AN ANALYSIS AND IMPLEMENTATION OF NIM GAME VARIATION SOLUSION BY USING SPRAGUE-GRUNDY THEOREM

Student’s name : Halimah Winajma  
NRP : 5105 100 116  
Major of Department : Informatics, FTIF – ITS  
First Advisor : Yudhi Purwananto, S.Kom, M.Kom  
Second Advisor : Rully Soelaiman, S.Kom, M.Kom

ABSTRACT

Combinatorial game is a game of two people with perfect information in which the winning position obtained when the movement of the opponent can not occur again (terminal position). The most famous combinatorial game is Nim Game. How to play Nim Game are as follows, there are one or more stacks of chips. Two players take turns playing. Every time you play, the player takes one or more pieces in one pile.

Unlike the game Nim, Nim Game Special resolution using Sprague-Grundy theorem that begins with analyzing backward induction. Further search for the Sprague-Grundy performed for each value of N to the Sprague-Grundy value = 0 is a winning position. In this case the desired winning for second players, so that the Sprague-Grundy values held by certain N can be expressed second players winning. Sprague-Grundy value obtained by calculating the value of non-negative integer that is not found among the smallest value of x followers, the so-called mnimal excludant or mex.

Game Special Nim was analyzed using the Sprague-Grundy to winning a second player, was obtained at N = 2, N = 3, N = 5,
\[ N = 8, N = 13, N = 21, N = 34, N = 55, N = 89, N = 144, N = 233, N = 377, N = 610, N = 987 \text{ and } N = 1597 \text{ where the Sprague-Grundy value is } 0 \text{ (zero).} \]

**Keyword:** Combinatorial Game, Special Nim Game, Teorema Sprague-Grundy