

# Analyzing the behavior of a Virtual Social Networking in an online social game based on a Serious Game

## Analizando el comportamiento de una red social virtual en un juego social en línea basado en un juego serio

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### KEYWORDS:

Social Network Game,  
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### ABSTRACT

This paper develops a hybrid algorithm that combines evolutionary programming to improve the optimization of a virtual social networking in the Facebook's social network game named "My Tribe". This prototype takes a collection of individuals and interprets the expectedly of collective studies in different activities. Using a specific model to create and verify the method, led by means of a collection of structure heuristics acquired from the prospect of reaching the ideal tribe, this prototype can operate in two ways: by generating a tribe without restrictions or by a creation of a tribe accordant to one of the three preset architecture of the tribe. Seven construction heuristics are taken into account, through different combinations of two batches of the creation of the initial population, the first generated from an established combination, one popularly used in anthropology and the other using the psychosocial analysis of habitat patterns. The goal is to make sure the relative importance of the initial population size tribe and the construction of a Heuristic based on the general acceptability of the resulting tribe, which is validated with the Cultural Algorithm.

### PALABRAS CLAVE:

Juego de Redes Sociales,  
Antropología, Algoritmos  
Culturales.

### RESUMEN

Este documento desarrolla un algoritmo híbrido que combina la programación evolutiva para mejorar la optimización de una red social virtual en el juego de redes sociales de Facebook llamado "Mi tribu". Este prototipo toma una colección de individuos e interpreta lo esperado de los estudios colectivos en diferentes actividades. Usando un modelo específico para crear y verificar el método, liderado por una colección mediante heurísticas de generación adquiridas a partir de la probabilidad de encontrar a la tribu ideal, este prototipo puede operar de dos maneras: mediante la creación una tribu sin restricciones o por medio de la creación de una tribu conforme con una de las tres estructuras predefinidas de la tribu. Se toman en cuenta siete heurísticas de construcción, mediante diferentes combinaciones de dos lotes de la creación de la población inicial, la primera generada a partir de una combinación establecida, una popular utilizada en antropología y la otra utilizando el análisis psicosocial de los patrones de hábitat. El objetivo es asegurar la importancia relativa de la población inicial del tamaño de la tribu y del diseño de una Heurística basada en la aceptabilidad general de la tribu resultante, que se valida con el Algoritmo Cultural.

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## 1 INTRODUCTION

The Social Network Games are very popular on Internet (Used by a 7% of World Population); supported with Social Networking especially Facebook is a goal of the artificial intelligence congregation, however, it has not been given the proper credit. Applications are found in the area of analysis of Multiplayer game online; due to interpreting the behavior of game and the modus it provides some kind of rewards [1]. On one side, the automatic creation of a social composition is carried out, involving advanced psychology and an environmental sense. On the other hand, it entails a significant part of ingenuity and sensitivity. All components are usually laborious to earnestly model, and therefore there is not much work done on how they could be addressed algorithmically. However, a tribe is organized with a variety of different types of individuals. The main objective of a tribe is a collective effort; with this, the main complication turns into easier to narrow down. The present article takes into account how the different parameters are involved in a hybrid algorithm; this relationship affects the field of acceptability of the results obtained. This collection of parameters to be considered is the size of a tribe, gender, age, and specialized skills (Figure 1).

Figure 1 shows the attributes of every citizen of the tribe, this parameter will be composed by a hybrid algorithm. The unsociable conception of acceptability of a tribe is determined in the manner of manual evaluation by a team of volunteers who play the game "the Tribe"; said users have a Facebook account. The unsociable conception of acceptability of a tribe is determined in the manner of manual evaluation by a team of volunteers who play the game "the Tribe", users that has a Facebook account.



Figure 1. Parameters to be considered: size of a tribe, gender, age, and specialized skills.

By performing the search for the interrelationship between the initial population and strategy implemented to create a tribe, both a negative or positive evaluation of the result obtained on the relative aptitude of these parameters for the final result.

We evaluated the performance aptitude of the evolutionary algorithms, the proposed Hybrid Algorithm vs the algorithm of randomly selected actions in the game. The result from sceneries demonstrates that using the proposed Hybrid Algorithm has better results.

Table 1 show a review of research on video games (VG) and serious games (SG) that compares Learning effect and engagement effect [11]. This variation of the obtained results considers the small number of studies selected as described in [8]. During the realization of the state of the art, we realized that there were only a few works of research that analyze the online players of social networking sites about their behavior.

communication objectives”.

**Table 1.** Terminations of the study for a SG and VG [8]:

Authors	SG or VG	Name of the game	Learning effect of the game	Engagement effect of the game
Annetta, Minogue, Holmes & Cheng	SG	(no name) MEGA	No	Yes
Beale, Kato, Marin-Bowling, Guthrie & Cole	SG	Re-Mission	Yes	?
Beale, Kato, Marin-Bowling, Guthrie & Cole	VG	Indiana Jones & The Emperor's Tomb	No	?
Boot, Kramer, Simons, Fabiani & Gratton	VG	Medal of Honor Allied Assault	No	?
Boot, Kramer, Simons, Fabiani & Gratton	VG	Rise of Nations	No	?
Hainey, Connolly, Stansfield & Boyle	SG	RCAG	No	?
Kabritchi, Hirumi & Bai	SG	DimensionM	Yes	No
Knight, Carley, Tregunna, Jarvis, Smithies, De Freitas, Dunwell & Mackway-Jones	SG	Triage Trainer	Yes/no	?
Lorant-Royer, Munch, Mescié & Lieury	VG	New Super Mario Bros™	No	?
Tanes & Cernačičar	VG	SimCity	Yes	?
Wrzesien & Raya	Serious virtual world	E-Junior	No	Yes

## 2.1 Social Network Games

Nowadays, online video games are one of the fastest growing online entertainment industries due a continuous exponential growth of players. The environment of social networking platforms has provided a platform for online games to develop more naturally. Thanks to these platforms, the player is allowed to compare scores, play with friends and challenge other players, among other things.

Social networking games on social networking platforms such as Facebook facilitate the possibility of interacting and playing with "Friends".

In this work, we discuss different dimensions of how the game contributes to the beginning and expansion of relationships using qualitative data obtained from Facebook users (N = 21). Data suggest that interpersonal motivations are the main driver of the initial game, although there is not direct social interaction.

We are considering a collection of agents, and then we capture the social structure. Later, we model the network through the distribution of the number of neighbors that each agent has.

## 2 SG: CONCEPTS

Serious games normally attribute to games used for experiential learning, training, simulation or even for education, this with the goal to generate knowledge, is believed to be created through the transformation of experience [10]. According to [12] serious games “is all about leveraging the power of computer games to captivate and engage end-users for a specific purpose, such as to develop new knowledge and skills”. This shows that, although the serious games/simulations have the potential to increase knowledge and develops various skills, there is little information available through developers or users about its effectiveness. When seeking the network, a few different definitions are available. A research site provides the following description of serious games [13]:

“The Serious Games Initiative is focused on uses for games in exploring management and leadership challenges facing the public sector. Part of its overall charter is to help forge productive links between the electronic game industry and projects involving the use of games in education, training, health, and public policy.” In Zyda's is defined a formal definition, entertainment is explicitly brought up as an ingredient [9]: “Serious game: a mental contest, played with a computer in accordance with specific rules that uses entertainment to further government or corporate training, education, health, public policy, and strategic

## 3 Research Model

### Participants

This research was conducted by an online game on Facebook. The total number of participants was 21, composed of 15 males and 6 females.

First, some users started playing tribe as a mechanism to seek social interaction with existing members of their Friends network. During the examination of the test made on the participants, two different types of motivations to play this type of video game were found. There were a number of different initial motivations identified by the participants, but it was usually due to free time

and easy access to the game through the platform.

### **Data Collection**

To perform the experiment, it was necessary that the participants register to the game and be friends in common to allow them to join the game. It may be appreciated that the majority of the participants started playing games on Facebook after receiving invitations by friends, which generally meant that the friend needed friends to complete some of the tasks in the game, to obtain rewards.

### **Data Analysis**

To analyze the empirical data of this work, at the first stage, we analyzed the measurement model to determine the reliability and validity of the instruments, and then we tested the structural model to verify the research hypotheses.

## **4 Anthropology Analysis**

Formal analysis of Anthropology composition considers the role of a person in a specific habitat. The period required for eating, rest and work vary to each individual and gender and the time to arrive at adult age will have a range from 3 to 3.5 days when two persons are adults and have enough "plumage" to procreate, is possible arrived a new baby or twins. It is enough for certain strategic related with the organization of a tribe. The literature of multiagent system [3] describes a collection of skills to obtain advantages when the game is playing in this kind of games.

For the representation of a tribe, it can be represented as an unstructured sequence of individuals; however, this research focuses specifically on a tribe that makes use of a well-known multi-strategy compound, which refers to problems with different similar compatible abilities in the biological diagnosis. Thereby, the explicit ruling that conduct the selected anthropology structure can be implemented to model the generation mechanism. A tribe subsists of many men and

women; usually, the organization behaves for its behavior. For this stage of the investigation, only three of the simplest patterns are considered: Gender, Time to be an adult and skills required.

## **5 Description of the System**

In order to achieve a collection of information, it is necessary to begin the process of creating an initial population: a set of individuals and a collection of social patterns are associated to a particular tribe.

This decision to procreate a baby improves the abilities of a tribe. A collection of anthropological patterns is considered as a collection of descriptions of the best tribe in nature, in the sensory faculty that codifies the data on relevant parameters (lifetime, the amount of food required ...) this allows a definite margin regarding of explicit gist (skills) of current resolution as a function of time. Obtaining the initial data, the generation is described. From a collection of people, divided into a value of each individual according to the speed of its size increase. All issues of this repository will be incorporated into the proposed tribe. The values obtained from the original problems are used to produce the reference patterns. In order to analyze the consequence of choosing of an individual from a source of anthropology, two data of a different set are used to test the system.

The first data collection is generated from a collection of social patterns. The second data collection is generated randomly from an academic work in the area of sustainable Habitat. According [4] a certain tribe of equivalent size is chosen, all people are included in it, and a collection of reference designs is created by dividing the tribe into triplets (a mini combinatorial family) with a required size and coding the necessary information.

We study an evolutionary version of the game called the tribe, played by agents placed on a small island. Agents are able to alter their

scheme, imitating the best individual. We note that different topologies, ranging from regular lattices to random graphs, develop a kind of emergent behaviors.

### 5.1 Hybrid Algorithm

In this work, we are using Cultural Algorithms to study how the representation affects the strategies to try to found the best solution as discussed in [14].

We use Cultural Algorithms as a vehicle to study how the representation permits organizing the best approaches to grasp the optimal tribe using the different techniques to get better skills and other things related with the life in an island, a solution is achieved. The cultural algorithms were proposed by the researcher Robert G. as “a metaphor used by evolutionary algorithms, which had driven the concepts of natural selection of Darwin and mainly focused on genetic algorithms” [14].

According [11] Cultural algorithms are based on archeology and some theories originated in sociology, which aims to model cultural evolution of individuals.

According [11] cultural evolution is often seen as a process of inheritance that operates on two levels: “(1) a micro evolutionary level, consisting of the genetic material that inherits a descendant from its parents, and (2) a macroevolutionary level, which it consists of the knowledge acquired by individuals through generations. This knowledge, once encoded and stored, is used to guide the behavior of individuals belonging to a certain population”.

Cultural Algorithms (CA) normally consists of three components:

First, there is a population component that contains the population to be evolved and the mechanisms for its evaluation, reproduction, and modification.

An advertisement for research participation was about the creation, the first step initiates with the selection of convenient Anthropology patterns, established on criteria described to insure that there is a minimum of coherence across the issues in the tribe. From this

pattern, an empty draft of the current tribe is created.

The straightforward creation steps can be characterized as shows:

1. Random selected from the population people in the collection that concur to the first class of the present tribe as claimed by the level in the game.
2. Add it to the version of the present section.
3. Exclude (bought) the matching persons from the present section pattern.
4. Check if the consequence tribe version accomplishes the surroundings of the approach being used and the stabilized dimension of population in a number of distinct aptitudes.
5. Check stop condition, repeat step 1.
6. Tribe's Solutions that do not meet the conditions of improving the population are rejected or overshoot or given number of generations

Example of pseudocode description of a cultural algorithm [11]:

```
Cultural Algorithm
t=0;
Initialize Population Pop(0);
Initialize Belief Network
BLF(0);
Initialize Communication channel
CHL(0);
Evaluate (POP(0));
t=1;

Repeat
Communicate (POP(0), BLF(t));
Adjust (BLF(t));
Communicate (BLF(t), POP(t));
Evaluate Fitness (BLF(t),
POP(t));
t=t+1;
Select POP(t) from POP(t-1);
Evolve (POP(t));
Evaluate (POP(t))
until (stop condition)
end
```

Three distinct collections of analysis were

## 6 Evaluation Results



accomplished. All experimentation of the first collection, for the interpretations of the corresponding research, a variety of strategies were implemented to build the best tribe, to generate a greater variety of individuals using Cultural Algorithms to find better solutions of tribes, we use this technique because we can simulate an artificial society. Experiments carried out in the second generation were proposed to evaluate which of the strategies was feasible to validate the current draft of a proposed tribe, this showing that better results were obtained when using cultural algorithms. For both, as well as the first and the second collections of experimentation, every competing issue was evaluated attempted generating diversified scenarios, operating in normal style mode.

A collection of 37 people was taken from "My Tribe" to generate a first population (initial population) so that the anthropological patterns were not modified. The third collection of experiments will be carried out using the elicitor approach; only one version of the population is stored from the strategies that had obtained better results in the course of the previous generations. With this, starting points were established between the results obtained for distinct combinations of the initial population, to generate greater diversity. For this generation, each tribe generated created possible scenarios in the game.



Figure 2. My Tribe Users interface with statistics about the progress at the time in this Multiplayer Game Online

### 6.1 My Tribe Generation Initial Data

Different sources for initial data (individuals to a tribe) extensions of Anthropology patterns search in a Society, two possible ways of improving the tribe are:

Determining which people has the finest aptitude and time to becoming adults to develop skills and get more resources: 37 different possible types of people and 12 combinations to organize. Many of the resulting tribes were either sustainable incorrect.

Due to this, the evaluations were carried out through two scenarios. For the first stage, each resulting tribe was assigned attributes, described below.

- (1) A number of issues in a tribe.
- (2) A value for its sustainable accurateness, and
- (3) A value of its skills aptitude.

As a first step, these data are used for filtering to avoid wasting efforts of evaluation of aptitude in tribes that have deficient abilities or not optimal values. The values were assigned in the first inspection by a sample of users (21 players).

To consider a tribe that does not have a lot of weakly connected aptitude, it can be interpreted in some way that this collection of people is very independent of each other. On the other hand, to consider a strongly connected tribe, if at least part of the aptitudes of individuals are united in a variety of skills that make anthropology meaningful.

Table 2. Esthetical rating subjectively evaluated

Esthetical rating	
1	ungraceful
2	So-so
3	Tolerable
4	Agreeable
5	Good looking

### 6.2 Discussion of experimentation

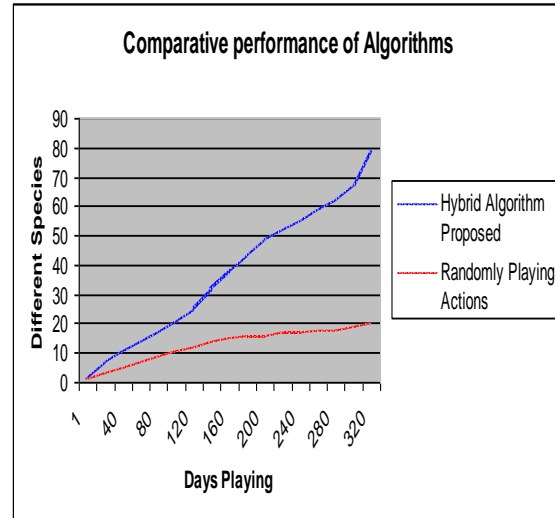
The experimentation obtained involves a large number of data from the populations. Nonetheless, some very interesting conclusions could be appreciated from the case resulting from the study. Because it had been assumed as the initial phase of an individual through selectivity and by the selection of anthropological patterns (for

example, the number of tasks performed by the individual during the course of the day) all these data play an important role in the calculation of the fitness of a tribe. This hypothesis is due to the fact that only seven of the 45 optimal tribes were generated using the collection of initial data (it is worth mentioning that the overall optimum (best tribe) could be reached up to level 97 after 447 days of the game had elapsed).

In general, it was seen that nine of the optimal solutions managed to create a tribe that was within the final selection. Of these, it was possible to appreciate that only one of them was not using any of the initial solutions (obtaining from the gifts of another player). On the other hand, this individual managed to generate the best tribe with the highest score. This gives us to know that in general terms, the game has better solutions if there is greater diversity, however it can happen that during the random generation process this population may come out in the final solution, this occurrence could be appreciated during this process. On the other hand, when taking the first population, and always taking the best individuals, this type of estimation is not a viable solution.

Another observation that could be appreciated was that a couple of the combinations that built most of the tribes with better skills were through repositories that had expanded with additional problems (people with different abilities).

The probability of these individuals arising within the population is greater than that of other tribes. On the other hand, some interesting results could be appreciated from an aesthetic approach. At the same time, we have not yet found a way to evaluate this fact numerically, numerous of the evaluators have observed it informally and must be considered for a more detailed study.



**Figure 3.** Comparative Analysis of algorithms, Hybrid Algorithm proposed vs randomly selection actions in the game.

In Figure 3 is shown the behavior of the game during 320 days of a game using our proposed algorithm and the randomly playing actions.



**Figure 4.** Results obtained with different possible strategies and stratagems in the game.

## 7 CONCLUSIONS

In the present investigation was possible to appreciate the prototype that pretends to be a preliminary work of a project to develop anthropological knowledge through the use of evolutionary computation using cultural algorithms.

Through the experiments carried out, it was possible to help discriminate between the strategies of the game and the different possible strategies using combinatorial optimization. It should be mentioned that for the correct tuning of the heuristic, the appropriate choice of algorithm operators are necessary to follow a correct generation of solutions for the creation of the tribe or always discard solutions that are not very good. Interesting results can be seen through the analysis of the investigation. It is important to mention that it is important to improve the heuristics to select the operators for the next tribe generation. Anthropology patterns must be distinguished in somehow depending on if they are initial, intermediate and even in the final sections of a game. Combination of evaluation operators, are still susceptible to enhancement in significant form, due to lack of further experimentation. It is a matter of criticism is subject to the player, is emphasized to propose a form of evaluation that provides a thorough qualification without modifying the natural behavior of the player as a user of this type of social network game. In a future investigation, more algorithm experiments are performed to try finding better results and the Virtual Social Alliances in the City of Wonders (27 people in an alliance in level 47) will be analyzed to reach the top level and try to conquer in another society and the social organization developed by it.



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