the causes of the output response changes [12].
Dr. Taguchi Genichi improved the quality control called ”Taguchi Design of Experiments”. The Taguchi method was used to arrive at the best values of the factors affecting the design steps to make the design of any product less sensitive to the influence of noise. The results of using the Taguchi method were optimal in improving product quality [13]. The principle of orthogonality is the mathematical basis of Taguchi's method for designing an experiment, as it is used to measure the influence of controllable factors. Taguchi matrices contain columns of independent coefficients, and the size of orthogonal matrices in Taguchi depends on the number and levels of designer variables. Details could be founded in [14].
The number of experiments affecting the design can be found based on several factors, which are the number of Taguchi parameters (M) and the number of levels for each parameter (G), as these factors are related to the relationship (M*f+1), where f = (G-1) [15]. Three levels, four factors can be controlled with nine experiments (L9 (3)4). The orthogonal Taguchi group can be found in [16], [17], [18]. While other applications of Taguchi method could be seen in [19], [20], [21], [22]. The fitness function and SNR are used to evaluate the experiment. The SNR is used to study the influence of factors to find the optimal solution. To calculate the SNR, (2, 3, 4, 5, and 6) are needed [13].

$$S_m = \frac{(T1+T2+T3)^2}{N} \tag{2}$$

$$S_t = T_{12} + T_{22} + T_{32} \tag{3}$$

$$S_e = S_t - S_m \tag{4}$$

$$V_e = \frac{Se}{(N-1)} \tag{5}$$

$$SNR = \ 10Log\ \frac{(Sm-Ve)}{(NxVe)} \tag{6}$$

N is the number of results equal to 3 and T (T1 to T3) is the results values. In this article, T1, T2, and T3 are the measured throughput, the measured φ, and the measured ψ respectively (φ and ψ are defined in sections 5, 6). Meanwhile, SNR is the signal to noise ratio.

V. GTFT COOPERATION STRATEGY BASED AD-HOC NETWORK SIMULATION

In this article, a single node (n_1) behaviour has been considered which is a part of a population contains N nodes dispensed among κ classes. Now, suppose n_i are the nodes in class i where $i = 1$ to N. The value of N is assumed to be 4 for easier simulation; so, the simulation nodes are (n_1, n_2, n_3, n_4). All nodes have an energy constraint (Ei), and a lifetime expectation (Li). Each node has a constraint of average power which is $\rho_i = Ei/Li$. It's assumed that $\rho 1 > \rho 2 > \rho 3 > \rho 4$. Since the system is operated in discrete time so, in every slot, any node of the N nodes (except n_1) could be picked as a source with the same probability where n1 is considered as a relay node for testing and analyze its behaviour in different networking circumstances using Taguchi DoE. Each source needs several relays to reach the destination and the relays max number is (M). For the sake of simplicity, at least one relay in each session has been assumed. The source demands the relay node to deliver its traffic toward the destination and the relay node could accept or deny the request. The relay node transmits its ruling to the source by sending either a negative or a positive acknowledgment. The traffic session blocked on negative acknowledgment. Positive and negative acknowledgments may be sent depending on power constraints. Because the node tested using Taguchi DoE under different conditions of power constrains. 0.0005 assumed as a constant value of energy needed for sending a packet.

For a relay node $n_1(n)$, denote by B_n the number of relayed requested packets made by node n, and by A_n the number of relays requested packets accepted by node n. D_n the relay requests number that has been made toward node n, and by C_n the relay requests number that has been accepted to node n. It's defined in (7) [1]:

$$\Phi n = \frac{A_n}{B_n} \quad and \quad \psi n = \frac{C_n}{D_n} \tag{7}$$

Watch that φ_n is the ratio of the relay requests number by n which had been accepted, to the requests number that had been made by n; thus, Φ_n is one of the throughput indications which experienced by n.

In the proposed GTFT algorithm, each node preserves an experience record for its behaviour depending on the two variables Φ_n and Ψ_n. Therefore, each node only keeps information for each session kind and does not keep individual logs of its experience with each node inside the network. The relay node always makes decisions based on its values of Φ_n and Ψ_n. Assume that the n relay node receives a request to be relayed. Suppose that ε is a small number representing the degree of generosity and that τ_n is the probable probability of accepting a request as far as a node in class i fetch a request. GTFT algorithm is as below:

If $\Psi_n > \tau_n$ or $\Phi_n < \Psi_n - \varepsilon$ → Reject
Else → Accept

The simulation details are summarized in algorithm 1. It should be mentioned that the algorithm is repeated 9 times (once for a Taguchi experiments) i.e., each Taguchi experiment is an ad-hoc session for testing the relay node with a different circumstance.

Algorithm (1)

```
Step_1: let node_i ∈ Class_i where i=1, 2, 3... k
Step_2: Let k=4
Step_3: Let Energy and Lifetime of all nodes are E_i and L_i respectively.
Step_4: Average power of node_i is $\rho_i = E_i/L_i$.
Step_5: Let $\rho_1 > \rho_2 > \rho_3 > \rho_4$
Step_6: Let n_1 is the relay node.
Step_7: Let $B_n$ is number of relayed requested packets made by node $n$.
Step_8: Let $A_n$ the relay requested packets number that accepted by node $n$.
Step_9: Let $D_n$ the relay requests number that made to node $n$.
Step_10: Let $C_n$ the relay requests number that accepted to node $n$.
Step_11: $\Phi_n = A_n/B_n$ , and $\Psi_n = C_n/D_n$
Step_12: Suppose $\varepsilon$ is a tiny +ve number which presents the grade of generosity and $\tau_n$
Step_13: If $\Psi_n > \tau_n$ or $\Phi_n < \Psi_n - \varepsilon$ → Reject , Else → Accept
```

VI. TAGUCHI METHOD BASED GTFT NODE BEHAVIOUR OPTIMIZATION

The proposed system demonstrates the Taguchi method for studying the effect on GTFT node behaviour; there are four factors (parameters). Then use the Taguchi method to infer which factor will influence the node's cooperative behaviour depending on throughput, φ, and Ψ; these are the measurements calculated from the Taguchi method. Where:

- Throughput is the number of forwarded packets per time slot.
- φ is the (amount of the requested packets that relayed and created by the node) per (requested packets number that had been accepted by a node from the relays).
- Ψ is the (amount of relay request that has been accepted to the node) per (number of relay request that has been made to the node).

The analysis is based on dependent factors. These factors are:

- Power constraints of the node.
- Several received packets by a specific node that need to be forwarded to the next node.
- Power consumption per a packet
- Grade of generosity.

GTFT node's behaviour optimization experiments (shown in Table I) have four control parameters (which represents the four factors that are mentioned above), where each parameter has three levels (values), so, L9 orthogonal array is selected. The parameters are:

- F1: Power constraints per node (P). Where (L1= 1, L2=0.5, L3=0.2).
- F2: Number of packets required to forward (N). Where (L1=1000, L2=500, L3=200).
- F3: power consumption per node (C). Where (L1=0.001, L2=0.0008, L3=0.0003).
- F4: Grade of generosity GoG (ε). Where (L1=0.08, L2=0.05, L3=0.02).

When the OA has designated the iterations or trials, experiments can be done. The trial number is concluded based on the application budget and the complication of experiments. For the GTFT node's behaviour experiments, it may contain 3 trials, and at finally, each trial has three outcome values which are:

- T1: is the measured Throughput.
- T2: is the measured φ.
- T3: is the measured Ψ .

Then, SNR is calculated using (2), (3), (4), (5), and (6). All of experiments' calculations are shown in Table II. After that, the average SNR value per parameter is calculated in accordance with given levels. The calculations for the ρ (F1), N (F2), c (F3), and ε (F3) are shown in Table III. From the DOE of GTFT node behavior, notices that Taguchi Method is perfect for identifying the best impact factor on the node behavior from the four given factors. Table IV concluded the results. Since this article's objective is to present the problem of improving GTFT node behaviour as a series of experiment design tests, Taguchi's method of designing experiments has been used. The strength of using the Taguchi method in this article is measuring design quality using the signal-to-noise ratio (SNR) and the orthogonal array principle that is used to study the influence of several design parameters: number of packets (N), power consumption (c), power constraint of the node (ρ), and GoG, respectively. The Taguchi method is a robust design approach that uses many insights from statistical experimental design to evaluate and implement process improvements. The basic principle is to improve product quality by reducing the impact of the causes of the difference without eliminating the causes.

It should be mentioned that the Taguchi DOE was generated for the L9 OA using Minitab version 20. Using MATLAB 2018, the simulation of the ad-hoc network was performed. The information regarding the parameters of ad-hoc networks was gathered using MATLAB and subsequently imported into the Minitab DOE in preparation for Taguchi analysis.

VII. GTFT NODE BEHAVIOUR RESULTS

Impact factor levels are taken as initial parameters and entered GTFT according to the OA-designed experiments of the Taguchi method which are used to evaluate node behaviour performance. Fig. 1 to 9 show the performance of the node. Based on Taguchi optimization, statistics show that the optimal case for a node to behave as a relay is in the third experiment where the values of φ and ψ were one due to the availability of ideal factors that are: the power of the node at the highest level, that is, the battery node is fully charged, the number of packets at its lowest level where it is equal to 200, and the packets that are required to be redirected by the node consume energy at the lowest level (0.0003 watts), that it is mean, the two hundred packets consume 6% of the node's battery power.

The throughput was as high as possible, and it was 200 out of 200 packets, which means that all packets were redirected. The influencing factor mainly is the number of packets required to be redirected, accordingly, the level of generosity does not effectively affect the behaviour, of the node because in the third experiment, the level of generosity was at the lowest level, which is 0.02. While most selfish behaviour of the node was in experiment 8 where the throughput equal to 41 out of 500 packets due to the non-ideal conditions of the node:

- The power of the node is at the lowest level. It is equal to 0.2, meaning that the battery is almost empty and at the level of 20% of the remaining charge, which drives it to selfish behaviour to maintain the level of its ability to stay alive (power on).
- The number of packets was at a high level, equal to 500.

The packets that are required to be forwarded by the node consume power at the highest level of 0.001 watts, meaning that the 500 packets consume 50% of the energy of the full node battery, in other words, that the node battery is not sufficient to redirect the packets. The selfish behaviour of experiment 8 was at the same level of generosity as that of the ideal cooperative behaviour of experiment 3, equal to 0.02.

Fig. 1 shows the behaviour of a node for experiment number (1), and from our observation of the shape, when ordering more than 200 packets, the φ of the node begins to decrease dramatically to reach a value of zero when requesting more than 1000 packets. From Fig. 2 and at experiment number (2), we notice that the node behaves roughly like experiment

TABLE I.
OA FOR GTFT NODE BEHAVIOUR EXPERIMENTS.

No. of Exp.	**ρ (F1)**	**N (packet) (F2)**	**c (watt) (F3)**	**ε (F4)**	**Throughput (T1) (packet/sec)**	**Phi (T2)**	**Psi (T3)**	**Mean (M)**
1	1	1000	0.001	0.08	225	0.2250	0.3061	75.1770
2	1	500	0.0008	0.05	294	0.5880	0.5910	98.3930
3	1	200	0.0003	0.02	200	1	1	67.3333
4	0.5	1000	0.0008	0.02	155	0.1550	0.1754	51.7768
5	0.5	500	0.0003	0.08	282	0.5660	0.5223	94.3628
6	0.5	200	0.001	0.05	73	0.3850	0.4385	24.6078
7	0.2	1000	0.0003	0.05	172	0.1720	0.1259	57.4326
8	0.2	500	0.001	0.02	41	0.0820	0.1046	13.7289
9	0.2	200	0.0008	0.08	46	0.2300	0.2040	15.4780

TABLE II.
OA FOR GTFT NODE BEHAVIOR WITH SNR.

No. of Exp.	**ρ (F1)**	**N (packet) (F2)**	**c (watt) (F3)**	**ε (F4)**	**Throughput (T1) (packet /sec)**	**Phi (T2)**	**Psi (T3)**	**Mean (M)**	**Sm**	**St**	**Se**	**Ve**	**SNR**
1	1	1000	0.001	0.08	225	0.2250	0.3061	75.1770	16955	50625	33670	16835	-56.3687
2	1	500	0.0008	0.05	294	0.5880	0.5910	98.3930	29044	86437	57393	28697	-51.0837
3	1	200	0.0003	0.02	200	1	1	67.3333	13601	40002	26401	13200	-41.8716
4	0.5	1000	0.0008	0.02	155	0.1550	0.1754	51.7768	8042.5	24025	15982	7991	-57.3764
5	0.5	500	0.0003	0.08	282	0.5660	0.5223	94.3628	26713	79525	52812	26406	-51.4765
6	0.5	200	0.001	0.05	73	0.3850	0.4385	24.6078	1816.6	5329.3	03513	1757	-40.7685
7	0.2	1000	0.0003	0.05	172	0.1720	0.1259	57.4326	9895.5	29584	19688	9844	-59.4618
8	0.2	500	0.001	0.02	41	0.0820	0.1046	13.7289	565.4453	1681	1116	558	-50.0992
9	0.2	200	0.0008	0.08	46	0.2300	0.2040	15.4780	718.7055	2116.1	1397	698	-42.1097

TABLE III.
TRAILS RATIO AVERAGE.

EXP. No.	**P**	**N**	**c**	**ε**
1	-49.774	-57.735	-49.078	-49.985
2	-49.873	-50.886	-50.189	-50.438
3	-50.556	-41.583	-50.936	-49.782
Difference (D)	0.6831	6.8491	0.7467	0.4530

number (1), as is the case for experiment number 3, whose results are shown in Fig. 3. As for the results of experiment number (4), shown in Fig. 4, we notice that there is a difference in the value of φ due to the difference in the value of the packet request, which directly affected it, as is the case for experiments numbers (5, 6, 7, 8, and 9), (see Fig. 5, Fig. 6, Fig. 7, Fig. 8, and Fig. 9).

TABLE IV.
CONCLUSION OF GTFT NODE'S BEHAVIOUR OPTIMIZATION USING TAGUCHI METHOD.

Factor	**Impaction serial number**
Power constraints per node (P)	3
Number of packets required to forward (N)	1
power consumption per node (C)	2
Grade of generosity GoG (ε)	4

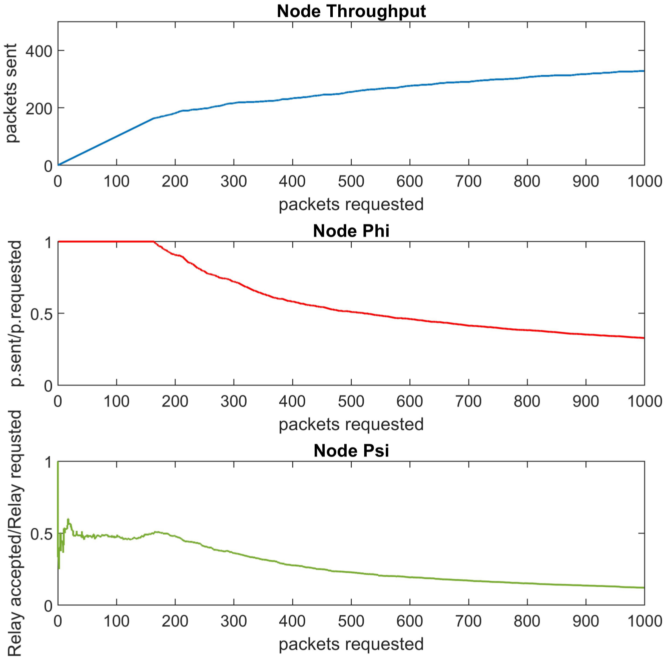

Fig. 1. GTFT node behaviour resulted from experiment (1), where throughput in packet per second.

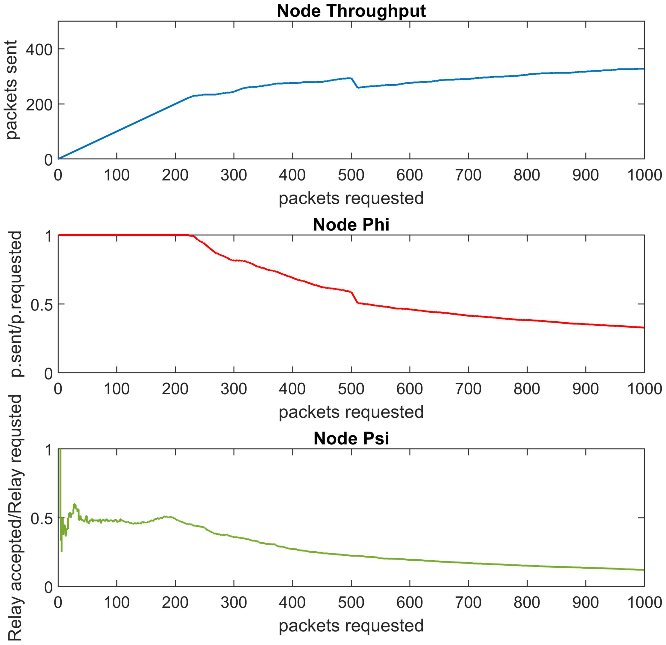

Fig. 2. GTFT node behaviour resulted from experiment (2), where throughput in packet per second.

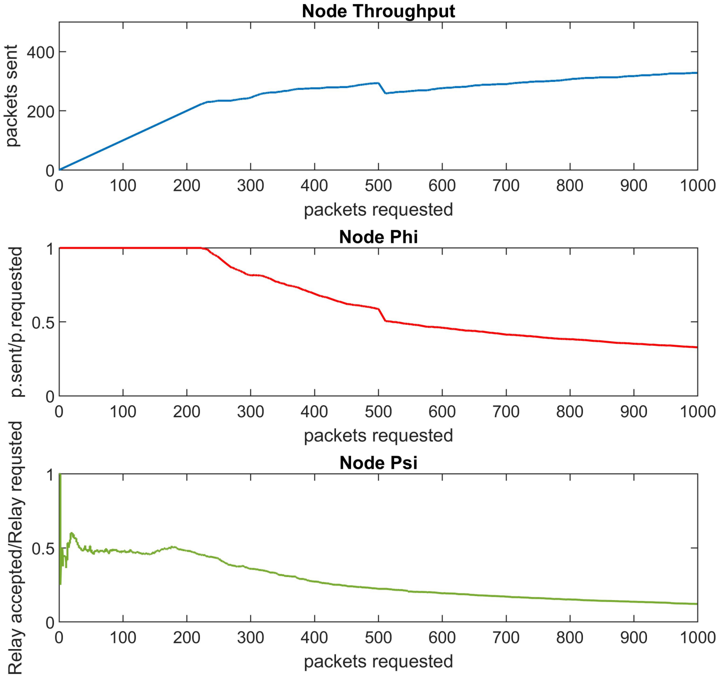

Fig. 3. GTFT node behaviour resulted from experiment (3), where throughput in packet per second.

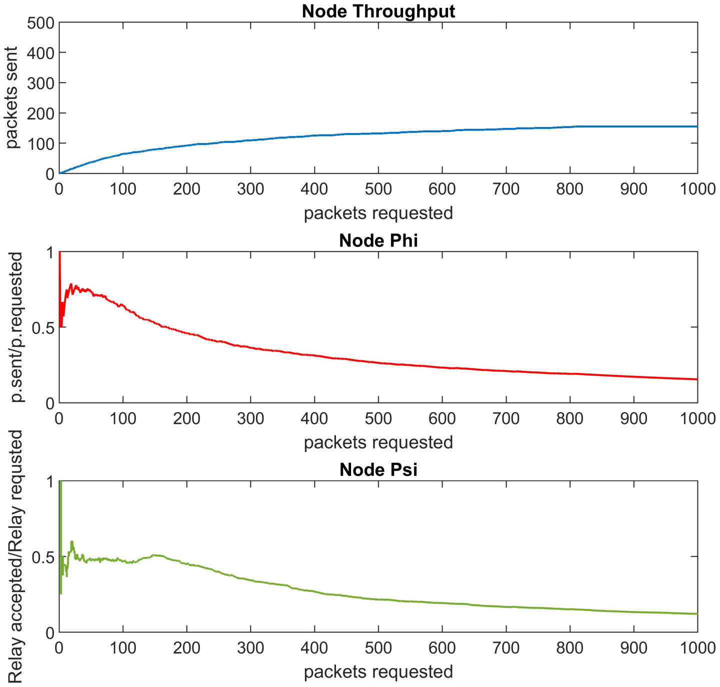

Fig. 4. GTFT node behaviour resulted from experiment (4), where throughput in packet per second.

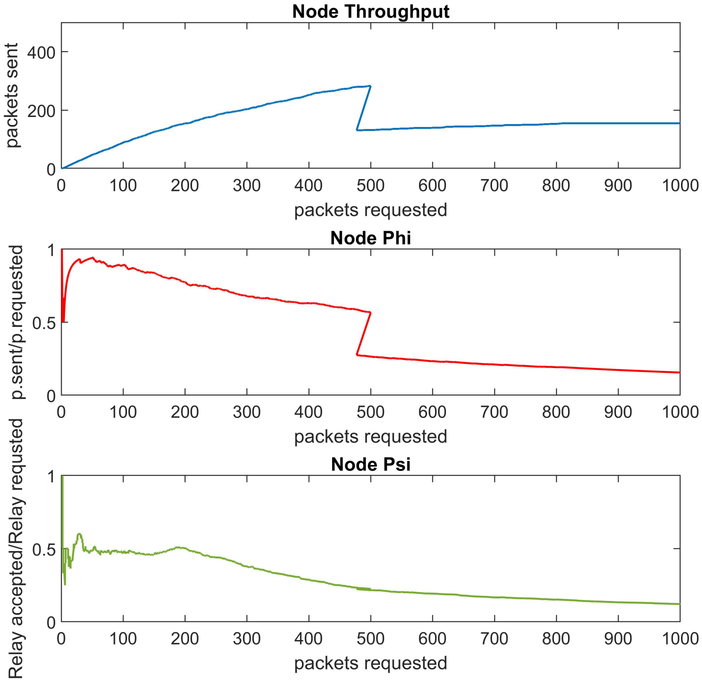

Fig. 5. GTFT node behaviour resulted from experiment (5), where throughput in packet per second.

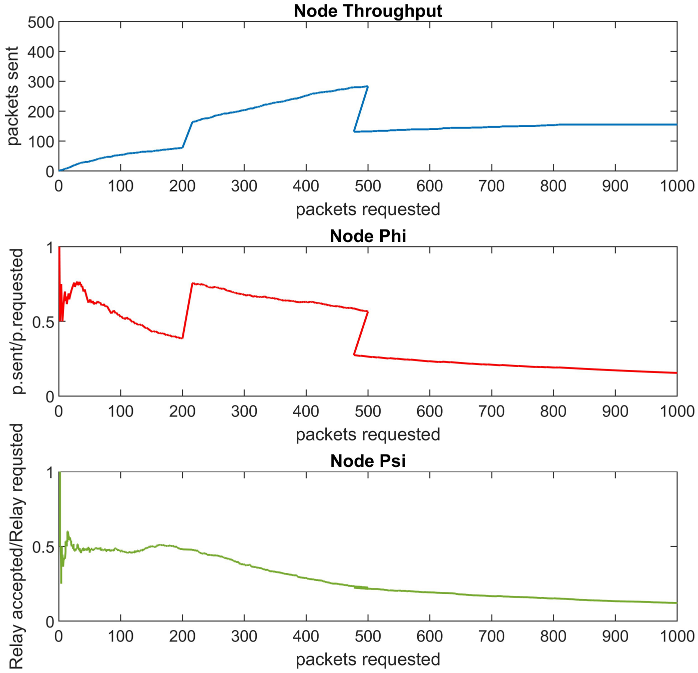

Fig. 6. GTFT node behaviour resulted from experiment (6), where throughput in packet per second.

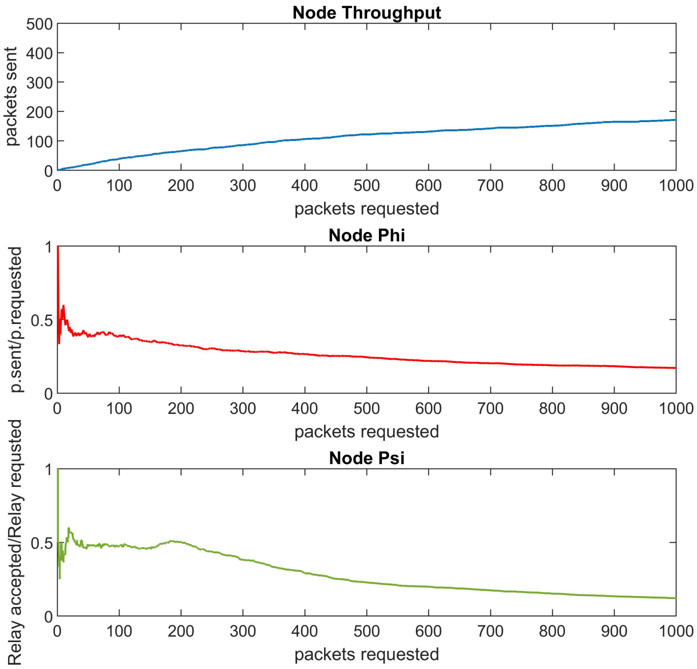

Fig. 7. GTFT node behaviour resulted from experiment (7), where throughput in packet per second.

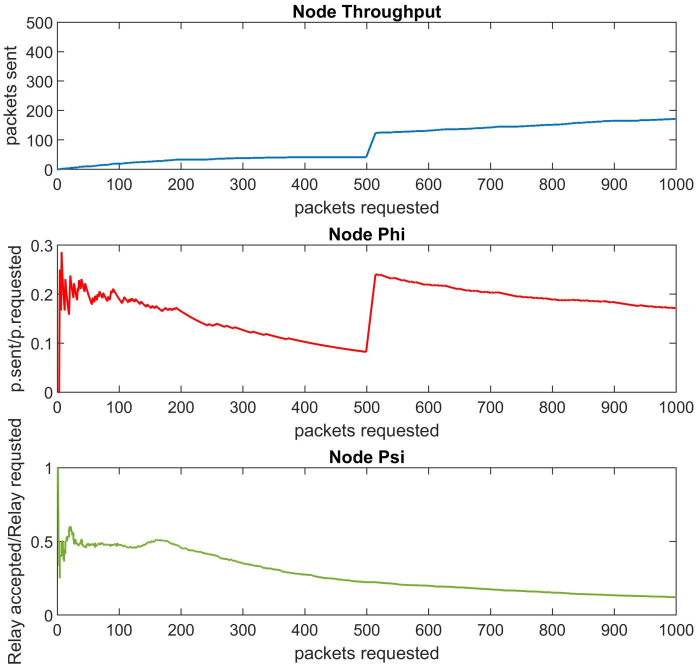

Fig. 8. GTFT node behaviour resulted from experiment (8), where throughput in packet per second.

VIII. CONCLUSIONS

Not only in goods factories, but the Taguchi method is also used in statistical experiments in many different fields to study specific influencing factors or to investigate the optimum condition as described in this article. The Taguchi method experiments were used to investigate node behaviour within an Ad-Hoc network working according to a GTFT cooperation strategy. All data included in Taguchi DOE are collected from a dedicated adaptive network stimulus based on the GTFT cooperation strategy, and all these data are real statistical data. In this article, the Taguchi method's experimental design with the orthogonal array L9 was used to analyze process parameters to test GTFT node behaviour. The tested parameters influence node cooperation in the following sequence: number of packets required to redirect (N) (6.8491 behaviour effect), power consumption per node (C) (0.7467 behaviour effect), and power constraints per node (P) (0.6831 behaviour effect), and lest behaviour's impaction is the grade of generosity GoG (ε) (0.4530 behaviour effect).

Also, experiments proved that the grade of generosity (GoG) is not the influencing factor where the highest productivity level (Exp. 3) was achieved with a minimum grade of generosity (GoG) of 0.02 when the minimum productivity level (Exp. 8) was achieved.

CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest regarding the publication of this manuscript.

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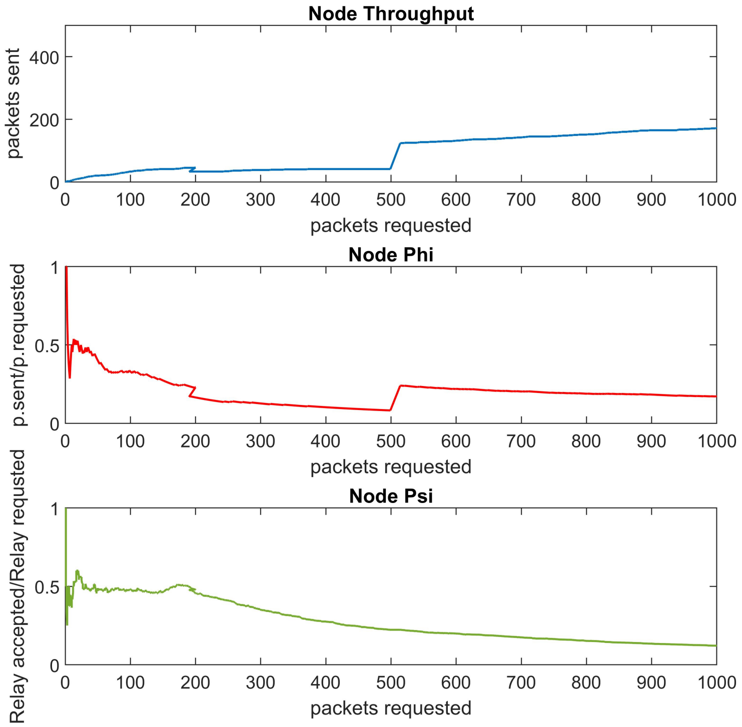

Fig. 9. GTFT node behaviour resulted from experiment (9), where throughput in packet per second.

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