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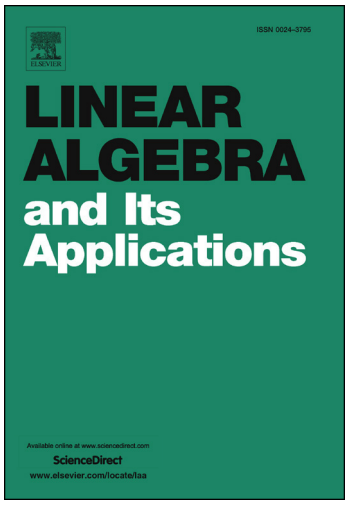


# The spectra of arrangement graphs

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# The Spectra of Arrangement Graphs

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**Abstract**

Arrangement graphs were introduced for their connection to computational networks and have since generated considerable interest in the literature. In a pair of recent articles by Chen, Ghorbani and Wong, the eigenvalues for the adjacency matrix of an (n,k)-arrangement graph are studied and shown to be integers. In this manuscript, we consider the adjaceny matrix directly in terms of the representation theory for the symmetric group. Our point of view yields a simple proof for an explicit fomula of the associated spectrum in terms of the characters of irreducibile representations evaluated on a transposition. As an application we prove a conjecture raised by Chen, Ghorbani and Wong.

*Keywords:* Arrangement graphs, eigenvalues of graphs, representations of symmetric groups.
*MSC2010*: 20C30, 05C50.

## 1 Introducion

Since arrangement graphs were first introduced in the seminal paper [3], there has been considerable interest in the literature. In two recent articles, [1] and [2], the eigenvalues of the adjacency matrix are studied. The main result in [2] is that the eigenvalues are integers. In this article we study the adjacency matrix from the perspective of the representation theory of symmetric groups. In particular, we consider the representation associated to the arrangement graph and the corresponding equivariant operator associated to the adjacency matrix. Our approach leads to a

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