Title: Comparing mathematical, local search and hybrid heuristics for solving the minimum shift design problem with breaks

Abstract:
The purpose of this paper is to compare a number of mathematical, local search, and hybrid approaches based on their practical efficiency and the accuracy of results to tackle the minimum shift scheduling problem with breaks keeping a number of constraints which occur in real life situations into consideration. This problem is of high practical importance as it appears in many areas of workforce scheduling like in big organizations, airports, hospitals, traffic control etc. We have used different approaches to solve the problem, which are:

1. Using the set covering model of Dantzig (1954) using several linear programming packages including CPLEX.
2. Using the implicit modeling approach of Bechtold and Jacobs (1990) also with CPLEX.
3. Using the minimum edge-cost flow approach of Di Gaspero et al. (2003) using Easy-Local++.
4. Using Operating Hours Assistant - A local Search Based System for Generation of Shifts with Breaks of Gaertner et al. (2004).
5. Using Constraint Satisfaction Programming (CSP) with the Mozart Programming System (http://www.mozart-oz.org).
6. Using a new hybrid approach combining Tabu and other local search heuristics with linear programming approaches.

The computational results are for a real life problem in a large European Airport.