PATTERN GENERATION FOR TWO-DIMENSIONAL CUTTING STOCK PROBLEM

W. N. P. Rodrigo

Department of Mathematics, Faculty of Science, University of Peradeniya, Sri Lanka
Postgraduate Institute of Science, University of Peradeniya, Sri Lanka

Minimizing wastage is a key factor in improving productivity of a manufacturing plant. Wastage can occur in many ways and at any stage of the production process. Therefore, there is a great need to unearth solutions for the rawmaterial wastage. In that context, cutting stock problem has been introduced with many techniques to optimize the rawmaterial wastage. A cutting stock problem basically describes in two ways, One-Dimensional and Two-Dimensional cutting stock problems. An optimum cutting stock problem can be defined as cutting a main sheet into smaller pieces while minimizing the total wastage of the rawmaterial or maximizing overall profit obtained by cutting smaller pieces from the main sheet. It consists of cutting large pieces (main sheet), which are available in stock into different shapes to produce required pieces known as items, in order to meet the given demand. This often results in cutting pieces which cannot be reused and considered as wastage. Therefore, cutting items should be designed to optimize the rawmaterial wastage. These types of problems arise in many industries such as textile, paper, glass, metals and leather, etc

At the groundwork of this study, modified *Branch and Bound algorithm* for one-dimensional cutting stock problem is coded and programmed in the Matlab programming environment to generate feasible cutting patterns. Subsequently, two-dimensional cutting stock problem is considered with rectangular shape main sheet and three different shapes of cutting items; rectangle, triangle and circle. Modified *Branch and Bound Algorithm* is further modified to generate cutting patterns for two-dimensional cutting stock problem. Besides, identification of cutting location within the main sheet is significantly crucial to outline items within the main sheet depending on the selected cutting pattern. To address this issue, further development of algorithms was made to ascertain the locations of each cutting item within the main sheet by using Cartesian coordinate system. Developed algorithms are coded and programmed in the Matlab programming environment to generate feasible cutting patterns.

In our approach, proposed algorithms are tested and compared with Shop Master Software which is used at Mega Marble Company in London. All the case studies which are discussed pertains to real data used at Mega Marble Company for its tile production. Comparison has been made for a case study of two-dimensional rectangular shape cutting stock problem by applying modified *Branch and Bound Algorithm* with Shop Master Software.