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Project Based Learning in Java

Experiment 6

23CSP-304

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Experiment 6: Product Data Processing using Java Streams

Aim

To process a large dataset of products using Java Stream API and perform operations such as grouping products by category, finding the most expensive product in each category, and calculating the average price of all products.

Objectives

- Implement a Product class with attributes: id, name, price, and category.
- Use **Stream API** for efficient data processing.
- Apply `Collectors.groupingBy()` to group products by category.
- Use `Collectors.maxBy()` to find the most expensive product per category.
- Use `Collectors.averagingDouble()` to calculate the average price of all products.
- Demonstrate advanced stream operations in a functional programming style.

Code Implementation

```
import java.util.*;
import java.util.stream.*;

class Product {
    private int id;
    private String name;
    private double price;
    private String category;

    // Constructor
    public Product(int id, String name, double price, String category) {
        this.id = id;
        this.name = name;
        this.price = price;
        this.category = category;
    }

    // Getters
    public int getId() { return id; }
    public String getName() { return name; }
    public double getPrice() { return price; }
    public String getCategory() { return category; }

    @Override
    public String toString() {
        return name + " (₹" + price + ")";
    }
}

public class StreamProductAnalysis {
    public static void main(String[] args) {
```



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```
List<Product> products = Arrays.asList(  
    new Product(1, "Laptop", 80000, "Electronics"),  
    new Product(2, "Smartphone", 25000, "Electronics"),  
    new Product(3, "Tablet", 30000, "Electronics"),  
    new Product(4, "Office Chair", 12000, "Furniture"),  
    new Product(5, "Desk", 7000, "Furniture"),  
    new Product(6, "Bookshelf", 9000, "Furniture"),  
    new Product(7, "Refrigerator", 45000, "Appliances"),  
    new Product(8, "Microwave", 18000, "Appliances")  
);
```

```
// Step 2: Group products by category and find the most expensive one  
Map<String, Optional<Product>> mostExpensiveByCategory = products.stream()  
    .collect(Collectors.groupingBy(  
        Product::getCategory,  
        Collectors.maxBy(Comparator.comparingDouble(Product::getPrice))  
    ));
```

```
// Step 3: Calculate average price of all products  
double averagePrice = products.stream()  
    .collect(Collectors.averagingDouble(Product::getPrice));
```

```
// Step 4: Display the results  
mostExpensiveByCategory.forEach((category, product) ->  
    System.out.println(category + " → Most Expensive: " + product.get().getName() +  
        " (₹" + product.get().getPrice() + ")")  
);
```

```
System.out.println("Average Price of All Products: ₹" + averagePrice);  
}  
}
```

Output

```
Electronics → Most Expensive: Laptop (₹80000.0)  
Furniture → Most Expensive: Office Chair (₹12000.0)  
Appliances → Most Expensive: Refrigerator (₹45000.0)  
Average Price of All Products: ₹28250.0
```

Learning Outcomes

- Learned how to **group, aggregate, and analyze** data using Stream API.
- Understood the use of `groupingBy()`, `maxBy()`, and `averagingDouble()`.
- Gained practical experience using **lambda expressions** and **functional programming** in Java.