Correction to "Relative Observability of Discrete-Event Systems and Its Supremal Sublanguages"

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***Abstract*—In this note, we make a few corrections to our previous paper "Relative Observability of Discrete-Event Systems and Its Supremal Sublanguages."**

***Index Terms*—Discrete-event systems, relative observability, supervisory control.**

An error was found in the program that was originally used to compute the results of [1], Sec. V, *Examples*. Specifically, the generator displayed in Fig. 12, and multiple entries (4th, 7th row and 4th column) of Table 1 of [1] were incorrect. We present corrected results in the following.

Control of a Guideway Under Partial Observation

Consider the same Guideway example as presented in Sec. V.A of [1], except that we choose the unobservable events to be 13 and 23. Applying the Algorithm 3 in [1], we obtain the generator displayed in Fig. 1. The resulting controlled behavior is verified to be relatively observable and controllable; moreover, it is strictly larger than the supremal normal and controllable sublanguage represented by the generator displayed in Fig. 2. The reason is as follows (refer to Fig. 11 in [1]). After string 11.13.10, $\mathbf{V}_1$ is at state 3 and $\mathbf{V}_2$ at 0. With relative observability, either $\mathbf{V}_1$ executes event 15 (moving to state 4) or $\mathbf{V}_2$ executes 21 (moving to state 1); in the latter case, the supervisor disables event 23 after execution of 21 to ensure mutual exclusion at (3, 3) because event 20 is uncontrollable. With normality, however, event 23 cannot be disabled because it is unobservable; thus 21 is disabled after string 11.13.10, and the only possibility is that $\mathbf{V}_1$ executes 15.

Control of an AGV System Under Partial Observation

Consider the same AGV example as presented in Sec. V.B of [1]. We select different subsets of controllable events to be unobservable, and apply the Algorithm 3 in [1] to compute the corresponding supervisors whose controlled behaviors are relatively observable and controllable. The computational results are displayed in Table I; the supervisors are state minimal, and controllability, observability, and normality are independently verified.

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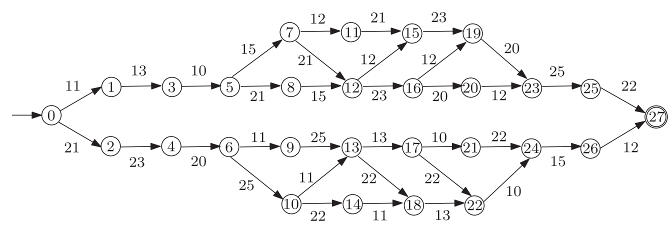

Fig. 1. Supremal relatively observable and controllable sublanguage.

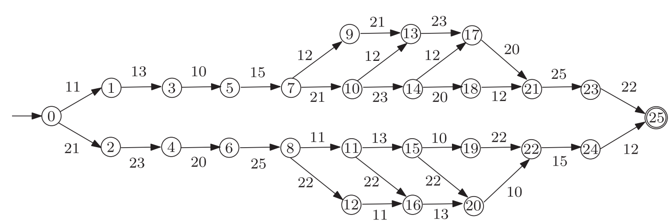

Fig. 2. Supremal normal and controllable sublanguage.

TABLE I
TEST RESULTS OF ALGORITHM 3 IN [1] FOR DIFFERENT SUBSETS OF UNOBSERVABLE EVENTS IN THE AGV SYSTEM

$\Sigma_{uo} = \Sigma - \Sigma_o$	State # of rel. obs. supervisor	State # of normal supervisor	Iteration # of Alg. 3 in [1]	Iteration # of Alg. 1 in [1]
{13}	4406	3516	1	1
{21}	4348	0	2	399
{41,51}	3795	0	3	291
{31,43}	4215	1485	2	233
{11,31,41}	163	0	2	28
{13,23,31,33, 41,43,51,53}	563	0	3	583

In addition, Footnote 1 (Sec. II of [1]) and the prescription "Note that in computing . . . the controllability requirement" (Sec. IV of [1], the paragraph above Theorem 3) should be removed, because *all* events (not just controllable events) must be taken into account to ensure that Algorithm 3 generates a relatively observable and controllable sublanguage.

Finally, in Fig. 4 of [1] the ambient language should be revised to $C = \{\alpha, \beta\}, \overline{C} = \{\epsilon, \alpha, \beta\}$.

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References

[1] K. Cai, R. Zhang, and W. M. Wonham, "Relative observability of discrete-event systems and its supremal sublanguages," *IEEE Trans. Autom. Control*, vol. 60, no. 3, pp. 659–670, Mar. 2015.