

1. Fuzzy Node Fuzzy Graph

There exist several interesting researches concerning the fuzzy graph theory, but, the fuzzy graph which has the fuzziness of the nodes has little been researched. In comparison with the fuzzy graph, the fuzzy node fuzzy graph is able to express much detailed information than that.

In this chapter, we would explain the fuzzy partial graph and the fuzzy node fuzzy graph.

Definition.1.1 Fuzzy Graph

The fuzzy graph (the crisp node fuzzy graph) G is defined by

$$G=(V,F) : V=\{v_i\}, F=(f_{ij}), 0 \leq f_{ij} \leq 1$$

where $V=\{v_i\}$ is a set of nodes, f_{ij} is the fuzziness of the arc from the node v_i to the node v_j .

For example, the fuzzy graph $G=(V,F)$ is illustrated in Figure.1.1.

$$G=(V,F) : V=\{v_1, v_2, v_3, v_4\}, F = \begin{pmatrix} 1 & 0.84 & 0.12 & 0.84 \\ 0.39 & 1 & 0.65 & 0.71 \\ 0 & 0.43 & 1 & 0.32 \\ 1.00 & 0.93 & 0.56 & 1 \end{pmatrix}$$

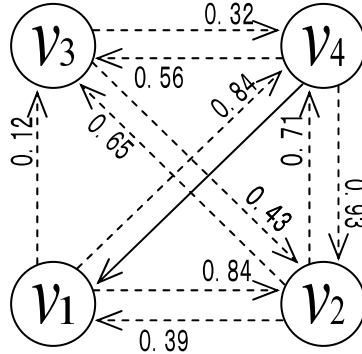


Figure.1.1 Fuzzy Graph $G=(V,F)$

Definition.1.2 Fuzzy Partial Graph

If the fuzzy graph $G=(V,F)$ and the fuzzy graph $G'=(V,F')$ satisfies:

$$F = (f_{ij}), F' = (f'_{ij}), f_{ij} \geq f'_{ij}$$

we call fuzzy graph G' as fuzzy partial graph of fuzzy graph G and denote $G' \pi G$.

For example, the fuzzy partial graph G' of the fuzzy graph G is illustrated in Figure.1.2.

$$G=(V,F) : V=\{v_1, v_2, v_3, v_4\},$$

$$F = \begin{pmatrix} 1 & 0.84 & 0.12 & 0.84 \\ 0.39 & 1 & 0.65 & 0.71 \\ 0 & 0.43 & 1 & 0.32 \\ 1.00 & 0.93 & 0.56 & 1 \end{pmatrix}$$

$$G'=(V,F') : V=\{v_1, v_2, v_3, v_4\},$$

$$F' = \begin{pmatrix} 1 & 0.59 & 0.10 & 0.33 \\ 0.39 & 1 & 0 & 0.67 \\ 0 & 0 & 1 & 0.12 \\ 0.76 & 0.56 & 0.56 & 1 \end{pmatrix}$$

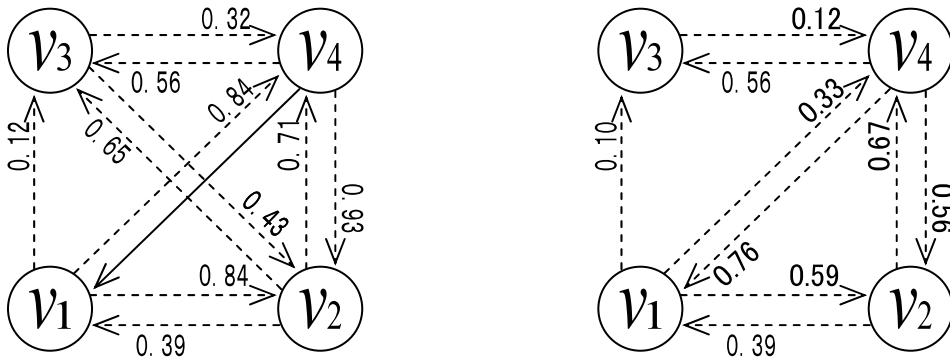


Figure.1.2 Fuzzy Partial Graph G' of Fuzzy Graph G

Definition.1.3 Fuzzy Node Fuzzy Graph

The fuzzy node fuzzy graph G is defined by

$$G=(V, Y) : V=\{v_i(u_i)\}, Y=(y_{ij}), 0 \leq y_{ij} \leq 1$$

where u_i is the fuzziness of the node v_i , y_{ij} is the fuzziness of the arc from the node v_i to the node v_j .

For example, the fuzzy node fuzzy graph $G=(V,Y)$ is illustrated in Figure.1.3.

$$G=(V,Y) : V=\{v_1(0.42), v_2(0.65), v_3(0.54), v_4(0.87)\}, Y = \begin{pmatrix} 1 & 0.64 & 0.03 & 0.95 \\ 0.59 & 1 & 0.48 & 0.32 \\ 0.74 & 0.20 & 1 & 1.00 \\ 0 & 0.65 & 0.89 & 1 \end{pmatrix}$$

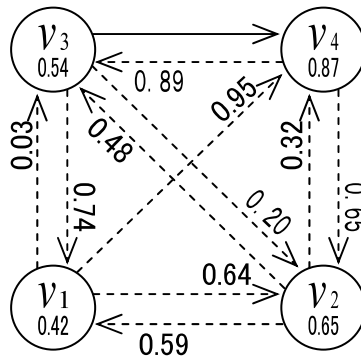


Figure.1.3 Example of Fuzzy Node Fuzzy Graph $G=(V,Y)$