

# $P^*$ - $\alpha$ -Connectedness in Ideal Bitopological Spaces

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**Abstract:** The aim of this paper is to use the concepts of ideal  $\mathcal{I}$ , bitopological space  $(X, \tau_1, \tau_2)$  and its associated supra topological space  $(X, \tau_{12})$  to introduce a new local function,  $A_{12}^*$ . The properties of these local function  $A_{12}^*$  and some important results related to it have obtained. The local function  $A_{12}^*$  is used to generate a family  $\tau_{12}^*$  which is finer than  $\tau_1, \tau_2$  and  $\tau_{12}$ .  $\tau_{12}^*$  is a supra topology not a topology in general. In addition, a supra topology  $\tau_{12}^*$  is used to study connectedness in the ideal bitopological space  $(X, \tau_1, \tau_2, \mathcal{I})$ . Examples have introduced to illustrate the concepts in a friendly way. Finally, the relationship between the current study and the previous one has been given.

**Keywords:** Bitopological spaces, Ideal, Supra-topological spaces,  $P^*$ -Continuous mappings,  $P^*$ -separated set,  $P^*$ -Connected spaces,  $P^*$ - $\alpha$ -separated set,  $P^*$ - $\alpha$ -Connected spaces.

**Mathematics Subject Classification (2010):** 54A05, 54A10, 54E55.

## 1 Introduction

In 1963 Kelly [10] was introduced a bitopological space  $(X, \tau_1, \tau_2)$  as a richer structure than topological space. A study of bitopological space is a generalization of the study of general topological space as every bitopological space  $(X, \tau_1, \tau_2)$  can be regarded as a topological space  $(X, \tau)$  if  $\tau_1 = \tau_2 = \tau$ .

The concept of ideals in topological spaces has been introduced and studied by Kuratowski [11] and Vaidyanathaswamy [17]. An ideal is a nonempty collection of subsets closed under heredity and finite additivity. The study of ideal bitopological spaces was initiated by Jafari and Rajesh [6].

As a generalized to topological spaces, Mashhour et al. [13] introduced supra-topological spaces by dropping only the intersection condition. Kandil et al. [9] generated a supra-fuzzy topological space  $(X, \tau_{12})$  from the fuzzy bitopological space  $(X, \tau_1, \tau_2)$  and studied some properties of the space  $(X, \tau_1, \tau_2)$  via properties of the space  $(X, \tau_{12})$ .

The notion of connectedness in bitopological spaces has been studied by Pervin [14], Reilly [15] and Swart [16]. In

2014 Mandira Kar and Thakur [12] have been studied the notion of connectedness in ideal bitopological spaces, but the studying of such spaces by using the supra-topological space has not been considered.

In this paper, given a bis  $(X, \tau_1, \tau_2)$  and its associated supra topological space  $(X, \tau_{12})$  [13]. Also, let  $\mathcal{I}$  be an ideal on a space  $X$ , we introduce a new local function,  $A_{12}^* : P(X) \rightarrow P(X)$ ,  $A_{12}^*(A) = \{x \in X : O_x \cap A \not\subseteq \bigcup_{\substack{O_x \\ \tau_{12}(x)}} O_x\}$ , where  $\tau_{12} = \{U_1 \cup U_2 : U_i \in \tau_i, i = 1, 2\}$  is a supra topology [13] generated by  $\tau_1$  and  $\tau_2$ .  $(X, \tau_{12})$  is a supra topological space associate to the bis  $(X, \tau_1, \tau_2)$ . The properties of the operator  $A_{12}^*$  have obtained. In addition, we show that  $A_{12}^*(A) = A_{12}^*(A) \cap A_{12}^*(A)$ . Moreover, we show that the operator  $\alpha_{12}^*(A) = A \cup A_{12}^*(A)$  is a supra closure operator [8, 9] and then induces a supra topology  $\tau_{12}^*$  which is finer than  $\tau_1, \tau_2$  and  $\tau_{12}$ .  $\tau_{12}^*$  is not a topology in general. Furthermore, a supra topology  $\tau_{12}^*$  is used to study connectedness in the ideal bitopological space  $(X, \tau_1, \tau_2, \mathcal{I})$ , since the dealing with one family is easier than the dealing with two families. Also, the class of all supra-topological spaces is wider than the class of topological spaces. So, the study of supra-topological spaces is a generalization of the study of topological spaces. The notions of  $P^*$ - $\alpha$ -connected spaces,  $P^*$ - $\alpha$ -separated sets and  $P^*$ - $\alpha$ -connected sets in ideal

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**JA Banks**



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