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Erratum

Corrigendum to "Computing random consistency indices and assessing priority vectors reliability" [Inf. Sci. 420 (2017) 532–542]

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ABSTRACT

Algorithm 2 given in Information Sciences 420 (2017) 532–542 is revised. Corrected algorithm does not affect abstract, main findings and conclusions of the original paper.

1. Introduction

Condition $a_{ij} \in \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$ $\forall i < j$ is not sufficient for ensuring transitivity of a reciprocal MPCM $A = (a_{ij})$; thus, Algorithm 2 in [1] has to be revised. As an example, the following MPCM:

$$A = \begin{pmatrix} 1 & 2 & 1 \\ \frac{1}{2} & 1 & 3 \\ 1 & \frac{1}{3} & 1 \end{pmatrix}$$

is not transitive. For a better understanding of further conditions included in the corrected Algorithm 2, the following theorem is provided:

Theorem 1. *[2] The following assertions are equivalent:*

1. $A = (a_{ij})$ *is transitive;*
2. (a) $a_{ij} > 1, a_{jk} > 1 \Rightarrow a_{ik} > 1$,
   (b) $a_{ij} = 1,\ a_{jk} = 1 \Rightarrow a_{ik} = 1$;
3. $a_{ij} > 1, a_{jk} \geq 1 \Rightarrow a_{ik} > 1$;
4. $a_{ij} \geq 1, a_{jk} > 1 \Rightarrow a_{ik} > 1$.

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Algorithm 2 Building a transitive MPCM.

OUTPUT: a transitive MPCM of order n

for $i = 1 \dots n$ **do**
  $a_{ii} = 1$
end for
for $i = 1 \dots n-1$ **do**
  $a_{i\,i+1} = sample.int(Saatyscale)$
  $a_{i+1\,i} = 1/a_{i\,i+1}$
end for
for $i = 1 \dots n-2$ **do**
  for $j = i+2 \dots n$ **do**
    if $a_{i\,j-1} == 1$ *and* $a_{j-1\,j} == 1$ **then**
      $a_{ij} = 1$
    else
      $a_{ij} = sample.int(Saatyscale - \{1\})$
    end if
    $a_{ji} = 1/a_{ij}$
  end for
end for

Table 2
RI, RI_{CD}, RI_{PL} and RI_{GCI} values derived from simulation (R, T and WC denote reciprocal, transitive and weakly consistent MPCMs, respectively).

n	RI			RI_{CD}			RI_{PL}			RI_{GCI}		
	R	T	WC	R	T	WC	R	T	WC	R	T	WC
3	0.497	0.157	0.024	38.016	5.912	1.772	36.252	4.257	0.484	2.505	0.898	0.142
4	0.836	0.257	0.032	13.158	4.792	1.603	35.923	4.422	0.424	2.511	0.93	0.127
5	1.049	0.325	0.035	11.044	4.635	1.531	36.004	4.536	0.37	2.513	0.954	0.112
6	1.182	0.377	0.036	10.378	4.634	1.507	36.026	4.66	0.343	2.514	0.978	0.105
7	1.267	0.414	0.036	10.079	4.657	1.48	35.708	4.741	0.316	2.51	0.994	0.097
8	1.328	0.442	0.036	9.909	4.671	1.468	35.901	4.794	0.299	2.51	1.004	0.092
9	1.376	0.463	0.035	9.844	4.684	1.456	35.955	4.813	0.281	2.515	1.01	0.088
10	1.406	0.483	0.035	9.765	4.718	1.45	35.863	4.862	0.272	2.509	1.019	0.085
11	1.433	0.498	0.034	9.739	4.743	1.444	35.798	4.899	0.262	2.511	1.026	0.082
12	1.455	0.511	0.035	9.713	4.759	1.444	35.837	4.917	0.258	2.51	1.03	0.081
13	1.472	0.522	0.034	9.697	4.778	1.438	35.802	4.94	0.248	2.51	1.034	0.078
14	1.487	0.531	0.034	9.684	4.791	1.435	35.817	4.959	0.244	2.51	1.038	0.077
15	1.502	0.54	0.034	9.685	4.811	1.434	35.923	4.979	0.24	2.513	1.042	0.076

Table 3
Mean of T/R and WC/T in Table 2 for each random consistency index.

RI		RI_{CD}		RI_{PL}		RI_{GCI}	
T/R	WC/T	T/R	WC/T	T/R	WC/T	T/R	WC/T
0.339	0.08	0.389	0.311	0.132	0.065	0.397	0.096

2. Corrections

Algorithm 2, provided in this corrigendum, is a correct algorithm for building a transitive MPCM, with $a_{ij} \in \{1, 2, 3, 4, 5, 6, 7, 8, 9\}\ \forall i < j$.

According to the new Algorithm 2, four columns in Table 2 of [1], i.e. those related to consistency indices of transitive MPCMs, change as shown in current Table 2; thus, Table 3 of [1] is replaced by current Table 3 and, at page 538 of [1], corrected percentages are shown in the following statement: "RI_{PL} of transitive MPCMs is on average 13.2% of RI_{PL} of reciprocal MPCMs, and RI_{PL} of weakly consistent MPCMs is on average 6.5% of RI_{PL} of transitive MPCMs." Finally, Figs. 1 and 2 of [1], which synthesize the results of the simulations, are replaced by current Figs. 1 and 2.

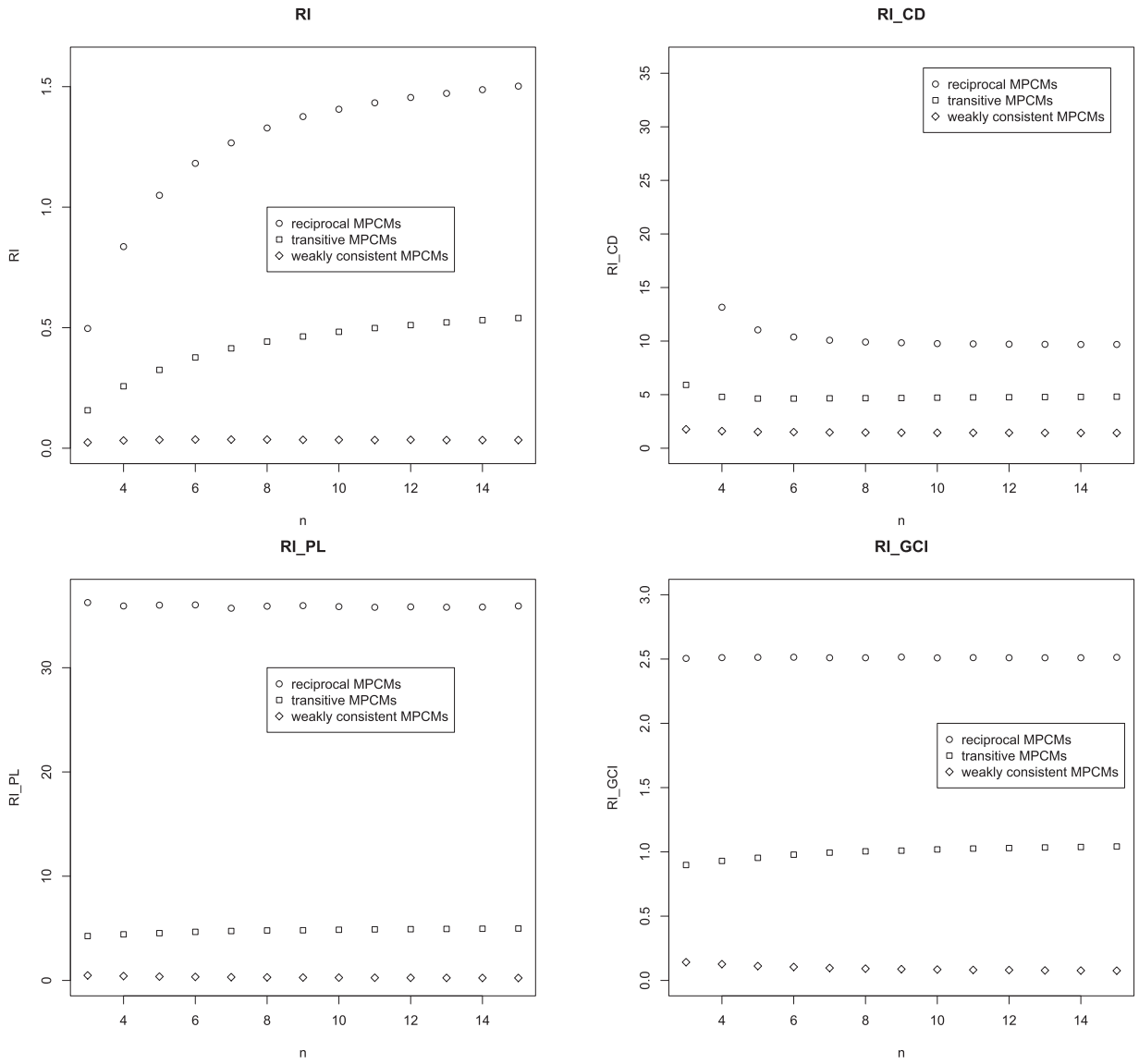

Fig. 1. Random consistency indices related to CI, CI_{CD}, CI_{PL} and GCI. On the x-axis, n is the size of the MPCMs. On the y-axis, random consistency index. For each random consistency index, series ○ represents reciprocal MPCMs, series □ represents transitive MPCMs, series ◇ represents weakly consistent MPCMs.

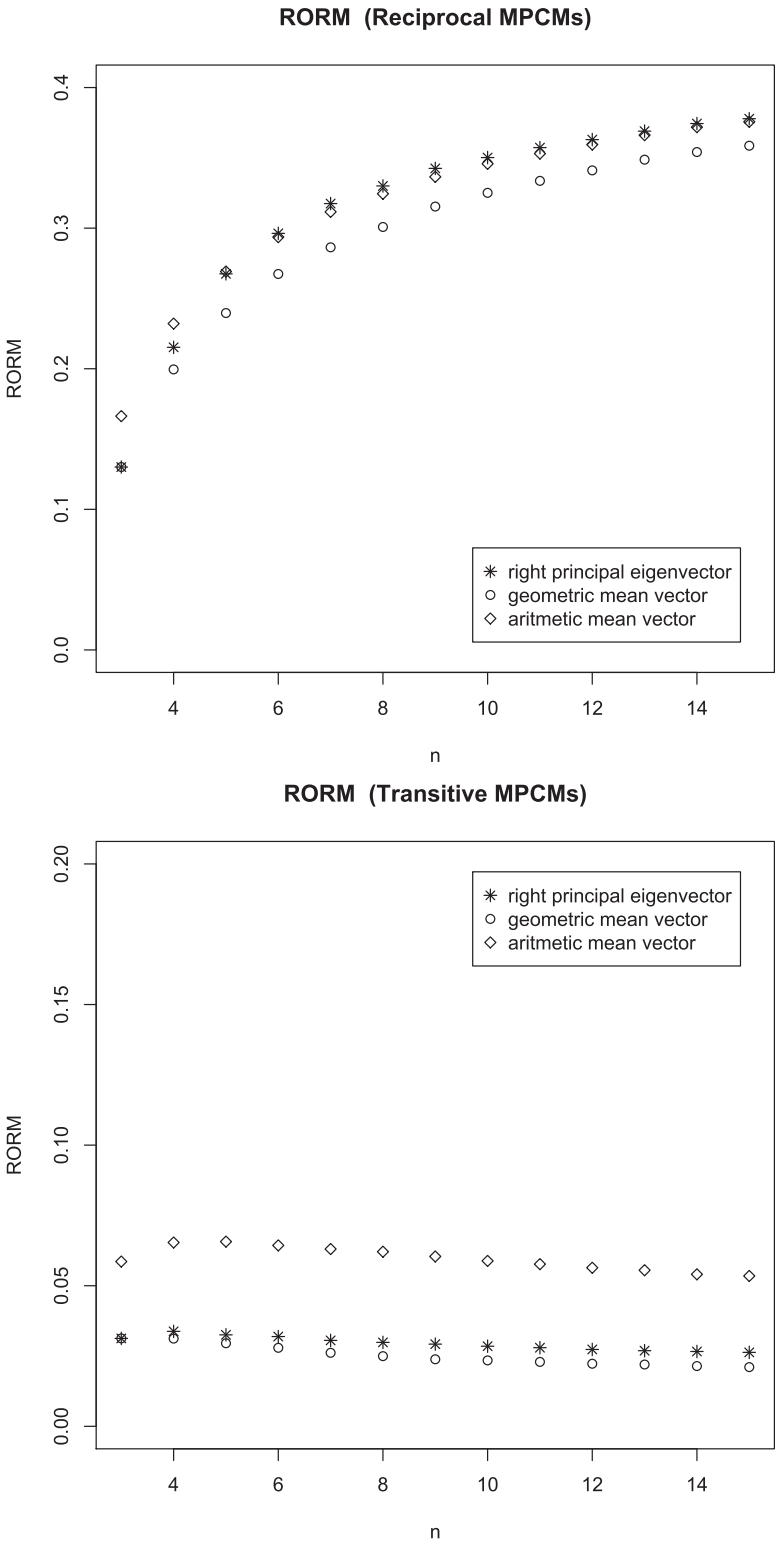

Fig. 2. RORM for reciprocal and transitive MPCMs. On the x-axis, n is the size of the MPCMs. On the y-axis, *RORM*. Series ✳ represents $RORM(\underline{w}_{\lambda_{max}})$, series ○ represents $RORM(\underline{w}_{gm})$, series ◇ represents $RORM(\underline{w}_{am})$.

3. Conclusions

By comparing this corrigendum with [1], it is crucial to emphasize that, although corrected random consistency indices and RORM of transitive MPCMs (see Table 2, Figs. 1 and 2) are slightly smaller than those provided in [1] (see Table 3, Fig. 1 and 2 of [1]), the new Algorithm 2 does not affect main findings and conclusions of [1].

References

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