THE SUMMARY OF Ph. D. DISSERTATION

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Title

An Application of Factorial Representations to Heuristic Searches

Abstract

In recent years, the various heuristic searches have been developed for the challenge to the problems called the NP-hard. The search method that imitated the evolution of the creature and be called the genetic algorithms is one of the methods like that. To request an approximation solution by using the genetic algorithms, the solution candidacy needs to be expressed with the form called a chromosome. The chromosome expression will differ by the problem that we try to solve. As genes, 0 and 1 or permutations were used conventionally. However, depending as if we adopt what kind of chromosome expression, the search ability of the genetic algorithms differs. So, chromosome expression is an important problem.

In this paper, the methods that the chromosome is expressed by using the factorial representation were proposed. We can express n! numbers by use a factorial representation of a n column. Therefore, it is conceivable to correspond factorial representation and a permutation first of all. Furthermore, We can also interpret a factorial representation shows the connection between the elements. Because, a factorial representation is as well possible to be applied to the gathering division problems. A factorial representation corresponds to a permutation one to one and can restrain a lethal gene in crossing over operations. In addition, we can express certain kind order restrictions easily. In gathering division problems, we could confirm that a factorial representation can be applied to fixed and unfixed number of group problems. Like this the chromosome expression by a factorial representation has several desirable nature, evaluations of factorial representation expression was made the purpose of this research.

Thus at first, we applied to traveling salesman problems and flow shop scheduling problems which a solution could be express as a permutation and examined the effectiveness of a factorial representation. Especially, in flow shop scheduling problems, we confirmed that proposed methods were excellent though numerical experiments.

In addition, we can interpret a factorial representation as an expression of combination between elements. So, we examined an application to gathering division problems. In rule extraction from the contingency tables, we were able to confirm the effectiveness of a factorial representation. We were able to get effective a few rules in an iris identification problem.

Furthermore, we examined the effectiveness of proposed methods in a depreciation methods selection problem including many variables and vague answers. Twenty-six variables are set up as the explanation variables here. We did the selection of the contingency table by using variables increase and decrease law, because it is not realistic to think the contingency table including all the variables. We were able to get the few rules that agree with the wisdom of the accounts, even in the case of depreciation methods selection problems.