

Hierarchical Method for Nurse Rostering based on Pre-Processing of Constraints

INTRODUCTION

Nurse rostering is a highly constrained resource allocation problem which attempts to reconcile the requirements of legal work shifts and the individual preferences of nurses. The ultimate aim is to create high quality timetables that balance all of the constraints.

NURSE ROSTERING PROBLEM

Nurse rostering problem consist of allocating the required workload to nurses subject to a number of constraints. Constraints are categorized into two groups: Hard and Soft Constraints; which vary with legal regulations and individual preferences.

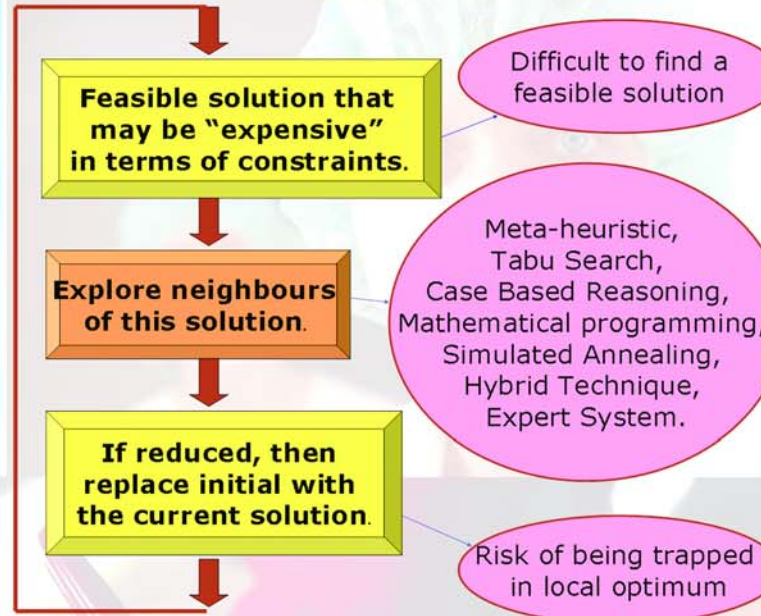
Hard Constraints are those that must be satisfied to obtain feasible solutions.

Soft Constraints are time related constraint. They are desirable but not compulsory; and thus can be violated.

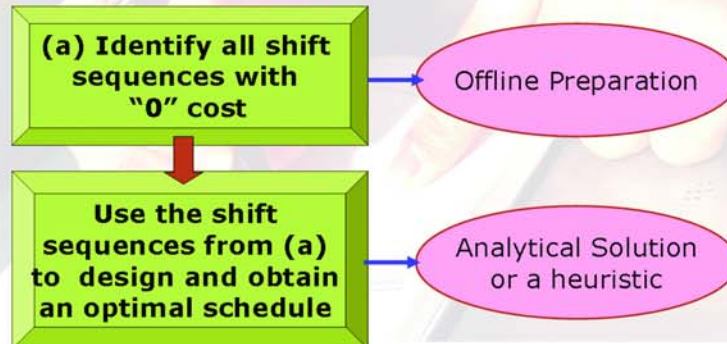
SOLVING METHOD

Many methods have been presented to tackle the problem of nurse rostering. Hierarchical method generally decomposes a set of data using some criteria. A hierarchical model is one in which successively more narrowly defined groups are nested within larger groups. Hierarchical representation allows for a natural multi-resolution representation of the problem domain. This approach appears to be well suited for pre-processing of constraints.

PREVIOUS STUDIES



CURRENT STUDIES



RESULT OF PRE-PROCESSING

WEEK1	WEEK2	WEEK3
N N R R d d d	d d R d d R R	d d d d R R R
.....		
..... WEEK1 WEEK2 WEEK3
N N R R E E E	E E R E D R R	E E E D R R R
N N R R E E E	E E R E D R R	E E D D R R R
.....		
N N R R E E D	D D R E E R R	E E E D R R R
.....		
N N R R D D D	D D R E E R R	E E E D R R R
.....		
N N R R D L L	L L R E E R R	E E E D R R R
.....		
N N R R L L L	L L R E E R R	E E E D R R R
.....		

Zero-Cost sequences for generic day/night shifts

Zero-Cost sequences for specific day shifts and a night shift

CHALLENGES

- Tackle a range of nurse rostering problems across the health care sector.
- Impact upon how hospital are administered and upon the working lives of nurses.
- Could help to alleviate the current shortage of nurses
- Minimize the number of uncovered shifts over the planning horizon

CONCLUSION

- Automating the nurse rostering problem can:
- reduce the scheduling effort and time
 - take care all the constraints; give a quick evaluation of schedules.
 - manually adapted
 - provide a good quality of solution.