Exp: 8 Developing Social Distancing application

Aim: To write simple code for developing social distancing application.

Algorithm:

1.Define the User Class: Create a User class with attributes user_id, latitude, and longitude.

2.Calculate Distance Function (calculate_distance): Implement a function calculate_distance that uses the Haversine formula to compute the distance in meters between two User objects.

3.Check Social Distancing Function (check_social_distancing): Define a function check_social_distancing that takes a list of User objects (users) and a threshold_distance (in meters) as parameters.

4.Main Execution: Execute main function which calculate distance and then check and print alerts.

5.Output: Display alerts on the console indicating pairs of users that are too close based on the specified threshold_distance.

Code:

```
import math

class User:
    def __init__(self, user_id, latitude, longitude):
        self.user_id = user_id
        self.latitude = latitude
        self.longitude = longitude

def calculate_distance(user1, user2):
    # Radius of the Earth in meters
    R = 6371000

    # Convert latitude and longitude from degrees to radians
    lat1_rad = math.radians(user1.latitude)
    lon1_rad = math.radians(user1.longitude)
    lat2_rad = math.radians(user2.latitude)
    lon2_rad = math.radians(user2.longitude)

    # Haversine formula
    dlon = lon2_rad - lon1_rad
    dlat = lat2_rad - lat1_rad
    a = math.sin(dlat/2)**2 + math.cos(lat1_rad) * math.cos(lat2_rad) *
math.sin(dlon/2)**2
    c = 2 * math.atan2(math.sqrt(a), math.sqrt(1 - a))
    distance = R * c
```

```
    return distance

def check_social_distancing(users, threshold_distance):
    for i in range(len(users)):
        for j in range(i + 1, len(users)):
            dist = calculate_distance(users[i], users[j])
            if dist < threshold_distance:
                print(f"Alert: User {users[i].user_id} and User
{users[j].user_id} are too close! Distance: {dist} meters")

# Example usage:
if __name__ == "__main__":
    # Simulating users with their coordinates
    users = [
        User(1, 37.7749, -122.4194),  # User 1 in San Francisco
        User(2, 34.0522, -118.2437),  # User 2 in Los Angeles
        User(3, 40.7128, -74.0060)    # User 3 in New York City
    ]

    threshold = 2000000  # Threshold distance in meters (e.g., 2000
meters)

    check_social_distancing(users, threshold)
```

output:

```
Alert: User 1 and User 2 are too close! Distance: 559120.5770615534 meters
```

Result: The code has been executed successfully