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CORRECTION

Correction to: Incremental maintenance of three-way regions with variations of objects and values in hybrid incomplete decision systems

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The original version of this article unfortunately contained three mistakes due to the transformation document being edited through different formulas. The presentation of Definition 5, Theorem 3 and Table 3 were incorrect. The correct versions are given below:

Definition 5 Given a HIDS, for $\forall x_i,\ x_j \in U$ and $\exists \in C^I$, suppose that $f(x_i, a) = \left[\mathrm{l}_i^a, \mathrm{h}_i^a\right]$ and $f\left(x_j, a\right) = \left[\mathrm{l}_j^a, \mathrm{h}_j^a\right]$, the distance metric $d_a(x_i,\ x_j)$ of objects x_i, x_j pertaining to a can be depicted as follows:

$$d_a\left(x_i, x_j\right) = \begin{cases} 1-\dfrac{\left|f(x_i, a)\cap f\left(x_j, a\right)\right|}{\left|f(x_i, a)\cup f\left(x_j, a\right)\right|} & a\in C^I, f(x_i, a)\neq{}'*'\wedge f\left(x_j, a\right)\neq{}'*' \\ 0 & a\in C^I, f(x_i, a)={}'*'\vee f\left(x_j, a\right) = {}'*' \end{cases}$$

where $\left|f(x_i, a)\cap f\left(x_j, a\right)\right| = \left\{ \min\left\{\mathrm{h}_i^a, \mathrm{h}_j^a\right\} -\max\left\{\mathrm{l}_i^a, \mathrm{l}_j^a\right\} \right.$ $\min\left\{\mathrm{h}_i^a, \mathrm{h}_j^a\right\} -\max\left\{\mathrm{l}_i^a, \mathrm{l}_j^a\right\} > 00\min\left\{\mathrm{h}_i^a, \mathrm{h}_j^a\right\} -\max\left\{\mathrm{l}_i^a, \mathrm{l}_j^a\right\}$ < 0, and $\left|f(x_i, a)\cup f\left(x_j, a\right)\right| = \max\left\{\mathrm{h}_i^a, \mathrm{h}_j^a\right\} -\min\left\{\mathrm{l}_i^a, \mathrm{l}_j^a\right\}$.

Theorem 3 Let δ-HIDS$^{(t)}$ be a δ-HIDS at t, and let $\mathbf{M}_D^{(t)} = \left[d_{ir}^{(t)}\right]_{n\times s}$ and $\mathbf{M}_A^{(t)} = \left[m_{ij}^{(t)}\right]_{n\times n}$ be the decision matrix and the neighborhood relation matrix in regard to $A \subseteq C$ at t, respectively. When modifying the object set ΔV, adding the object set Δ^+U at t+1 and deleting the object set Δ^-U, let the decision matrix be $\mathbf{M}_D^{(t+1)} = \left[d_{ir}^{(t+1)}\right]_{\left(n+n'-p\right)}$ $\times$s and the neighborhood relation matrix be $\mathbf{M}_A^{(t+1)} = \left[m_{ij}^{(t+1)}\right]_{\left(n+n'-p\right)}$ $\times\left(n + n'-p\right)$. The following properties hold:

(1) for $p + 1 \leq i \leq n$, $\omega_{ir}^{+1} = \sum_{j=p+1}^{n}\left(\left(m_{ij}^{(t)}\oplus m_{ij}^{(t+1)}\right)\cdot d_{jr}^{(t+1)} \cdot m_{ij}^{(t+1)}\right);$

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Table 3 Comparison of the time complexities of static and incremental algorithms at t+1

Steps	MSTW	MITW-OV
Compute decision matrix	$O(n+n^{'}-p)$	$O(n^{'})$
Compute relation matrix	$O(m\times(n+n^{'}-p)^2)$	$O((n-p)^2\times(+s)+(n^{'})^2\times m)$
Compute intermediate matrix	$O(s\times(n+n^{'}-p)^2)$	$O(s\times(n^2+n^{'}\times(n-p)+(n^{'})^2))$
Compute column vector	$O(s\times(n+n^{'}-p))$	$O(n+n^{'}-p)$
Compute basic matrix	$O(s\times(n+n^{'}-p))$	$O(s\times(n+n^{'}-p))$
Compute three-way regions	$O(s\times(n+n^{'}-p))$	$O(s\times(n+n^{'}-p)$
Total	$O((m+s)\times(n+n^{'}-p)^2+$ $(s+1)\times(n+n^{'}-p))$	$O(n^{'}+(\ n-p)^2\times(m+s)+(n^{'})^2\times m+s\times\ (p^2+n^{'}\times(n-p)+(n^{'})^2)+(s+1)\times(n+n^{'}-p))$

(2) for $p+1 \leq i \leq n$, $\omega_{ir}^{-1} = \sum_{k=1}^{n}\left(\left(m_{ij}^{(t)} \oplus m_{ij}^{(t+1)}\right) \cdot d_{jr}^{(t+1)} \cdot m_{ij}^{(t)}\right)$;

(3) for $p+1 \leq i \leq n$, $\omega_{ir}^{-2} = \sum_{j=1}^{p}\left(m_{ij}^{(t+1)} \cdot d_{jr}^{(t+1)}\right)$;

(4) for $p+1 \leq i \leq n$, $\omega_{ir}^{+2} = \sum_{j=n+1}^{n+n'}\left(m_{ij}^{(t+1)} \cdot d_{jr}^{(t+1)}\right)$;

(5) for $n+1 \leq i \leq n+n'$, $\omega_{ir}^{+3} = \sum_{j=p+1}^{n+n'}\left(m_{ij}^{(t+1)} \cdot d_{jr}^{(t+1)}\right)$.

The original article has been corrected.