

Hotel Interiors

COMP 567 Project

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Outline

- Overview
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Overview

- Hotel company purchased a 50m x 35m plot of land
- Want to build/open new hotel downtown Montreal
- Hotel must have 35 floors above ground, 3 below
- It should
 - occupy the entire lot
 - be of a rectangular prism shape
 - have rectangular rooms
 - possibly have recreational facilities, amenities

Design Decisions

Team hired to decide:

- Layout of the hotel
- Number, types of rooms
- Recreational facilities, amenities

to be included in the hotel,
with the aim of maximizing hotel's future earnings

Deliverables (1/3)

Prototype:

- Reduced number of floors
- Min/max room type constraints reduced accordingly
- Fit determined by area alone
- Staircases, elevators treated the same as rooms
- No amenities
- All staff considered equal
- 100% capacity at all times

Deliverables ^(2/3)

Goal

- All 35 + 3 floors
(first floor reserved for lobby, underground floor for hotel operations)
- Fit determined by area, overlap constraints
- Fixed spacing around each room to be accumulated for hallways
- Different amenities have different costs, benefits
- All staff considered equal
- Capacity determined by market average

Deliverables (3/3)

Extensions

- Parking for 30% of the rooms; rent additional spots as necessary
- Distinguish between staff types
(managers, cleaners)
- Special staff for amenities
(lifeguards for pools)
- Fixed placements of staircases, elevators
- Incompatibilities between some rooms
(honeymoon suite on the same floor as the laundry room)

Decision Variables

For each floor i , each type of room j , and each type of possible amenity k , let :

x_{ij} = *number of rooms of type j on floor i*

$y_{ik} = \begin{cases} 1 & \text{if amenity } k \text{ is built on floor } i \\ 0 & \text{otherwise} \end{cases}$

Objective Function

$$\text{Max Profit} = \text{Income} - \text{Expenses}$$

Income:

- Let d_j be the expected demand for rooms of type j
- Let c_j be the rate per night for a room of type j
- Then, income = $\sum_j d_j c_j$

Expenses:

- Maintenance costs
- Staff salaries

Constraints ^(1/2)

1. Min/max requirement for each type of room
2. Min/max housing constraints
3. Area constraints

(total area of rooms, amenities, hallways, elevators, stairways on each floor $\leq$ area of floor)

4. Overlap constraints

(rooms cannot overlap with each other or with hallways, stairways)

5. Accessibility constraints

(each room must be accessible from a hallway)

Constraints (2/2)

6. Layout Constraints

(first floor reserved for lobby, underground floor for hotel operations, space on each floor for storing maintenance supplies)

7. Parking constraints

(must have parking for 30% of the rooms)

8. Arrangement constraints

(certain type of rooms must go in certain places)

Required Data

- Average capacity of the hotel
- Types of rooms and their specifications
(length, width, base price, max number of guests, min/max number of this room type, number of staff per room type)
- Types of amenities and their specifications
(length, width, maintenance cost, increase to room prices, increase to number of staff)
- Stairway, elevator, storage space specifications
(length, width)
- Staff salary, max number of staff
- Fixed maintenance cost of common areas



Thank You