

# Employee Scheduling for Small Businesses

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## Overview

Small businesses must overcome daily struggles in order to survive in a competitive environment. One of these complex but necessary tasks is the scheduling of employees into shifts.

By using a customized Constraint Satisfaction Problem (CSP), a generic backtracking algorithm can be applied to greatly improve both quality of the schedule as well as the time in which it takes to calculate it.

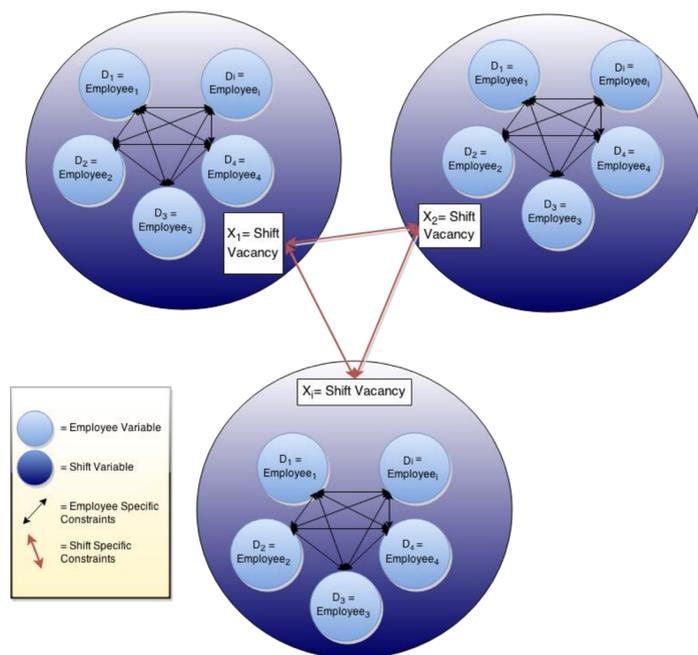


Diagram 1

## Constraint Satisfaction

Constraint Satisfaction Problems (CSPs) are often used in scheduling as a way of structuring the NP Complete problem. The generic definition of a CSP follows the pattern of a set of all Domains  $D$ , trying to satisfy a set of Constraints  $C$ , to be finally accepted

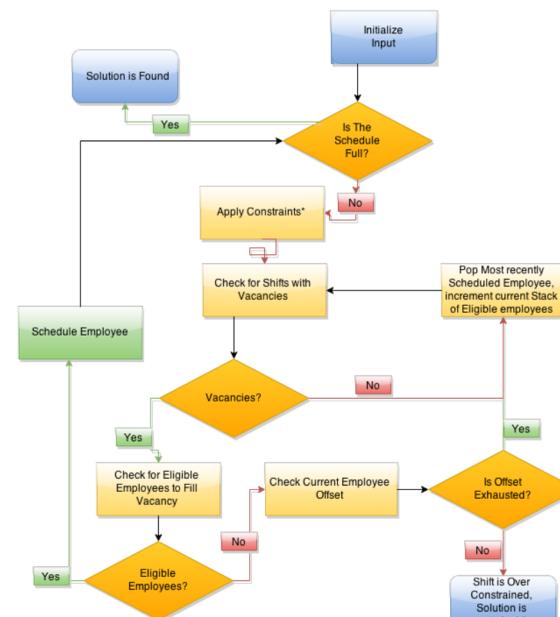


Diagram 2

by the set of Variables  $X$ . In the case of scheduling it is many Employees, being constrained by employer requirements, attempting to fulfill Shift Vacancies. The constraints used for the algorithm are defined by the employer, but revolve around wage, experience, and availability.

## Resolving a CSP

There are many ways to generate a solution to a CSP, most of which involve a searching algorithm. An iterative Backtracking algorithm was used to generate the solution in order to create a baseline to build off of. The backtracking has four main steps; Searching, Updating the domain, Applying Constraints, and Backtracking. In the Diagram 2, the algorithm starts the searching process, updates the domain, and backtracks. Diagram 3 details portions of the constraint application portion of the algorithm.

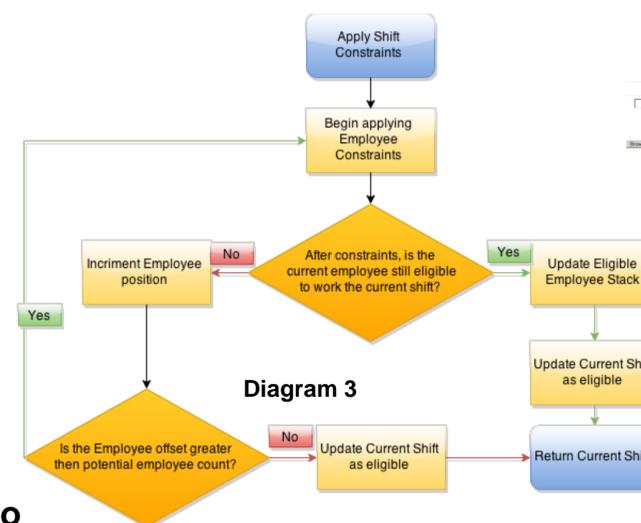


Diagram 3



## Solution

By utilizing ASP. Net and its ability to easily create websites, a solution can be generated quickly and easily while being accessible to both employees and employers alike. This distribution method allows for the flexibility that the solution, as well as the project as a whole, demands.

Special thanks to Dr. Silaghi for all his help

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