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Erratum to "On some fixed points of $\alpha - \psi$ contractive mappings with rational expressions, J. Nonlinear Sci. Appl., 10 (2017), 1569 - 1581"

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Abstract

The aim of this note is to correct the affiliation of the authors in [E. Karapınar, A. Dehici, N. Redjel, J. Nonlinear Sci. Appl., **10** (2017), 1569–1581]. We shall also extend the main result of this paper further.

Keywords: Complete metric space, (c)-comparison function, fixed point, α-admissible mapping, cyclic mapping.

2010 MSC: 46T99, 47H10, 54H25.

1. Introduction and Preliminaries

The main aim of this note is to correct the affiliation of the first author in [2]. On the other hand, by getting a chance for putting a note on [2], we shall give a more generalized version of the main results in [2]. For this purpose, we shall use the notion of *simulation function*:

Definition 1.1 ([3]). A *simulation function* is a mapping $\zeta : [0, \infty) \times [0, \infty) \to \mathbb{R}$ satisfying the following conditions:

(ζ_1) $\zeta(t, s) < s - t$ for all $t, s > 0$;

(ζ_2) if $\{t_n\}, \{s_n\}$ are sequences in $(0, \infty)$ such that $\lim_{n\to\infty} t_n = \lim_{n\to\infty} s_n > 0$, then

$$\limsup_{n\to\infty} \zeta(t_n, s_n) < 0. \tag{1.1}$$

Notice that in [3] there was a superfluous condition $\zeta(0, 0) = 0$. Let $\mathcal{Z}$ denote the family of all simulation functions $\zeta : [0, \infty) \times [0, \infty) \to \mathbb{R}$. Due to the axiom (ζ_1), we have

$$\zeta(t, t) < 0 \text{ for all } t > 0. \tag{1.2}$$

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Example 1.2 (See e.g. [1, 3, 4]). We define the mappings $\zeta_i : [0,\infty) \times [0,\infty) \to \mathbb{R}$, for $i = 1,2,3$, as follows:

Suppose that $\varphi : [0,\infty) \to [0,1)$ is a function such that $\limsup_{t\to r^+} \varphi(t) < 1$ for all $r > 0$. We define

$$\zeta_1(t,s) = s\,\varphi(s) - t \qquad \text{for all } s,t \in [0,\infty).$$

Let $\eta : [0,\infty) \to [0,\infty)$ be an upper semi-continuous mapping such that $\eta(t) < t$ for all $t > 0$ and $\eta(0) = 0$. Then, we construct

$$\zeta_2(t,s) = \eta(s) - t \qquad \text{for all } s,t \in [0,\infty).$$

If $\phi : [0,\infty) \to [0,\infty)$ is a function such that $\int_0^\varepsilon \phi(u)du$ exists and $\int_0^\varepsilon \phi(u)du > \varepsilon$, for each $\varepsilon > 0$, then we state

$$\zeta_3(t,s) = s - \int_0^t \phi(u)du \qquad \text{for all } s,t \in [0,\infty).$$

Clearly, each function ζ_i $(i = 1,2,3)$ is a simulation function.

2. Simulation results

In this section, we shall generalize the main result in [2]. We refer to [2], for all used notions and notations here.

We start this section by introducing the concept of $\alpha - \psi - K$ mappings of ζ type.

Definition 2.1. Let (X,d) be a metric space and $f : X \longrightarrow X$ be a given mapping and $\zeta \in \mathcal{Z}$. We say that f is an $\alpha - \psi - K$ mapping of ζ type if there exist two functions $\alpha : X \times X \longrightarrow [0,\infty)$ and $\psi \in \Psi$ such that

$$\zeta(\alpha(x,y)d(f(x),f(y)),\psi(K(x,y))) \geqslant 0 \tag{2.1}$$

for all $x,y \in X, x \neq y$, where

$$K(x,y) = \max\left\{d(x,y), \frac{d(x,f(x)) + d(y,f(y))}{2}, \frac{d(x,f(y)) + d(y,f(x))}{2}, \frac{d(x,f(x))d(y,f(y))}{d(x,y)}, \frac{d(y,f(y))[1 + d(x,f(x))]}{[1 + d(x,y)]}\right\}.$$

Theorem 2.2. *Let (X,d) be a complete metric space. Suppose that $f : X \longrightarrow X$ is an $\alpha - \psi - K$ mapping of ζ type satisfying the following conditions:*

(i) *f is α-admissible;*

(ii) *there exists $x_0 \in X$ such that $\alpha(x_0, f(x_0)) \geqslant 1$;*

(iii) *f is continuous.*

Then there exists $u \in X$ such that $f(u) = u$.

Sketch of the Proof.

$$0 \leqslant \zeta(\alpha(x,y)d(f(x),f(y)),\psi(K(x,y))) < \psi(K(x,y)) - \alpha(x,y)d(f(x),f(y)), \tag{2.2}$$

which yields that

$$\alpha(x,y)d(f(x),f(y)) < \psi(K(x,y)).$$

Verbatim of the proof of the main theorem in [2], we complete the proof. □

3. Correction of the affiliation in [2]

The affiliation of the first author, Erdal Karapınar, in the recently published paper [2] should be "Department of Mathematics, Atilim University 06836, Incek, Ankara, Turkey".

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