Министерство образования Республики Беларусь

Учреждение образования

БЕЛОРУССКИЙ ГОСУДАРСТВЕННЫЙ УНИВЕРСИТЕТ

ИНФОРМАТИКИ И РАДИОЭЛЕКТРОНИКИ

Факультет компьютерных систем и сетей

Кафедра программного обеспечения информационных технологий

Дисциплина: Метрология, стандартизация и сертификация (в информационных технологиях) (МСиСвИТ)

ОТЧЕТ

по лабораторной работе №2

Тема работы: Метрики сложности потока управления программ

Выполнили

студенты: гр. 151003 Матошко И.В.

Барановский Р.А.

Проверил: Болтак С.В.

Минск, 2023

**Анализируемый текст программы**

#include <iostream>

int printInRange(int a, int b)

{

for (int i = a; i < b; ++i)

cout << i;

}

int main(int argc, char\*\* argv)

{

cout << "Hello!";

int x, a;

cin >> x;

cin >> a;

switch(x)

{

case 0: {

cout << "X is zero";

}

case 1: {

cout << "X is one";

}

case 2:

cout << "X is two";

case 3:

cout << "X is three";

case -1:

x += 1;

default:

if (a > 1000) {

if (a % 2 == 0)

cout << "A is big and even";

else

a = 0;

}

else if (a > 2000) {

cout << "A is very big";

}

else if (a > 3000) {

while (x > 0) {

while (x > 0) {

cout << x;

for (int i = 0; i < 4; i++)

for (int j = 0; j < 5; j++)

for (int k = 0; k < 6; ++k)

for (int t = 0; t < 7; ++t)

cout << i << j << k << t;

x--;

}

cout << x;

x--;

}

cout << "A is very-very big";

}

else if (a > 4000)

cout << "A is very-very-very big";

else if (a > 5000)

cout << "A is very-very-very-very big";

else if (a > 6000)

a = 1000;

else if (a > 7000)

a = 2000;

else

a = 0;

}

if (a > x) {

a \*= x;

}

else if (a < x)

a /= x;

else if (a == x)

a += x;

else if (a % 2 == 0)

cout << "A is even";

else if (x / 2 == 0)

cout << "X is less than 2";

//else if (x < 0)

//cout << "X is negative";

else

printInRange(a, x);

}

**Схема алгоритма части анализируемого текста программы**













**Расчёт метрики граничных значений**

Таблица 1 – Свойства подграфов программы

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Свойства  подграфов программы | Номер вершины выбора | | | | | | | | | | | |
| 5 | 7 | 9 | 11 | 13 | 15 | 16 | 17 | 21 | 22 | 23 | 26 |
| Номера вершин перехода | 6,7 | 8,9 | 10,  11 | 12,  13 | 14,  15 | 16,  17 | 18,  19 | 20,  21 | 22,  42 | 23,  41 | 24,  39 | 27,  38 |
| Скорректированная сложность вершины выбора | 57 | 55 | 53 | 51 | 49 | 47 | 14 | 43 | 41 | 32 | 32 | 32 |
| Номера вершин подграфа | см.  5. | см.  7. | см.  9. | см.  11. | см.  13. | см.  15. | см.  16. | см.  17. | см.  21. | см.  22. | см.  23. | см.  26. |
| Номер нижней границы подграфа | 62 | 62 | 62 | 62 | 62 | 62 | 62 | 62 | 62 | 62 | 62 | 62 |

Таблица 2 – Свойства подграфов программы

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Свойства  подграфов программы | Номер вершины выбора | | | | | | | | | | | | |
| 28 | 30 | 32 | 42 | 44 | 46 | 48 | 51 | 53 | 55 | 57 | 59 | 65 |
| Номера вершин перехода | 29,  37 | 31,  36 | 33,  35 | 43,  44 | 45,  46 | 47,  48 | 49,  50 | 52,  53 | 54,  55 | 56,  57 | 58,  59 | 60,  61 | 66,  68 |
| Скорректированная сложность вершины выбора | 32 | 32 | 32 | 20 | 18 | 16 | 14 | 11 | 9 | 7 | 5 | 3 | 4 |
| Номера вершин подграфа | см.  28. | см.  30. | см.  32. | см.  42. | см.  44. | см.  46. | см.  48. | см.  51. | см.  53. | см.  55. | см.  57. | см.  59. | см.  65. |
| Номер нижней границы подграфа | 62 | 62 | 62 | 62 | 62 | 62 | 62 | 62 | 62 | 62 | 62 | 62 | 68 |

**5.** 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61

**7.** 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61

**9.** 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61

**11.** 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61

**13.** 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61

**15.** 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61

**16.** 18, 19, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61

**17.** 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61

**21.** 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61

**22.** 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61

**23.** 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61

**26.** 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61

**28.** 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61

**30.** 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61

**32.** 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61

**42.** 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61

**44.** 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61

**46.** 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61

**48.** 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61

**51.** 52, 53, 54, 55, 56, 57, 58, 59, 60, 61

**53.** 54, 55, 56, 57, 58, 59, 60, 61

**55.** 56, 57, 58, 59, 60, 61

**57.** 58, 59, 60, 61

**59.** 60, 61

**65.** 65, 66, 67

Таблица 3

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Номер вершины графа программы | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Скорректирован-ная сложность вершины графа | 1 | 1 | 1 | 1 | 57 | 1 | 55 | 1 | 53 | 1 | 51 | 1 |

Таблица 4

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Номер вершины графа программы | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| Скорректирован-ная сложность вершины графа | 49 | 1 | 47 | 14 | 43 | 1 | 1 | 1 | 41 | 32 | 32 | 1 |

Таблица 5

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Номер вершины графа программы | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 |
| Скорректирован-ная сложность вершины графа | 1 | 32 | 1 | 32 | 1 | 32 | 1 | 32 | 1 | 1 | 1 | 1 |

Таблица 6

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Номер вершины графа программы | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 |
| Скорректирован-ная сложность вершины графа | 1 | 1 | 1 | 1 | 1 | 20 | 1 | 18 | 1 | 16 | 1 | 14 |

Таблица 7

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Номер вершины графа программы | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 |
| Скорректирован-ная сложность вершины графа | 1 | 1 | 11 | 1 | 9 | 1 | 7 | 1 | 5 | 1 | 3 | 1 |

Таблица 8

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Номер вершины графа программы | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | ***Sa*= 761** |
| Скорректирован-ная сложность вершины графа | 12 | 0 | 1 | 1 | 4 | 1 | 1 | 0 | **= 0.91** |

**Ручной подсчет(Метрика Джилба)**

*Количество операторов:* 64

*Абсолютная сложность:* 25

*Относительная сложность:* 0,3906

*Максимальный уровень вложенности:* 13

**Работа программы(Метрика Джилба)**

