A Response to Volgenant's Addendum on the Most Vital Edges

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Let $G = (U \cup V, E)$ be a weighted bipartite graph having an edge weight $w_e \geq 0$ for each e in E. An edge is called a *most vital edge* if its removal from G results in the largest decrease in the total weight of the maximum weighted matching. In [1], an $O(n^3)$ algorithm was presented to obtain the most vital edges. In [3], Volgenant pointed out that the most vital edges can also be found using the *dual solutions* of the linear assignment problem [2]. We were unaware of this result and studied this problem from different point of view. In our paper, we first gave characterization of the most vital edges in Lemma 1 and the effect of deleting a matched edge which is a candidate for the most vital edges in Lemma 6. Our motivation was to study the effect on the cost of any combinatorial optimization problem subject to the deletion of an edge in turn.

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We did not necessarily know the shortest distances u_i from an arbitrarily chosen vertex to all other vertices i, i.e., the dual solution specified in [2]. Thus, we simply chose Floyd's algorithm rather than Dijkstra's algorithm to accommodate negative edge weights for solving shortest-path problems.

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