

1. (a) Relational Algebra

- Find the titles of the Novel books which use Chinese as the language.

$$\pi_{\text{title}} \left(\sigma_{\text{genre}=\text{Novel} \wedge \text{language}=\text{Chinese}}(\text{Book}) \right) \quad (1)$$

- Retrieve the names of female customers who have borrowed Novel books and are due for return on 01-01-2025.

$$\pi_{\text{name}} \left(\sigma_{\text{gender}=\text{Ms}}(\text{Customer}) \bowtie_{\text{Customer.cID}=\text{Borrow.cID}} \sigma_{\text{dueDate}=\text{01-01-2025}}(\text{Borrow}) \bowtie_{\text{Borrow.bID}=\text{Book.bID}} \sigma_{\text{genre}=\text{Novel}}(\text{Book}) \right)$$

1. (b) SQL Queries

- Display the distinct genres of books borrowed by Mr. customers whose ages are between 40 and 60.

```

1 SELECT DISTINCT B.genre
2 FROM Customer AS C
3 JOIN Borrow AS BR ON C.cID = BR.cID
4 JOIN Book AS B ON BR.bID = B.bID
5 WHERE C.gender = 'Mr.'
6 AND C.age BETWEEN 40 AND 60;

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- For each genre of books, display the genre and the average age of customers.

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1 SELECT B.genre, AVG(C.age) AS avg_age
2 FROM Customer AS C
3 JOIN Borrow AS BR ON C.cID = BR.cID
4 JOIN Book AS B ON BR.bID = B.bID
5 GROUP BY B.genre;

```

2

Table 1: please fill your steps of finding your desired building into this table

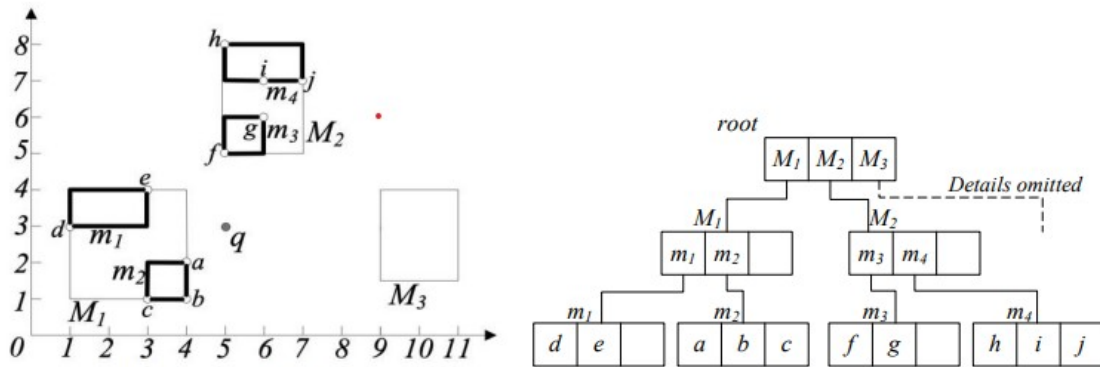


Figure 1: (left) spatial building points and enclosing rectangles; (right) corresponding R-tree

Building	a	b	c	d	e	f	g	h	i	j
Rating	6	7	7	5	5	7	8	6	4	7

Table 2: ratings of the ten buildings

Node	Q	oNN	dist(q, oNN)	rating
Root	M1(1), M2(2), M3(4)	null	inf	
M1	m2($\sqrt{2}$), m1(2), M2(2), M3(4)	null	inf	
m2	a($\sqrt{2}$), m1(2), M2(2), b($\sqrt{5}$), c($2\sqrt{2}$), M3(4)	null	inf	
a	m1(2), M2(2), b($\sqrt{5}$), c($2\sqrt{2}$), M3(4)	null	inf	$6 \not> 6$
m1	M2(2), b($\sqrt{5}$), e($\sqrt{5}$), c($2\sqrt{2}$), e(4), M3(4)	null	inf	
M2	m3(2), b($\sqrt{5}$), e($\sqrt{5}$), c($2\sqrt{2}$), e(4), m4(4), M3(4)	null	inf	
m3	f(2), b($\sqrt{5}$), e($\sqrt{5}$), c($2\sqrt{2}$), g($\sqrt{10}$), e(4), m4(4), M3(4)	null	inf	
f	b($\sqrt{5}$), e($\sqrt{5}$), c($2\sqrt{2}$), g($\sqrt{10}$), e(4), m4(4), M3(4)	f	2	$7 > 6$

Result

oNN = f

dist(q, oNN) = 2

Node Accessed = 1 + 3 + 4 + 7 = 15