Corrections to "Lightpath (Wavelength) Routing in Large WDM Networks" and "Dynamic Routing and Assignment of Wavelength Algorithms in Multifiber Wavelength Division Multiplexing Networks"

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***Abstract*—In this comment, several errors in Chlamtac *et al.*, 1996, Lightpath (Wavelength) Routing in Large WDM Networks and one error in Xu *et al.*, 2000, Dynamic Routing and Assignment of Wavelength Algorithms in Multifiber Wavelength Division Multiplexing Networks are pointed out. We present corrections to the errors.**

***Index Terms*—Routing and wavelength assignment algorithm, wavelength division multiplexing network, wavelength graph**

I. Errors in the Papers

In [1, p. 911], the Shortest Path Algorithm for the Wavelength Graph (SPAWG) was proposed to find the minimal cost path in an auxiliary graph (i.e., a wavelength graph). However, the proposed algorithm has five errors. These errors are described as follows:

(1) In Step 1, sub-step 2), "$u_i := a_{1j}$" should be "$u_i := a_{1i}$".

(2) In Step 3, sub-step 3), the word "column" after "i is in the jth " is missing.

(3) In Step 4, sub-step 1), "$u_l :=\min\{u_l, u_l + a_{hl}\}$" should be "$u_l :=\min\{u_l, u_h + a_{hl}\}$".

(4) Step 2 should contain an additional step after its sub-step 1), indicating that if the minimum of $R_i, C_j(\forall i, j)$ is infinite, the algorithm terminates.

(5) Steps 3 and 4 should be reversed. Note that the Go to Step 2 should still stay at the end of the algorithm after the two steps are reversed.

Here are explanations of these errors. Errors (1)-(3) are typographical errors. With error (4), the algorithm may produce infinite cost paths and generate wrong results in disconnected graphs, because the algorithm would always bring the temporary node with minimal distance to the source node into the permanent set, even though the distance is infinite. Error (5) should be corrected, because when a temporary node with minimal distance to the source node becomes a permanent node, the distances of this new permanent node's adjacent nodes to the source node should be revised before updating the row and column minimum.

Inspired by [1], in [2, p. 2133], the Modified Dijkstra (M_Dijkstra) algorithm was proposed to find the minimal cost path in an auxiliary graph (i.e., a layered graph). As a special case of the SPAWG algorithm, the M_Dijkstra algorithm is restricted to WDM networks without wavelength conversion. The proposed M_Dijkstra algorithm contains an error similar to the error (5) in the SPAWG algorithm. In the M_Dijkstra algorithm, Steps 3 and 4 should be reversed. And the "Go to Step 2" should still stay at the end of the algorithm after the two steps are reversed. The reason to reverse the two steps is similar to the reason of correcting error (5) in [1].

II. Correction of the Errors

The corrected SPAWG algorithm is shown as follows:

Step 1 (initialization):

1) $u_1 := 0$;
2) If $i \sim 1$ then $u_i := a_{1i}$ else $u_i := \infty(\forall i)$
3) $R_i :=$ min$\{u_j : j$ is in the ith row, $j \neq 1\}, (\forall i)$
4) $C_j :=$ min$\{u_i : i$ is in the jth column, $i \neq 1\}, (\forall j)$
5) $P := \{1\}, T := \{2, \cdots, N\}$.

Step 2 (Designation of a New Permanent Label):

1) Find the minimum of $R_i, C_j(\forall i, j)$.
2) If the minimum found above is infinite, then *STOP*.
3) Find an $h \in T$ with minimum u_h in the row or column which gave the minimum above (ties are broken arbitrarily).
4) $T := T - \{h\}; P := P \cup \{h\}$
5) If $T = \phi$ then *STOP*.

Step 3 (Revision of Tentative Labels):

1) If h, found in *Step 2*, is in row i and column j, then, for all $l \in T$ in row i and column j, set $u_l :=\min\{u_l, u_h + a_{hl}\}$.

Step 4 (Updating Row and Column Minimum):

1) If h, found in *Step 2*, is in row i and column j,
2) then $R_i :=\min\{u_k : k$ is in the ith row, $k \in T\}$
3) $C_j :=\min\{u_k : k$ is in the jth column, $k \in T\}$ - Note: The minimum over an empty set is taken to be ∞ in 2) and 3).
4) Go to *Step 2*.

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The corrected Steps 3 and 4 of the M_Dijkstra algorithm are given below:

Step 3 (Update D_i and p_i, Vertex i is on the w_{th} Layer):
If $i \in \{(w-1)|N|+1, \cdots, w|N|\}, i \notin S$ and $D_{Iw} + c_{Iwi} < D_i$ then $D_i := D_{Iw} + c_{Iwi}, p_i := p_{Iw} \cup \{i\}$.

Step 4 (Update R_w):
If $\{i : i \in \{(w-1)|N|+1, \cdots, w|N|\}, i \notin S\} = \phi$ then $R_w := \infty$, else $R_w :=$min$\{D_i : i \in \{(w-1)|N|+1, \cdots, w|N|\}, i \notin S\}$. Go to *Step 2*.

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REFERENCES

[1] I. Chlamtac, A. Farago, and T. Zhang, Lightpath (wavelength) routing in large WDM networks, *IEEE J. Sel. Areas Commun.*, Vol. 14, No. 5, pp. 909–913, June 1996.

[2] S. Xu, L. Li, and S. Wang, Dynamic routing and assignment of wavelength algorithms in multifiber wavelength division multiplexing networks, *IEEE J. Sel. Areas Commun.* , Vol. 18, No. 10, pp. 2130–2137, October 2000.