

1.041/1.200 Spring 2024: Recitation 7

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1 Problem 1 : MDP - Inventory Control

Suppose that a manager of a warehouse is responsible for maintaining the inventory of a single product and that additional stock can be ordered from a supplier at the beginning of each month. The manager's goal is to maintain sufficient stock to fill the random number of orders that will arrive each month, while limiting the costs of ordering and holding inventory.

At each month t , the store contains s_t items of a specific good and the demand for that good is D_t . Furthermore we know that,

- Stock is ordered and delivered at the beginning of each month.
- Demand for the item arrives throughout the month, but orders are filled on the final day of the month.
- The cost of maintaining an inventory of s is $h(s)$.
- The cost to ordering a items is $C(a)$.
- The income for selling q items is $f(q)$.
- If the demand D is bigger than the available inventory s , customers that cannot be served will leave.
- The store values early profit than later profit. In fact, each later profit gives the store management a factor of γ less satisfaction.
- The store has a maximum capacity M .

Model this problem as an MDP. Write the state space, action space, state transition, reward, and the objective.

Problem 2: Optimal Capacity Expansion

See external PDF.