

The Hospitals / Residents problem with Couples: Complexity and Integer Programming models

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Abstract

The Hospitals / Residents problem with Couples (hrc) is a generalisation of the classical Hospitals / Resident problem (hr) that is important in practical applications because it models the case where couples submit joint preference lists over pairs of (typically geographically close) hospitals. In this paper we give a new NP-completeness result for the problem of deciding whether a stable matching exists, in highly restricted instances of hrc. Further, we present an Integer Programming (IP) model for hrc and extend it the case where preference lists can include ties. Also, we describe an empirical study of an IP model or HRC and its extension to the case where preference lists can include ties. This model was applied to randomly generated instances and also real-world instances arising from previous matching runs of the Scottish Foundation Allocation Scheme, used to allocate junior doctors to hospitals in Scotland.