

## 論文の内容の要旨

論文題目 Deterministic Higher-order Matching for Program Transformation  
(和訳: プログラム変換のための決定性高階マッチングに関する研究)

氏名 横山 哲郎

Higher-order patterns play important role for describing concise calculation rules. Higher-order patterns are capable of checking and binding subtrees far from the root, which is useful for program manipulation. To obtain the bindings of higher-order variables, higher-order matching is used.

However, there are three major problems from the practical viewpoint. First, it is difficult to explain why a particular desired matching result cannot be obtained because of the complicated higher-order matching algorithm. Second, the general higher-order matching algorithm is of high cost, which may be exponential time at worst. Third, the (possibly infinite) nondeterministic solutions of higher-order matching prevents it from being used in a functional setting.

To resolve these problems, we impose reasonable restrictions on the form of higher-order patterns to gain predictability, efficiency and determinism. Our deterministic patterns induce the linear time algorithm.

For the nondeterministic patterns, we impose restrictions on algorithm. We define reasonable orders on solutions and only return the largest solution. As a result, algorithm becomes linear time.

We show that our deterministic higher-order patterns and deterministic higher-order matching are powerful to support concise specification and efficient implementation of various kinds of program transformations for optimizations.