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TOPOLOGY PROCEEDINGS



Volume 52, 2018

Pages 347–354

<http://topology.nipissingu.ca/tp/>

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Electronically published on April 30, 2018

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E-mail: topolog@auburn.edu

ISSN: (Online) 2331-1290, (Print) 0146-4124

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ABSTRACT. Let X be a continuum and let G be an upper semi-continuous decomposition of X such that each element of G is the continuous image of an arc. If the quotient space X/G is the continuous image of an arc, under what conditions is X also the continuous image of an arc? Examples demonstrate that one must place severe conditions on G if one wishes to obtain positive results. Such results that characterize those locally connected continua that admit a lifting of a map of an arc onto a decomposition space back to the base space are often called lifting theorems. Such lifting theorems have taken several forms and their proofs have utilized a variety of methods. In this paper, we prove what we call a “co-lifting” result, since we are not directly lifting a map of an arc to a decomposition space to the base space. We then note that a number of typical lifting theorems from the literature follow somewhat easily from this co-lifting theorem.

1. INTRODUCTION

The classical Hahn–Mazurkiewicz theorem asserts that a metric continuum is the continuous image of the closed unit interval $[0, 1]$ if and only if it is locally connected. In the non-metric case, the situation turns out to be quite complicated. The case of continuous images of non-metric arcs did not begin to be systematically studied until 1960. Characterizations of continuous images of non-metric arcs are given by Witold Bula and Marian Turzański [1], by Jacek Nikiel [6], and by L. B. Treybig [8]. For

2010 *Mathematics Subject Classification.* Primary: 54F15; Secondary: 54C05, 54F05.

Key words and phrases. arc, decomposition, lifting images of arcs, locally connected, ordered compactum.

The second author is partially supported by National Science and Engineering Research Council Discovery Grant.

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