Someone somewhere asks how it could be if I have something which I have

# Cellular Fight. Two Player Game

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## Abstract

In this article we proposed a new Game called as 'Cellular Fights'. It takes a long time for giving such title to this game. Before and after publishing this letter, rules are not tested and are not classified, by other words they are given as they were born in our minds and we have not any idea about issues. Fight does not mean, that the game claims and propagates inhumanity. It is pure mathematical game where we need to develop moves and provide beutiful winning over opponent, which is big art not only in desk games but in everyday life. In physics, chemistry, biology as well as in our life fight exists continuously: our healthy biological cells struggle with ill cells, political parties are involved in very hot debuts etc. Other interesting example of the fight can be considered natural reaction occurring between two chemical elements during chemical reactions. Of course many examples can be given to readers, but it is reasonable to restrict ourselves and start our trip. All basic ideas of Cellular Automata are given. Then flat jump to main purpose is given: Rules, objects for the fight as well as an environment for the fight are presented. At the and of article some problems are given for future investigations.

## Introduction

*A **cellular** automaton (pl. **cellular automata**, abbrev. **CA**) is a discrete model studied in computability theory, mathematics, physics, complexity science, theoretical biology and microstructure modeling. It consists of a regular grid of cells, each in one of a finite number of states, such as "On" and "Off". The grid can be in any finite number of dimensions. For each cell, a set of cells called its neighborhood (usually including the cell itself) is defined relative to the specified cell. For example, the neighborhood of a cell might be defined as the set of cells a distance of 2 or less from the cell. An initial state (time t=0) is selected by assigning a state for each cell. A new generation is created (advancing t by 1), according to some fixed rule (generally, a mathematical function) that determines the new state of each cell in terms of the current state of the cell and the states of the cells in its neighborhood. For example, the rule might be that the cell is "On" in the next generation if exactly two of the cells in the neighborhood are "On" in the current generation, otherwise the cell is "Off" in the next generation. Typically, the rule for updating the state of cells is the same for each cell and does not change over time, and is applied to the whole grid simultaneously, though exceptions are known. Cellular automata are also called "cellular spaces", "tessellation automata", "homogeneous structures", "cellular structures", "tessellation structures", and "iterative arrays".*

To play our Game, citation presented above from [1] is enough. Of course, much useful things about this subject can be learned from [1]. I want to mention about a book 'New kind of Science', book by Shtephan Wolfram, existing online at [2]. This book is good one and a reader will be satisfied, especially, if he/she seeks simplicity in Science and thinks that Nature does not complicated as scientists try to present. Reading of this book will make a feel for You, that what we need it is to have appropriate tiny parts of Nature, investigate appropriate interaction rules between them and such approach will be enough and for much cases will give an appropriate “macroscopic picture” of a phenomenon. Ideas, examples and analysis existing at 'New kind of Science', are the basics for many other articles, it brings new thinking for people like to us, opens new ways to understand and investigate world, science, models apparently different form other existing approaches. For our purposes an introduction given above is a proper one and it is time to have flat jump from this part to the next one and describe the rules of the game.

## Game, Rules, Objects and Subject of the Game

This game born from the simple idea. Let, suppose that different "cellular figures" known from Life Game [3], fight against each other. Than, taking into account of such idea we can simply ask what we have? At least we have a game. And, what if we will use not only figures from Life? As I know, such competition between Cellular Automata objects was not considered before. According to the situation and for future proper introduction of the game two definitions are given. After defination of the important objects we will develop rules for the game.

***Definition***

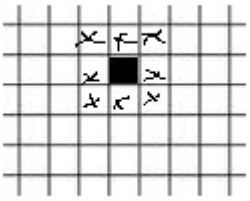
*A fighting arena is a rectangular field devided into small rectangular cells. The size of each rectangular cells is such, that it can host only one rectangular cell of the "Cellular Figure" i.e. if a "Cellular Figure" has 10 rectangular cells, it means that only 10 rectangular cells of the fighting arena are used by the "Cellular Figure".*

***Definition***

*A "Cellular Figure" is a figure composed by coloured rectangular cells and has a shape. Shape can be of two types. One type of the shapes possess symmetries, while others do not have symmetries as well as they must have continued form as depicted in pic. 1. Otherwise, figure will be counted as a discontinuous i.e if a cell has not any nearest neighbour.*

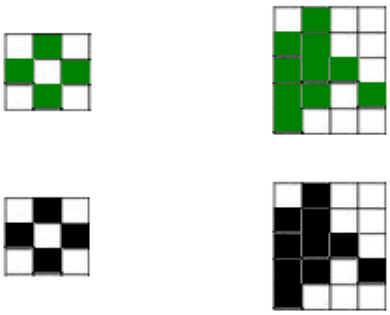
***Definition***

*A Cell of the 'fighting arena' has 8 nearest neighbours (see in bellow). A black coloured cell has 8 nearest neighbours, which are depicted by simbols like to 'X'.*

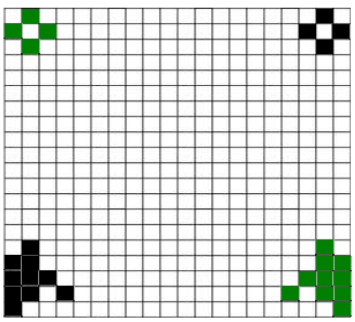


Above were introduced main objects of the game. Now it is time for rules to be appeared. Here, two colours for the figures will be used in accordance to the number of the players.

The Game is played on 20x20 board. Two of the four corners of the "Fighting Arena", called black, are opposite to each other and belong to the one player. Remaining two corners are called green corners. Such names are choosen, because there must be located "Cellular Figure" of the appropriate colours. For this version "Cellular Figure" are decided to choose figures, which are depicted in pic 1. In Pic. 2 the "Fighting Arena" with figures in they starting positions are depicted.



Pic. 1



Pic. 2

Structure of the figures was defined, our next step is to describe fighting rules. In this game players take turns to make moves. The first player is defined as the player possessing green figures. Also this condition is not fixed one and can be managed before a game started. The rules defined hereafter already fixed and must be followed during whole game and for each play. When the start is given players are allowed to move their figures one by one and at each turn from the initial positions of the figures no longer than 3 cells at any direction. The aim of this moves is to bring figures of opposite colours to close to each other for future fights. There is another strong restriction that does not allow figures of the same colour to gather and move or fight as whole. This construction from our point of view does not break beauty of the game and canceling this last condition can be considered as a new variant of the game. As You see do not being finished the first version we have proposed other version of the game. Why we called this game as 'Cellular fight' will be seen from this point. When desired collision between figures is happened the player can either move its figure away from fighting position no more than 2 cells or can wait until transformation is finished.

*Definition*

*Here and in the future writing of the article the transformation means (see bellow)*

The transformation which will manage number of coloured cells of the figures on the board is the following: At each turn up to 5 nearest cells surrounding opposite colour can chnage they colour to the opposite colour. The player can choose the number of cells as well as namely which cell could change the colour for that time. From this statement it is evident that figures starting from some point could transform to discontinuous figures and versa. The other goal of the game to keep figures continious. The other strategy and law of tha game is that that he/she can choose the third option and move the figure from collision state by 2 cells in any direction, making situation neutral which means that if You have a collision of the figures, that this does not mean that transformation of colours should occur. But if You choose colour changing strategy, then there is another constrain on future moves of figures: You are allowed to move Your figure if the figure continues to be without holes i.e. it is continious. The subject of the game is to reduce the total number of the cells of the fighting objects of the opponent or make such situation, that figures can not be moved anymore i.e. they are discontinous figures. Here we did not consider a strategy, where a figure could recover cellss` colour. Another possibility is that discontinuous figures could continue moving if some n number of holes are allowed to have. This will give additional dynamics and may be will complicate the game or simply will make it short playing game. Answer to this question will be given after some investigations.

## Open Problems and Questions

This section is devoted to the future research as well as for making many time played game. We want to present several problems as well as several versions of this game. First question is about symmetries of game. Our attention to symmetries is not occasional. It seems that symmetries, changing symmetries of the game could reveal and obtain very interesting results. By symmetries of game we mean symmetries of game board as well as symmetries of figures which are familiar us from every day life. For instance, two figures from left side of the pic. 1 are symmetric figures, while other two are not symmetric. Fight arena is taken to be symmetric. Of course, we do not escape cases where symmetries are not so obvius as in above example. There could be symmetries which are hidden from us. Could You develop several fighting figures as well as boards with hidden symmetries? It will be interesting to look to such objects.

First question which can interest player is sound like by this way: could symmetries predict a winner of game. As well as it is very interesting question to find such symmetries which

1. Always make first mover as a winner.
2. Always make second mover as a winner.
3. Make draw play between players.

Second series of questions is devoted to the situation where type of dynamics is changed, for indstance after some n moves symmetries either of board or fighting figures are changed. This version of game could present some family of dynamical games, which we would after as a family of games with dynamical symmetries.

Questions presented above are not final and last ones, we would like to stop here, to wait for a some time and then to rise questions and versions of games, where not just symmetries will play role, but other type of phenomenons will used.

## Remarks

During the writing of this letter, as well as in last cases [4],[5] we do not use special terminology known from Game Theory, because, here the aim is different. We just want to develop games and we are not attempting to be accepted by Game theory or by other community, we want to be free in creation, in art of game development and do not damage imagination of our readers with hard terminology and other type of difficulties. We choose this style of writing, because we want to share with readers with our ideas and we want to do that as simple as posible. Development, research and answers to questions rise anywhere just consequences of the simple ideas.

## References

[1] http://en.wikipedia.org/wiki/Cellular_automaton

[2] http://www.wolframscience.com/nksonline/toc.html

[3] http://en.wikipedia.org/wiki/Conway%27s_Game_of_Life

[4] http://vixra.org/abs/1103.0107

[5] http://vixra.org/abs/1103.0093