NIKHIL NIRANJAN WAKODE 2022BSC0201

AI – LAB-7 FUZZY- LOGIC

1}

Code a program to formulate a membership function for a fuzzy set having values defining "tall" with a triangular shape. The membership value should indicate : 0 at 165cm, 1 at 180cm, and 0 again at 195cm.

CODE:

AI_Lab > Nikhil_Wakode > fuzzy_logic_1.cpp > TriangularMembershipFunction

```cpp
#include <iostream>
#include <algorithm>
using namespace std;

class TriangularMembershipFunction {
private:
    int  a, b, c;

public:
    TriangularMembershipFunction(int left, int peak, int right)
        : a(left), b(peak), c(right) {}

    double getMembershipValue(int x) {
        if (x <= a || x >= c) {
            return 0;
        } else if (x == b) {
            return 1;
        } else if (x > a && x < b) {
            return (x - a) / (b - a);
        } else {
            return (c - x) / (c - b);
        }
    }
};

int main() {
    TriangularMembershipFunction tallMembership(165, 180, 195);


    for (int height = 160; height <= 200; height += 5) {
        double membershipValue = tallMembership.getMembershipValue(height);
        cout << "Height: " << height << " cm, Membership value: " << membershipValue << endl;
    }

    return 0;
}
```

2}

AI_Lab > Nikhil_Wakode > fuzzy_logic_2.cpp > hotMembership(float, float, float, float)

```cpp
#include <iostream>
#include <iomanip>
using namespace std;
float hotMembership(float temp, float start, float half, float full) {
    if (temp <= start) return 0;
    if (temp < half) return (temp - start) / (half - start) * 0.5f;
    if (temp < full) return 0.5f + (temp - half) / (full - half) * 0.5f;
    return 1;
}

void printMembership(float temp, float membership) {
    cout << setw(8) << fixed << setprecision(1) << temp << "C: "
              << setw(10) << setprecision(4) << membership << endl;
}

int main() {
    const float start = 22, half = 27, full = 32;

    cout << "Temperature  Membership Value\n"
              << "----------------------------\n";

    for (float temp = 22; temp <= 32; temp += 5) {
        printMembership(temp, hotMembership(temp, start, half, full));
    }

    cout << "\nKey Points:\n"
              << "----------------------------\n";

    for (float temp : {start, half, full, 37.0f}) {
        printMembership(temp, hotMembership(temp, start, half, full));
    }

    return 0;
}
```