

CSCI 4511/6511 - Exam Prep 4

Friday, 21 Feb 2025

Instructions:

This is ungraded exam prep to be completed as an in-class exercise.

1 Constraint Satisfaction

1.1 Setup

Consider an air freight terminal in which:

- Aircraft land at specific times carrying some number of cargo pallets per aircraft
- Trucks arrive at specific times to receive the cargo, and can each carry one pallet
- Each aircraft must be assigned to arrive at a hangar at a specific time to unload cargo
 - Each aircraft must be assigned to depart from the hangar at a specific time after unloading
 - Aircraft, after arriving at a hangar, remain until unload
 - Each hangar can only accommodate one aircraft at a time
- Each truck must be assigned to arrive at a hangar at a specific time to load cargo
 - Each truck must be assigned to depart from the hangar at a specific time after loading
 - Each hangar can only accommodate one truck at a time
- Forklifts must be assigned to unload cargo pallets at a specific hangar at a specific time
 - Unloading a pallet takes 20 minutes. One forklift can unload one pallet at a time
- Forklifts must be assigned to load cargo pallets at a specific hangar at a specific time
 - Loading a pallet takes 5 minutes. One forklift can unload one pallet at a time

Given:

- Three aircraft arrive:
 - Flight 1 at 0830, carrying 2 pallets
 - Flight 2, at 0845, carrying 1 pallet
 - Flight 3, at 0905, carrying 2 pallets
- Three trucks arrive:
 - Truck 1 at 0830
 - Truck 2 at 0830
 - Truck 3 at 0840
 - Truck 4 at 0850
 - Truck 5 at 0910
- The terminal has two hangars: Hangar A and Hangar B
- The terminal has two forklifts: Forklift A and Forklift B
- All loading and unloading must start after 0830 and finish by 1000

1.2 Problem

- Assign every aircraft a hangar, arrival time, and departure time
- Assign every truck a hangar, arrival time, and departure time
- Assign each forklift a series of unload and load operations:
 - Each operation must have a hangar and a time

The complete set of assignments must result in every aircraft being unloaded and every truck being loaded.

1.3 Variables & Domains & Constraints

Enumerate variables, domains, and constraints such that a consistent assignment of values to all variables would yield a solution to the problem. You don't need to solve the problem.

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