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Topology of 4-dimensional universe for every 3-dimensional manifold

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A 4-dimensional universe is a 4-dimensional boundary-less connected oriented manifold with every 3-dimensional closed connected oriented manifold embedded. A 4-dimensional punctured universe is a 4-dimensional boundary-less connected oriented manifold with the punctured manifold of every 3-dimensional closed connected oriented manifold embedded. It is known that every 4-dimensional universe and every 4-dimensional punctured universe are 4-dimensional open manifolds. If a 3-dimensional closed connected orientable manifold is considered as a 3-dimensional universe, then every spacetime is embedded in every 4-dimensional universe since the trivial line bundle over every 3-dimensional universe is embedded in it. For any 4-dimensional oriented manifold Y, some topological invariants of Y with values taken in {0, 1, 2, …, +∞} are defined by using homological arguments and called the topological indexes of Y. The topological indexes are applied to a 4-dimensional punctured universe and refined notions of a 4-dimensional universe, namely 4-dimensional types 1, 2 and full universes to show certain infinity of these topological indexes. It is shown that this infinity comes from embeddings of the connected sums of 3-dimensional homology handles obtained from certain infinite family of knots by 0-surgery. Recently, it is also shown that the rational second homologies of every 4-dimensional universe and every 4-dimensional punctured universe are always infinitely generated over the rationals by using the embeddings of 3-dimensional closed connected oriented manifolds obtained from the 3-torus and certain infinite family of knots. In conclusion, it is confirmed that the topology of every 4-dimensional universe and every 4-dimensional punctured universe are related to knot theory.

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