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Minimization of the Number of Heald Frames in a Dobby Loom Equipped with Long-Eye Healds

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Abstract: Woven fabric consists of two sets of yarn, called the warp and the weft. Warp yarn movements in the process of weaving cloth produce the yarn interlacement pattern. The more heald frames a doobby loom is equipped with, the more complicated designs of cloth can be woven. By introducing long-eye healds into a loom, we can reduce the number of heald frames.

In this paper, we propose a heuristic algorithm for minimizing, for a given design of cloth, the number of necessary heald frames. First, we show that the number of necessary heald frames equals the Boolean rank of a Boolean matrix associated with the design of cloth. Next, we transform the problem of calculating the Boolean rank to the graph coloring problem and apply a heuristic algorithm for the latter problem. Finally, we experimentally show that there are weave diagrams for which our algorithm decreases the number of required heald frames drastically.

Key Words: [Long-eye heald](#), [Dobby loom](#), [Boolean rank](#), [Graph coloring](#)

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