Intuitionistic Fuzzy Interpretation of Conway's Game of Life

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Conway's Game of Life is a popular zero-player game, devised by John Horton Conway in 1970, and it is the best-known example of a cellular automaton. Its universe is an infinite two-dimensional orthogonal grid of square cells, each of which is in one of two possible states, live or dead. Every cell interacts with its eight neighbours, which are the cells that are directly horizontally, vertically, or diagonally adjacent. In a stepwise manner, the state of each cell in the grid preserves or alternates with respect to a given list of rules. Intuitionistic fuzzy sets (IFS) are an extension of Zadehs fuzzy sets, which introduce a degree of membership and a degree of non-membership whose sum is equal to or less than 1 and the complement to 1 is called a degree of uncertainty. The article proposes an intuitionistic fuzzy estimation of the cells state in a modified Game of Life. For each cell we can define its IF estimation as a pair consisting of the degrees l_p and l_a, namely degrees of presence and absence of life, where $l_p + l_a \leq 1$. In the classical Conway's Game of Life, the live and dead states correspond to the elementary IF estimations $< 1, 0 >$ and $< 0, 1 >$. The article presents the formulas for calculation of the IF state of liveliness of each cell, as functions of the current states of the cells neighbors. Criteria of liveliness will be also determined in terms of IFS.