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by

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MAKING HOLES IN THE SECOND SYMMETRIC PRODUCT OF UNICOHERENT LOCALLY CONNECTED CONTINUA

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Abstract. A *continuum* is a compact connected metric space. The *second symmetric product* of a continuum X, $\mathcal{F}_2(X)$ is the hyperspace of all nonempty subsets of X having at most two points. Let X be a continuum such that $\mathcal{F}_2(X)$ is unicoherent. Then an element $A \in \mathcal{F}_2(X)$ *makes a hole* in $\mathcal{F}_2(X)$ if $\mathcal{F}_2(X) - \{A\}$ is not unicoherent. In this paper, we characterize the elements $A \in \mathcal{F}_2(X)$ satisfying A makes a hole in $\mathcal{F}_2(X)$ when X is a unicoherent locally connected continuum.

1. Introduction

A *continuum* is a connected compact metric space. Let X be a continuum. For each positive integer n, let $\mathcal{F}_n(X) = \{A \subseteq X : A \text{ has at most } n \text{ points and } A \neq \emptyset\}$. The hyperspace $\mathcal{F}_n(X)$ is called the n^{th} *symmetric product of* X. It is known that each $\mathcal{F}_n(X)$ is a continuum (see [6, pp. 876, 877] and [11, Theorem 4.10]).

A connected topological space Z is *unicoherent* provided that $A \cap B$ is connected whenever A and B are connected closed subsets of Z such that $Z = A \cup B$. A point z in a unicoherent topological space Z *makes a hole in* Z if $Z - \{z\}$ is not unicoherent.

In this paper, we are interested in the following problem which arises in [1, p. 2000].

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Key words and phrases. continuum, make a hole, property (b), symmetric products, unicoherence.

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