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Sub: Algorithm Analysis & Design

Branch: CS

Batch: 54

Sem: 5-B

Practical-5

You are working at the cash counter at a fun-fair, and you have three types of coins available to you in infinite quantities (coins are Rs. 1, Rs. 4 and Rs. 6). You are required to calculate the minimum numbers of coins required for changing the value of Rs. 9.

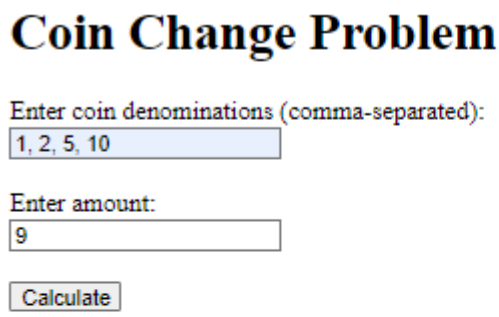
Design the algorithm for the same and implement using the programming language of your choice. Make comparative analysis for various use cases & input size.

Code:

```
from flask import Flask, render_template, request
import time
from collections import Counter

app = Flask(__name__)

def min_coins(coins, amount):
    dp = [float('inf')] * (amount + 1)
    coin_used = [-1] * (amount + 1)
    dp[0] = 0

    for i in range(1, amount + 1):
        for coin in coins:
            if coin <= i:
                if dp[i - coin] + 1 < dp[i]:
                    dp[i] = dp[i - coin] + 1
                    coin_used[i] = coin

    if dp[amount] == float('inf'):
        return -1, {}

    result_coins = []
    while amount > 0:
```

```
        result_coins.append(coin_used[amount])
        amount -= coin_used[amount]

    coin_count = dict(Counter(result_coins))

    return dp[amount + sum(result_coins)], coin_count

@app.route('/', methods=['GET', 'POST'])
def coin_change():
    result = None
    coins_used = {}
    execution_time = None

    if request.method == 'POST':
        coins = [int(x) for x in request.form.get('coins').split(',')]
        amount = int(request.form.get('amount'))

        start_time = time.time()
        result, coins_used = min_coins(coins, amount)
        execution_time = time.time() - start_time

    return render_template('Prac_5.html', result=result,
coins_used=coins_used, execution_time=execution_time)

app.run(debug=True)
```

Output:



Coin Change Problem

Enter coin denominations (comma-separated):
e.g., 1,4,6

Enter amount:

Calculate

Minimum coins required: 3

Coins used:

- 2 coin is used 2 times
- 5 coin is used 1 time

Time taken: 0.0 seconds