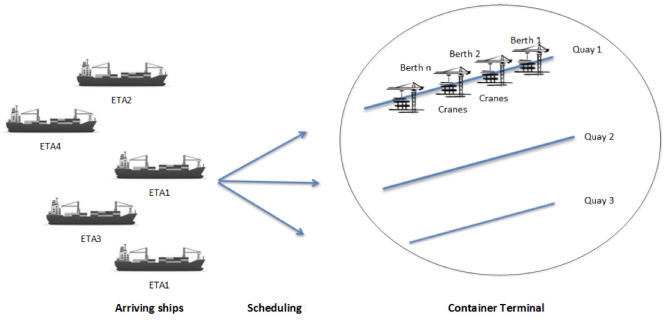
TÉCNICO LISBOA



IASD 2024/25
Project Assignment #2:
Berth Allocation Problem

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1 Introduction

The project for this assignment remains the same. The system receives as input information concerning a set of vessels that need berth space in a container terminal. The goal of the project is to allocate berth space to vessels and to schedule the vessels such that the total weighted flow time is minimized.

2 Second Assignment and Deliverable

This assignment is a followup of the Assignment #1, where the problem was properly formalized. This second assignment aims at obtaining optimal solutions to the problem using **uninformed search methods**.

Associated with the IASD course book, there is a Python code repository with many Python files for the different chapters of the book[1]. In the repository you have the file search.py where you can find the definition of the class Problem, the superclass of the class BAProblem, examples for other problems, and the functions that implement each one of the search algorithms mentioned in the IASD lectures. For this assignment, you only need to import search.py, which in turn imports utils.py. Both files are available in the repository. Copy both files to your work directory while developing and testing on your computer. Nothing else is needed.

The Python program to be delivered should be called solution.py and include (at least) a class with name `BAProblem` containing (at least) the following methods (see Annex A for a class template):

`result(state,action)` returns the state that results from executing the given `action` in the given `state`.

`actions(state)` returns the list of actions that can be executed in the given `state`.

`goal_test(state)` returns `True` if the given `state` is a goal.

`path_cost(c, state1, action, state2)` returns the path cost of `state2`, expanded from `state1` (with path cost `c`) after applying action `action`.

`load(fh)` loads a BAP from an opened file object `fh` (same as in Assignment #1).

`solve()` calls once (and only once) one uninformed search algorithm from `search.py` to solve the problem; the function should return a solution in the same format as defined in Assignment #1, i.e., a list of tuples.

In order to solve a problem one needs to:

- read the problem from a file object like you did for Assignment #1,
- decide and implement a representation for the state of the problem. You may change the representation used for Assignment #1 if you find a better one,
- represent the initial state with that representation, and saved it in the object BAProblem (self.initial),
- implement the methods `result`, `actions`, `goal_test`, `path_cost`, and `solve` as specified above,
- choose one (and only one) uninformed search algorithm that the group considers best fits the problem at hand, and use it in method `solve`. See `search.py` for the set of uninformed search algorithms available.

[1]The link for the repository is https://github.com/aimacode/aima-python.

3 Evaluation

The deliverable for this assignment is shown through DEEC Moodle, with the submission of a single python file, called `solution.py`, implementing the modules mentioned above. Instructions for this platform are available on the course webpage. Finally, the grade is computed in the following way:

- 50% from the public tests;
- 50% from the private tests; and
- -10% from the code structure, quality and readability.

Deadline: **11-October-2024**. Projects submitted after the deadline will not be considered for evaluation.

Closing Remarks on Ethics:

- Any kind of sharing code outside your group is considered plagiarism;
- Developing your code in any shared software development tool is considered sharing code;
- You can use GitHub, but make sure the project is marked private, and remove it afterward;
- If you get caught in any form of plagiarism, either by copying the code/ideas or sharing them with others, you will not be graded; and
- The scripts and other supporting materials produced by the instructors cannot be made public.

A Class Template

```
import search

class BAProblem(search.Problem):

        def __init__(self):
            """Method that instantiates your class.
                 You can change the content of this.
                 self.initial is where the initial state of
                 the BAP should be saved."""
            self.initial = None

        def result(self, state, action):
            """Returns the state that results from executing
            the given action in the given state. """
            pass

        def actions(self, state):
            """Returns the list of actions that can be executed in
            the given state."""
            pass

        def goal_test(self, state):
            """Returns True if the state is a goal."""
            pass

        def path_cost(self, c, state1, action, state2):
            """Returns the cost of a solution path that arrives
            at state2 from state1 via action, assuming cost c
            to get up to state1."""
            pass

        def solve(self):
            """Calls the uninformed search algorithm chosen.
            Returns a solution using the specified format."""
            pass

        def load(self, fh):
            """loads a BAP problem from the file object fh.
                 It may initialize self.initial here."""
            pass
```