Declaration

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College of Engineering and Technology
Department of Industrial
&
Management Engineering

A Genetic Algorithms Approach to the Group Technology Problem

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Engineering

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ABSTRACT

In recent years, the process of cellular manufacturing and group technology has received much attention and popularity in many developed countries. By applying Group technology, many benefits of flow-line production can be attained in a batch production system. GT can improve material handling, and significantly reduce material flow time and distance, and setup times.

In this thesis, a two steps approach to solve the GT problem using Genetic Algorithms is presented. The first step is to assign parts to the best available machines according to their required specifications. The second step is to form manufacturing cells (groups). The proposed GA model has the flexibility of choosing the number of cells required, which is very useful in examining different manufacturing cell configurations; or in case that the workshop or factory prefers a certain number of cells. For example if the workshop or factory doesn't have the workspace required for more than four cells.

To verify and validate the obtained results, the results of the first step are compared to the results of an exhaustive enumeration model, and the results of the second step are compared to the well known rank order clustering and direct clustering techniques. The results in both steps were found satisfactory. Additionally, the proposed model is used to solve some problems from the literature, and the results were compared to other techniques. The model produced satisfactory results, and in some cases, the results obtained were superior to the results obtained by other techniques.
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I would like to thank God, the most merciful, for his blessings, mercy and help that he always gives me through all my life.

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<tr>
<th>Abbreviation</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>ANN</td>
<td>Artificial Neural Network.</td>
</tr>
<tr>
<td>CMS</td>
<td>Cellular Manufacturing System.</td>
</tr>
<tr>
<td>DCA</td>
<td>Direct Clustering Algorithm.</td>
</tr>
<tr>
<td>FST</td>
<td>Fuzzy Set Theory.</td>
</tr>
<tr>
<td>GA</td>
<td>Genetic Algorithms.</td>
</tr>
<tr>
<td>GRAFICS</td>
<td>Grouping Using Assignment Method For Initial Cluster Seeds.</td>
</tr>
<tr>
<td>GT</td>
<td>Group Technology.</td>
</tr>
<tr>
<td>M/C</td>
<td>Machine.</td>
</tr>
<tr>
<td>MST</td>
<td>Minimum Spanning Tree.</td>
</tr>
<tr>
<td>ROC</td>
<td>Rank Order Clustering.</td>
</tr>
<tr>
<td>TSP</td>
<td>Travelling Sales Person.</td>
</tr>
<tr>
<td>ZODIAC</td>
<td>Zero One Data Ideal Seed Algorithm for Clustering.</td>
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ABSTRACT

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