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Optimize The Heuristic Line Balancing Using Nn Technique

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Abstract

The assembly line balancing[1] problem consists of assigning tasks to an ordered sequence of stations such that the precedence relations among the tasks are satisfied and some performance measure is optimized. In this paper we had done the largest candidate rule problem[2] solved using neural network tool[3] in mat lab software. It which has attracted attention of researchers and practitioners.

1. INTRODUCTION

The fundamental of line balancing problems is to assign the tasks to an ordered sequence of stations, such that the precedence relations are satisfied and some measurements of effectiveness are optimized. The first published paper of the assembly line balancing problem (ALBP) was made by Salveson (1955) who suggested a linear programming solution. Since then, the topic of line balancing has been of great interest to researchers. However, since the ALB problem falls into the NP hard class of combinatorial optimization problems (Gutjahr and Nemhauser, 1964), it has consistently developed the efficient algorithms for obtaining optimal solutions. Thus numerous research efforts have been directed towards the development of computer-efficient approximation algorithms or heuristics (e.g. Kilbridge and Wester, 1961; Helgeson and Birnie, 1961; Hoffman, 1963; Mansoor, 1964; Arcus, 1966; Baybar, 1986a) and exact methods to solve the ALB problems. (e.g. Jackson, 1956; Bowman, 1960; Van Assche and Herroelen, 1978; Mamoud, 1989; Hackmanetal., 1989; Sarin et al., 1999). Now we did the problem in neural network technique.

1.Largest candidate rule method

Procedure:

Step 1. List all elements in descending order of T_e value, largest T_e at the top of the list.

Step 2. To assign elements to the first workstation, start at the top of the list and work done, selecting the first feasible element for placement at the station. A feasible element is one that satisfies the precedence requirements and does not cause the sum of the T_{ej} value at station to exceed the cycle time T_c.

Step 3. Repeat step 2.

Example for Largest-Candidate Rule (LCR)

Step 1.

Work element	T_e	Immediate predecessor
3	0.7	1
8	0.6	3,4
11	0.5	9,10
2	0.4	---
10	0.38	5,8
7	0.32	3
5	0.3	2
9	0.27	6,7,8
1	0.2	---
12	0.12	11
6	0.11	3
4	0.1	1,2

Step 2, 3. If we assume T_c = 1.00 min.

Station	Element	T_e	ΣT_e at station
1	2	0.4	
	5	0.3	
	1	0.2	
	4	0.1	1.00
2	3	0.7	
	6	0.11	0.81
3	8	0.6	
	10	0.38	0.98
4	7	0.32	
	9	0.27	0.59
5	11	0.5	
	12	0.11	0.62

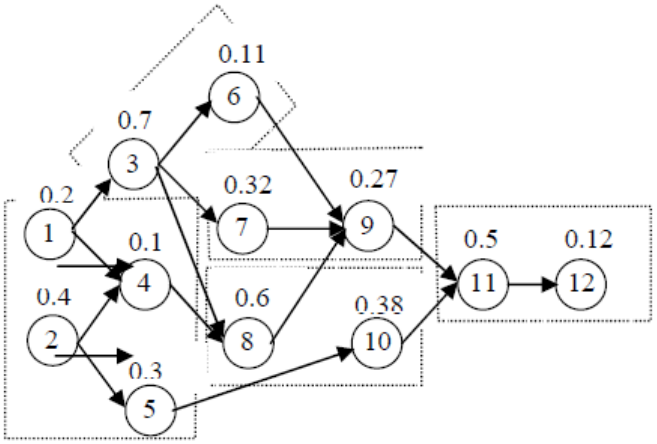

Fig -1: Precedence structure

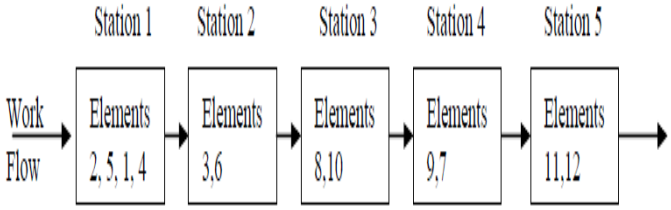

Fig -2; Work station order

2. Neural network tool in Mat lab

Neural networks have a large appeal to many researchers due to their great closeness to the structure of the brain, a characteristic not shared by more traditional systems.

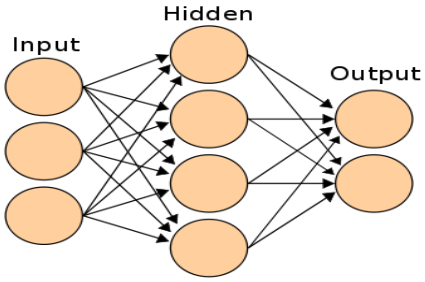

Fig -3. Basic structure of NN

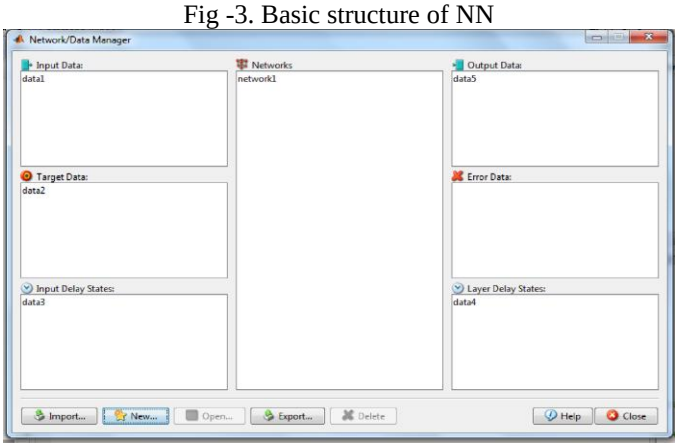

Fig 4: NN tool

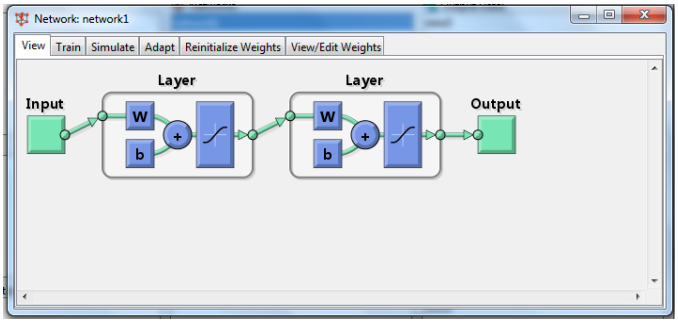

Fig 5: Network diagram

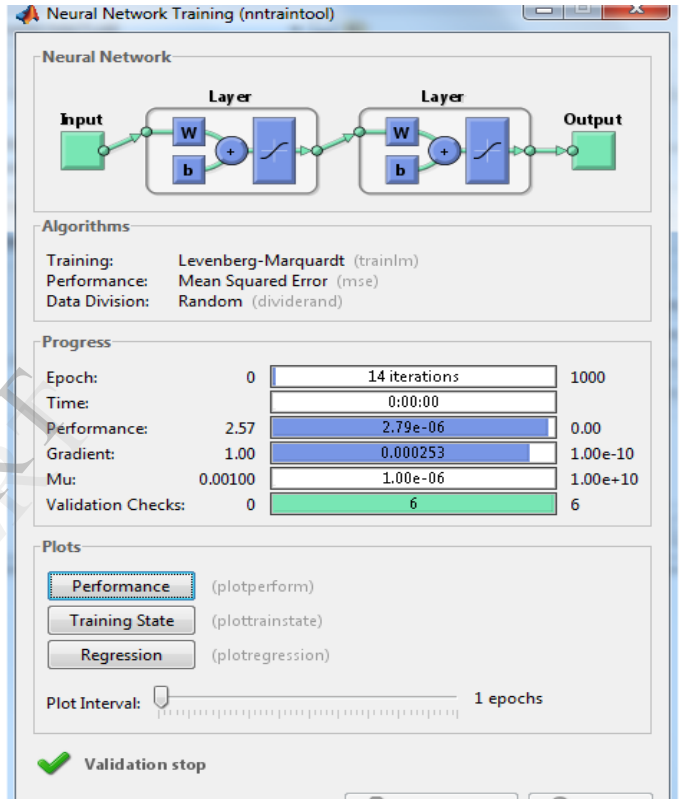

Fig 6: Training diagram

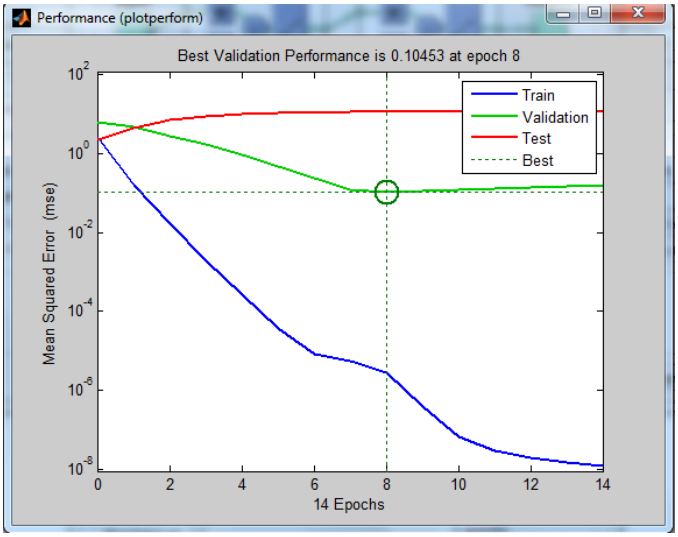

Fig 7. Performance plot

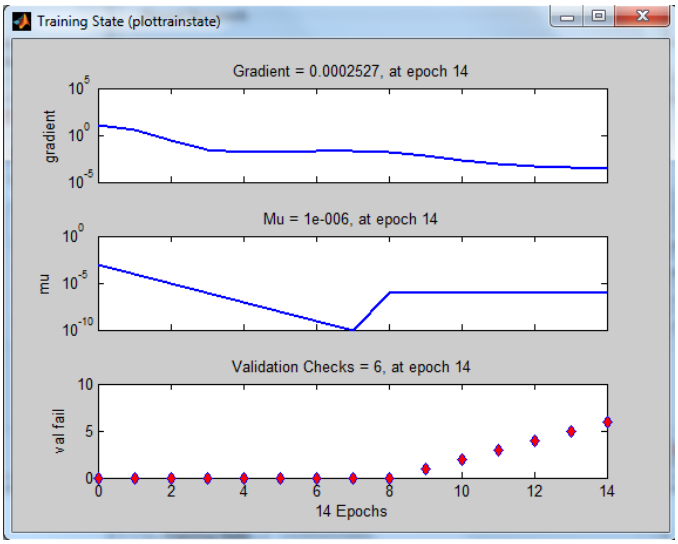

Fig 8. Training plot

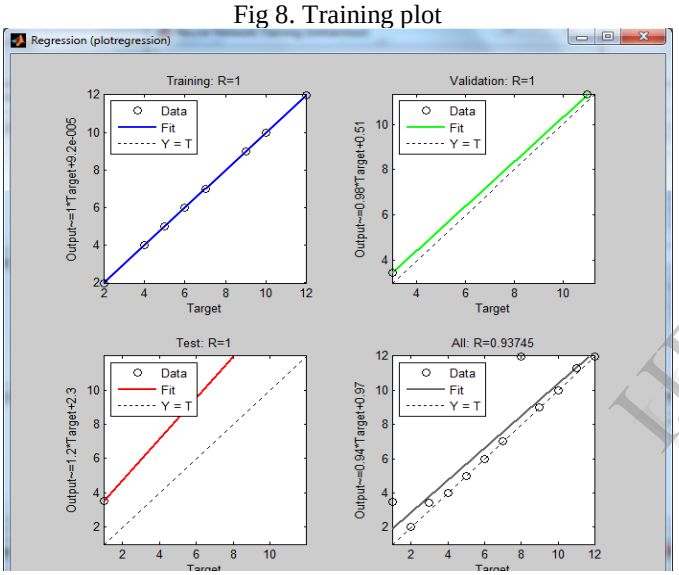

Fig 9: Regression plot

CONCLUSION

In the above results shows that research has made nn tool developments in solving simple problems. Though nn tool is a effective exact and heuristic algorithms are available which solve small and medium-size instances of problems. Nevertheless, further algorithmic improvement is necessary for solving large-scale problems.

ACKNOWLEDGEMENTS

Recently, assembly line balancing research evolved towards formulating and solving generalized problem with different additional characteristics such as cost functions, paralleling, equipment selection, u-line layout and mixed-model production. In the literature survey on GALBP (cf. Becker and Scholl, 2006) shows that a lot of relevant problems have been identified and modeled but development of sophisticated solution procedures has just begun. Then, additional research is necessary to adopt state-of-the-art solution concepts like met heuristics and highly developed algorithms for SALBP to the variety of GALBP.

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