Finding the complete set of minimal solutions for fuzzy relational equations with max-product composition

Yan-Kuen Wu[1,*] and Sy-Ming Guu[2]

[1]Department of Industrial Management, Vanung University, 1 Van-Nung Rd., Chung-Li, Taoyuan, Taiwan, 320, R.O.C.

[2]Department of Business Administration, Yuan Ze University, 135 Far East Rd., Chung-Li, Taoyuan, Taiwan, 320, R.O.C.

Abstract ──It is well known that the solution set of fuzzy relational equations with max-product composition can be determined by the maximum solution and a finite number of minimal solutions. There exists an analytic expression for the maximum solution and it can be yielded easily, but finding the complete set of minimal solutions is not trivial. In this paper we first provide a necessary condition for any minimal solution in terms of the maximum solution. Precisely, each nonzero component of any minimal solution takes the value of corresponding component of the maximum solution. We then propose rules to reduce the problem so that the solution can easily be found. A numerical example is provided to illustrate our procedure.

Keywords──Fuzzy relational equation, maximum solution, minimal solution

[*]Corresponding author's email: ykw@msa.vnu.edu.tw