

International  
Online Conference



**Algebraic  
and Geometric  
Methods of Analysis**

dedicate to the memory  
of Yuriy Trokhymchuk  
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## LIST OF TOPICS

- Topological methods in analysis
- Geometric problems of complex and mathematical analysis
- Algebraic methods in geometry
- Differential geometry in the whole
- Geometry and topology of differentiable manifolds
- General and algebraic topology
- Geometric and topological methods in natural sciences

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# On non-Hausdorff manifolds of dimension 1

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Consider a  $T_1$  topological space  $Y$  that is locally homeomorphic with  $[0, 1)$ . In other words,  $Y$  is a one-dimensional non-Hausdorff but  $T_1$  manifold.

As usual, a point  $y \in Y$  is *internal*, if it has an open neighborhood homeomorphic with  $(0, 1)$ . Otherwise,  $y$  has an open neighborhood homeomorphic with  $[0, 1)$  and is called a *boundary* point. The set of all internal and boundary points will be denoted by  $\text{Int}Y$  and  $\partial Y$  respectively.

For a point  $z \in Y$  define its *Hausdorff closure*,  $\text{hcl}(z)$ , to be the intersection of closures of all neighbourhoods of  $z$ , that is

$$\text{hcl}(z) := \bigcap_{V \text{ is a neighbourhood of } z} \bar{V}.$$

Evidently,  $z \in \text{hcl}(z)$ . We say that  $z$  is *special* whenever  $\text{hcl}(z) \setminus z \neq \emptyset$ . Denote by  $\mathcal{V}$  the set of all special points of  $Y$ .

Let  $\mathcal{H}(Y)$  be the group of homeomorphisms of  $Y$  endowed with compact open topology, and  $\mathcal{H}_{\text{id}}(Y)$  be the identity path component of  $\mathcal{H}(Y)$ , so it is a normal subgroup consisting of homeomorphisms isotopic to the identity. The following statement gives a characterization of  $\mathcal{H}_{\text{id}}(Y)$  under assumption that the set  $\mathcal{V}$  of special points of  $Y$  is locally finite.

**Theorem 1.** *Let  $Y$  be a second-countable  $T_1$  topological space being locally homeomorphic with  $[0, 1)$  and such that the set  $\mathcal{V}$  of its special points is locally finite. Let also  $k \in \mathcal{H}(Y)$ . Then  $k \in \mathcal{H}_{\text{id}}(Y)$  if and only if the following two conditions hold:*

- (1)  $k$  fixes each special point of  $Y$ ;
- (2)  $k$  preserves orientation of each connected component  $e$  of  $Y \setminus \mathcal{V}$ .

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