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ERRATUM

ERRATUM TO: INVARIANT SUBSPACE METHOD: A TOOL FOR SOLVING FRACTIONAL PARTIAL DIFFERENTIAL EQUATIONS, IN: FCAA-20-2-2017

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This is erratum to our paper [1] in: *Fract. Calc. Appl. Anal.* **20**, No 2 (2017), pp. 477-493, DOI: 10.1515/fca-2017-0024. Here we point out that Theorem 3.1 and Theorem 3.2 of [1] hold true more generally when fractional partial time derivatives $\frac{\partial^{\alpha+i}}{\partial t^{\alpha+i}}$ and $\frac{\partial^{i\alpha}}{\partial t^{i\alpha}}$ in FPDE (3.1) and (3.7) are Caputo as well as **Riemann-Liouville (R-L)** time derivatives.

Further, note that $\frac{d^{\alpha}(t^{-\alpha})}{dt^{\alpha}}$ is not defined in case of Caputo derivative if $\alpha \in (0,1)\backslash\{\frac{1}{2}\}$. In the literature many authors have mistakenly ignored the fact that $\frac{d^{\alpha}(t^{-\alpha})}{dt^{\alpha}} = \frac{\Gamma(1-\alpha)t^{-2\alpha}}{\Gamma(1-2\alpha)}$ is not valid in case of Caputo derivative, though it holds correct for R-L derivative.

In view of these facts, Example 4.2 and Example 4.7 are wrong if $\frac{d^{\alpha}f}{dt^{\alpha}}$ is taken as Caputo time derivative, but correct if we take fractional time derivative as R-L time derivative, i.e., $\frac{{}^{RL}d^{\alpha}f}{dt^{\alpha}}$ in both these examples.

Hence Example 4.2 given in [1] should read as follows:

$$\frac{{}^{RL}\partial^{\alpha}f}{\partial t^{\alpha}} + f\frac{\partial^{\beta}f}{\partial x^{\beta}} - d\frac{\partial^{\beta}}{\partial x^{\beta}}\left(\frac{\partial^{\beta}f}{\partial x^{\beta}}\right) = 0,\ \alpha \in (0,1),\ \alpha \neq \frac{1}{2},\ \beta \in (0,1],\quad (4.6)$$

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where the solution continues to be the same, i.e.,

$$f(x,t) = at^{-\alpha} - \left[\frac{\Gamma(1-\alpha)t^{-\alpha}}{\Gamma(1+\beta)\Gamma(1-2\alpha)}\right] x^{\beta}.$$

Proceeding on similar lines, Example 4.7 from [1] should be considered as:

$$\frac{{}^{RL}\partial^{\alpha} f}{\partial t^{\alpha}} - 6f\frac{\partial^{\beta} f}{\partial x^{\beta}} + \frac{\partial^{2\beta}}{\partial x^{2\beta}}\left(\frac{\partial^{\beta} f}{\partial x^{\beta}}\right) = 0, \ \alpha \in (0,1)\backslash\{1/2\}, \ \beta \in (0,1]. \quad (4.38)$$

The solution continues to be the same, i.e.,

$$f(x,t) = at^{-\alpha} + \left[\frac{\Gamma(1-\alpha)t^{-\alpha}}{6\Gamma(1+\beta)\Gamma(1-2\alpha)}\right] x^{\beta}.$$

References

[1] S. Choudhary and V. Daftardar-Gejji, Invariant subspace method: A tool for solving fractional partial deifferential equations. *Fract. Calc. Appl. Anal.* **20**, No 2 (2017), 477–493, DOI: 10.1515/fca-2017-0024; https://www.degruyter.com/view/j/fca.2017.20.issue-2/issue-files/fca.2017.20.issue-2.xml.

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