Bitopological dynamical system is a new area of dynamical system recently introduced by Acharjee et al. [1]. Nada and Zohny [2] applied topological dynamical system to study development of an organism from zygote until birth and they made three conjectures regarding the development of child growth from zygote to till its birth. In this paper, we disprove the conjecture 2 of Nada and Zohny [2] by applying some mathematical results from bitopological dynamical system [1] with medical evidences. Also, we introduce forward iterated connected space, backward iterated connected space, pairwise iterated connected space and found some related results. Further, we show that during the development of an organism from zygote until birth, the developing stage after gastrulation is pairwise disconnected and forward iterated disconnected.

Main results

Here, we introduce forward iterated connectedness, backward iterated connectedness, pairwise iterated connectedness and some related results.

**Definition 3.1.** Let \((X, f)\) be a bitopological dynamical system, where \((X, τ_1, τ_2)\) is a bitopological space and \(f: X \to X\) is a pairwise continuous map. We call \((X, f)\) as forward iterated connected if for all \(m, n \in \mathbb{N}\), \(U(\neq φ) \in τ_1 \) and \(V(\neq φ) \in τ_2\), such that \(X = f^m(U) \cup f^n(V)\) and \(f^m(U) \cap f^n(V) = φ\), if there exist \(m, n \in \mathbb{N}\), \(U(\neq φ) \in τ_1\) and \(V(\neq φ) \in τ_2\), such that \(X = f^{-m}(U) \cup f^{-n}(V)\) and \(f^{-m}(U) \cap f^{-n}(V) = φ\), then we call \((X, f)\) as \((m, n)\)-forward iterated disconnected.

**Definition 3.2.** Let \((X, f)\) be a bitopological dynamical system, where \((X, τ_1, τ_2)\) is a bitopological space, and \(f: X \to X\) is a pairwise continuous map. We call \((X, f)\) as backward iterated connected if for all \(m, n \in \mathbb{N}\), \(U(\neq φ) \in τ_1\) and \(V(\neq φ) \in τ_2\), such that \(X = f^{-m}(U) \cup f^{-n}(V)\) and \(f^{-m}(U) \cap f^{-n}(V) = φ\), then we call \((X, f)\) as \((m, n)\)-backward iterated disconnected.

**Definition 3.3.** Let \((X, f)\) be a bitopological dynamical system, where \((X, τ_1, τ_2)\) is a bitopological space, and \(f: X \to X\) is a pairwise continuous map. We call \((X, f)\) as pairwise iterated connected if for all \(m, n \in \mathbb{Z}\), \(U(\neq φ) \in τ_1\) and \(V(\neq φ) \in τ_2\), such that \(X = f^{-m}(U) \cup f^{-n}(V)\) and \(f^{-m}(U) \cap f^{-n}(V) = φ\), then we call \((X, f)\) as \((m, n)\)-pairwise iterated disconnected.

Main theorems

Some of the main theorems are stated below.

**Theorem 3.1.** Let \((X, f)\) be a bitopological dynamical system. If \((X, f)\) is forward iterated connected or backward iterated connected or pairwise iterated connected, then \(X\) is pairwise connected.

**Theorem 3.2.** Let \((X, f)\) be a bitopological dynamical system, where \(X\) is pairwise connected. If \(f\) is pairwise open and \(+\)-invariant, then \((X, f)\) is forward iterated connected.

**Theorem 3.3.** Let \((X, f)\) be a bitopological dynamical system, where \(X\) is pairwise connected. If \(f\) is \(-\)-invariant, then \((X, f)\) is backward iterated connected.

**Theorem 3.4.** Let \((X, f)\) be a bitopological dynamical system, where \(X\) is pairwise connected. If \(f\) is \(+\)-invariant, then \((X, f)\) is pairwise iterated connected.

In conjecture 2 of [2], Nada and Zohny conjectured that a medical treatment should be started to stop cognitive anomalies at any step of growth based on the properties of local topological subspaces for the dynamical topology. In this paper, we disprove their conjecture by showing that to cure cognitive anomalies, medical treatments should be done on local bitopological subspace; not on local topological subspace as conjectured by Nada and Zohny [2].

Figure: Here, Z - the zygote, U - development of the zygote just before gastrulation. T1 - Neural tissues. T2 - Non-neural tissues. O1 - Neural organs. O2 - Non-neural organs. NS1 - Neural organ systems. NS2 - Non-neural organ systems and R - the baby at the time of birth.

We show that the developing stage after gastrulation is forward iterated disconnected in the development of an organism from zygote until birth.

**References**

1. Acharjee, S., Goswami, K., Sarmah, H.K. Transitive map in bitopological dynamical systems (accepted for publication).