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Corrigendum

Corrigendum to: "Dissimilarity cumulation theory in arc-connected spaces" [J. Math. Psychol. 52 (2008) 73–92]

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On p. 86, footnote 5 to Lemma 2 contains an error which, although inconsequential for the lemma's validity, needs to be corrected. The lemma relies on the fact that given a (necessarily countable) collection $\mathbb{I}$ of closed, nondegenerate, pairwise disjoint intervals in an interval $[c, d]$, there is a continuous, onto function $\phi : [c, d] \to [a, b]$ which is constant on each of the intervals in $\mathbb{I}$ and increasing everywhere else. The lemma correctly states that "such a ϕ can be constructed in a variety of ways". The footnote in question was to provide an example of such a construction, and this example was in error.

Here is a correct example, chosen for closely following the standard construction of the Cantorian "devil's staircases": missing details therefore can be easily reconstructed from textbook descriptions of the latter (e.g., Kannan and Krueger, 1996, Example 1.3.3).

For simplicity, let $[c, d] = [0, 1]$. If there is no interval $[0, v_0] \in \mathbb{I}$, put $v_0 = 0$ and include $[0, 0]$ in $\mathbb{I}$. If there is no interval $[u_1, 1] \in \mathbb{I}$, put $u_1 = 1$ and include $[1, 1]$ in $\mathbb{I}$. Enumerate the intervals by dyadic numbers $r = k2^{-n}$ ($n = 0, 1, 2, \ldots, k = 0, \ldots, 2^n$) so that $[0, v_0] = I_0, [u_1, 1] = I_1$, and if $r_1 < r_2$ then I_{r_1} is below I_{r_2}. This is easily achieved by a recursive construction starting with I_0, I_1 and following the rule that for any two intervals enumerated $I_{i2^{-n}}$ and $I_{(i+1)2^{-n}}$, an arbitrary interval in between is chosen and designated $I_{(2i+1)2^{-(n+1)}}$ (and if there is no such interval, the number $(2i + 1)2^{-(n+1)}$ is not used in the enumeration). We define the mapping ϕ on $\bigcup \mathbb{I}$ by $\phi(x) = r$ on interval I_r. If $x \in [0, 1] \setminus \bigcup \mathbb{I}$, we first define $x_v = \sup\{v_r : v_r < x\}$ and $x_u = \inf\{u_r : u_r > x\}$, where we use the notation $I_r = [u_r, v_r]$. Then we put $\phi(x_v) = \sup\{r : v_r < x\}$, $\phi(x_u) = \inf\{r : u_r > x\}$, and $\phi(x) = \phi(x_v) + (\phi(x_u) + \phi(x_u))\frac{x-x_v}{x_u-x_v}$, with the understanding that $\phi(x) = \phi(x_v) = \phi(x_u)$ if $x_u = x_v = x$. The function obtained is a well-defined mapping $[0, 1] \to [0, 1]$, continuous, onto, constant on the enumerated intervals, and increasing everywhere else. (A Cantorian singular function is a special case in which $x_u = x_v = x$ for all $x \in [0, 1] \setminus \bigcup \mathbb{I}$.)

References

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