Jegyzőkönyv Operációs rendszerek

1. szorgalmi feladat

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OS 1. Szorgalmi feladat

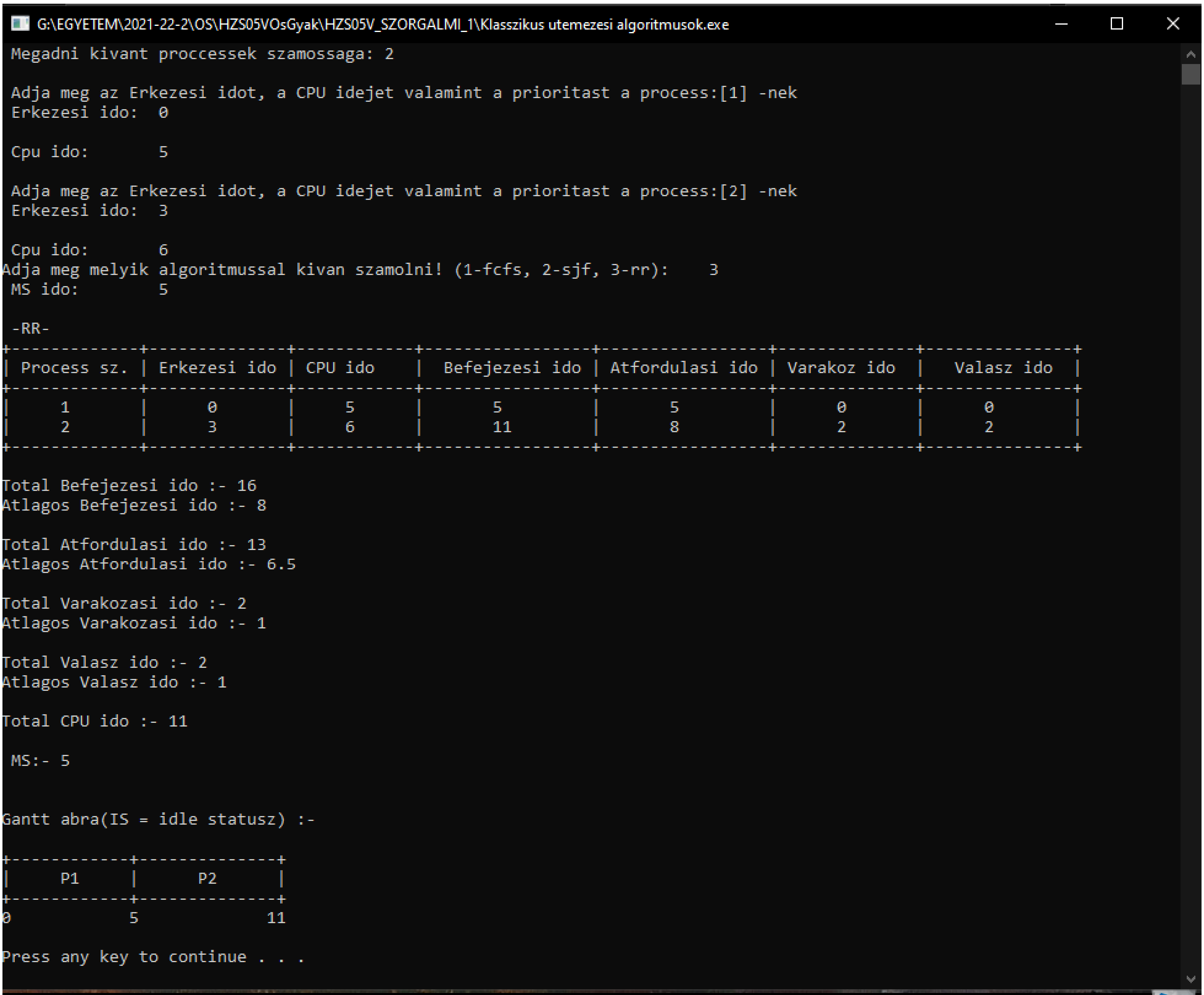
Írjon egy programot (grafikus felületű), amely a klasszikus ütemezési algoritmusok feladatait oldja meg (FCFS, SJF, RR).

A programnak az alábbiakat kell tartalmazni:

- Címsor: Klasszikus ütemezési algoritmusok
- Névjegy: Név, Miskolci Egyetem, Informatika Intézet, email cím
- A processzek számát (futási időben) a user adja meg - input: processz neve (pl.: P1), beérkezés, CPU idő.
- A beviteli mező törlése - gomb
- Ütemezési algoritmus kiválasztása
- RR esetén futása időben külön ablak az időszelet hosszát.
- Ütemezés futtatása.
- Megoldás ütemezési táblát, amely tartalmazza:
  - indulás – befejezés
  - várakozási idő
  - válaszidő
  - körülfordulási idő
- Gannt diagram

Fájl neve: Klasszikus utemezesi algoritmusok.exe

Egy példa a program futására



G:\EGYETEM\2021-22-2\OS\HZS05VOsGyak\HZS05V_SZORGALMI_1\Klasszikus utemezesi algoritmusok.exe

```
 Megadni kivant proccessek szamossaga: 2

 Adja meg az Erkezesi idot, a CPU idejet valamint a prioritast a process:[1] -nek
 Erkezesi ido:  0

 Cpu ido:       5

 Adja meg az Erkezesi idot, a CPU idejet valamint a prioritast a process:[2] -nek
 Erkezesi ido:  3

 Cpu ido:       6
Adja meg melyik algoritmussal kivan szamolni! (1-fcfs, 2-sjf, 3-rr):    3
 MS ido:        5

 -RR-
+-------------+--------------+------------+-----------------+-----------------+--------------+---------------+
| Process sz. | Erkezesi ido | CPU ido    |  Befejezesi ido | Atfordulasi ido | Varakoz ido  |   Valasz ido  |
+-------------+--------------+------------+-----------------+-----------------+--------------+---------------+
|     1       |      0       |     5      |       5         |        5        |      0       |       0       |
|     2       |      3       |     6      |       11        |        8        |      2       |       2       |
+-------------+--------------+------------+-----------------+-----------------+--------------+---------------+

Total Befejezesi ido :- 16
Atlagos Befejezesi ido :- 8

Total Atfordulasi ido :- 13
Atlagos Atfordulasi ido :- 6.5

Total Varakozasi ido :- 2
Atlagos Varakozasi ido :- 1

Total Valasz ido :- 2
Atlagos Valasz ido :- 1

Total CPU ido :- 11

 MS:- 5


Gantt abra(IS = idle statusz) :-

+------------+--------------+
|     P1     |      P2      |
+------------+--------------+
0            5             11

Press any key to continue . . .
```

NYERS FORRÁSKÓD:

```
// Klasszikus ütemezési algoritmusok
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#include <cstdlib>
#include <iostream>
#include <queue>
using namespace std;

class process
{
public:
    pid_t p_no = 0;
    time_t start_AT = 0, AT = 0,
           BT_left = 0, BT = 0, temp_BT = 0,
           CT = 0, TAT = 0, WT = 0, RT = 0;
    int priority = 0;

    // Befejezesi ido
    void set_CT(time_t time)
    {
        CT = time;
        set_TAT();
        set_WT();
    }

    // Atfordulasi ido (turn around time)
    void set_TAT()
    {
        TAT = CT - start_AT;
    }

    // Varakozasi ido
    void set_WT()
    {
        WT = TAT - BT;
    }
    // Mivel push()-nal frissul az Erkezesi ido, ezert azt kezelni kell
    void P_set()
    {
        start_AT = AT;
        BT_left = BT;
    }
    // Valasz ido
    void set_RT(time_t time)
    {
        RT = time - start_AT;
    }

    // '<' Operator tulterhelese
    // mivel az erkezesi idonek nagyobb a prioritasa
    // priority_queue elsonek poppolja a nagyobb erteket
    // ezert ki kell csereni a '<' -t '>' hogy a legkisebbet poppolja
    friend bool operator<(const process &a, const process &b)
    {
        return a.AT > b.AT;
    }
};
```

```
process pop_index(priority_queue<process> *main_queue, int index)
{
    priority_queue<process> rm_index;
    int i;
    process p;
    switch (index)
    {
    case 0:
        p = (*main_queue).top();
        (*main_queue).pop();
        break;
    default:
        for (i = 0; i < index; i++)
        {
            rm_index.push((*main_queue).top());
            (*main_queue).pop();
        }
        p = (*main_queue).top();
        (*main_queue).pop();
        while (!(*main_queue).empty())
        {
            rm_index.push((*main_queue).top());
            (*main_queue).pop();
        }
        (*main_queue) = rm_index;
        break;
    }
    return p;
}
time_t min_BT(priority_queue<process> main_queue, time_t clock)
{
    time_t min = 0;
    while (!main_queue.empty() && main_queue.top().AT <= clock)
    {
        if (min == 0 || min > main_queue.top().BT_left)
            min = main_queue.top().BT_left;
        main_queue.pop();
    }
    return min;
}
int min_BT_index(priority_queue<process> main_queue, time_t limit)
{
    int index, i = 0;
    time_t min = 0;
    while (!main_queue.empty() && main_queue.top().AT <= limit)
    {
        if (min == 0 || main_queue.top().BT_left < min)
        {
            min = main_queue.top().BT_left;
            index = i;
        }
        main_queue.pop();
        i++;
    }
    return index;
}

// RR algoritmus
priority_queue<process> RR_run(priority_queue<process> ready_queue,
                               time_t Time_Slice,
                               queue<process> *gantt)
```

```
{
    priority_queue<process> completion_queue;
    process p;
    time_t clock = 0;

    while (!ready_queue.empty())
    {
        while (clock < ready_queue.top().AT)
        {
            p.temp_BT++;
            clock++;
        }
        if (p.temp_BT > 0)
        {
            p.p_no = -1;
            p.CT = clock;
            (*gantt).push(p);
        }
        p = ready_queue.top();
        ready_queue.pop();

        if (p.AT == p.start_AT)
            p.set_RT(clock);

        while (p.BT_left > 0 && (p.temp_BT < Time_Slice || ready_queue.empty() || clock <
ready_queue.top().AT))
        {
            p.temp_BT++;
            p.BT_left--;
            clock++;
        }

        if (p.BT_left == 0)
        {
            p.AT = p.start_AT;
            p.set_CT(clock);
            (*gantt).push(p);
            p.temp_BT = 0;

            completion_queue.push(p);
        }
        else
        {
            p.AT = clock;
            p.CT = clock;
            (*gantt).push(p);
            p.temp_BT = 0;

            ready_queue.push(p);
        }
    }

    return completion_queue;
}

// FCFS algoritmus
priority_queue<process> FCFS_run(priority_queue<process> ready_queue,
                                 queue<process> *gantt)
{
    priority_queue<process> completion_queue;
    process p;
    time_t clock = 0;

    // Amig a bekert processek nem fogynak el ( a ready_queue-ban )
    while (!ready_queue.empty())
    {

        // Amig az eltelt ido kevesebb az erkezesi idonel
        while (clock < ready_queue.top().AT)
        {
            p.temp_BT++;
            clock++;
        }
        if (p.temp_BT > 0)
        {
            p.p_no = -1;
            p.CT = clock;
            (*gantt).push(p);
        }
        p = ready_queue.top();
        ready_queue.pop();
        p.set_RT(clock);
        while (p.BT_left > 0)
        {
            p.temp_BT++;
            p.BT_left--;
            clock++;
        }
        p.set_CT(clock);

        // Gantt diagram frissitese
        (*gantt).push(p);
        p.temp_BT = 0;

        completion_queue.push(p);
    }

    return completion_queue;
}

// SJF algoritmus
priority_queue<process> SJF_P_run(priority_queue<process> ready_queue,
                                  queue<process> *gantt)
{
    priority_queue<process> completion_queue;
    process p;
    time_t clock = 0;

    // Amig a bekert processek nem fogynak el ( a ready_queue-ban )
    while (!ready_queue.empty())
    {
        while (clock < ready_queue.top().AT)
        {
            p.temp_BT++;
            clock++;
        }
        if (p.temp_BT > 0)
        {
            p.p_no = -1;
            p.CT = clock;
            (*gantt).push(p);
        }
        p = pop_index(&ready_queue, min_BT_index(ready_queue, clock));
        if (p.AT == p.start_AT)
            p.set_RT(clock);
        while (p.BT_left > 0 && (ready_queue.empty() || clock < ready_queue.top().AT || p.BT_left <=
min_BT(ready_queue, clock)))
        {
            p.BT_left--;
            p.temp_BT++;
            clock++;
        }
        if (p.BT_left == 0)
        {
            p.AT = p.start_AT;
            p.set_CT(clock);
            (*gantt).push(p);
            p.temp_BT = 0;

            completion_queue.push(p);
        }
        else
        {
            p.AT = clock;
            p.CT = clock;
            (*gantt).push(p);
            p.temp_BT = 0;
            ready_queue.push(p);
        }
    }

    return completion_queue;
}

// Processek bekerese
priority_queue<process> set_process_data()
{
    priority_queue<process> ready_queue;
    process temp;

    int NOP, i;
    printf(" Megadni kivant proccessek szamossaga: ");
    scanf("%d", &NOP);
    for (i = 0; i < NOP; i++)
    {
        printf("\n Adja meg az Erkezesi idot, a CPU idejet valamint a prioritast a process:[%d] -nek \n", i +
1);
        printf(" Erkezesi ido: \t");
        scanf("%d", &temp.AT);
        printf(" \n Cpu ido: \t");
        scanf("%d", &temp.BT);
        //    printf(" \n Process prioritasa: \t");
        //    scanf("%d", &temp.priority);

        temp.p_no = i + 1;
        temp.P_set();
        ready_queue.push(temp);
    }

    return ready_queue;
}

double set_CS()
```

```
{
    double cs_given;
    printf(" Contex Switch ido: \t");
    scanf("%lf", &cs_given);

    return cs_given;
}

int set_MS()
{
    int ms_given;
    printf(" MS ido: \t");
    scanf("%d", &ms_given);

    return ms_given;
}

int choose_Algo()
{
    int algo_given;
    printf("Adja meg melyik algoritmussal kivan szamolni! (1-fcfs, 2-sjf, 3-rr):\t");
    scanf("%d", &algo_given);
    return algo_given;
}

// Atlagok szamitasa:
// Osszes varakozasi ido
double get_total_WT(priority_queue<process> processes)
{
    double total = 0;
    while (!processes.empty())
    {
        total += processes.top().WT;
        processes.pop();
    }
    return total;
}

// Osszes atfordulasi ido
double get_total_TAT(priority_queue<process> processes)
{
    double total = 0;
    while (!processes.empty())
    {
        total += processes.top().TAT;
        processes.pop();
    }
    return total;
}

// Osszes befejezesi ido
double get_total_CT(priority_queue<process> processes)
{
    double total = 0;
    while (!processes.empty())
    {
        total += processes.top().CT;
        processes.pop();
    }
    return total;
}
```

```
// Osszes valasz ido
double get_total_RT(priority_queue<process> processes)
{
    double total = 0;
    while (!processes.empty())
    {
        total += processes.top().RT;
        processes.pop();
    }
    return total;
}

// osszes cpu ido

double get_total_BT(priority_queue<process> processes)
{
    double total = 0;
    while (!processes.empty())
    {
        total += processes.top().BT;
        processes.pop();
    }
    return total;
}



// FCFS tabla kirajzolasa

void disp(priority_queue<process> main_queue, bool high)
{
    int i = 0, temp, size = main_queue.size();
    priority_queue<process> tempq = main_queue;
    double temp1, temp2;
    cout << "+-------------+--------------";
    cout << "+------------+-----------------";
    cout << "+-----------------+--------------+---------------+";
    if (high == true)
        cout << "----------+" << endl;
    else
        cout << endl;
    cout << "| Process sz. | Erkezesi ido ";
    cout << "| CPU ido    |  Befejezesi ido ";
    cout << "| Atfordulasi ido | Varakoz ido  |   Valasz ido  |";
    if (high == true)
        cout << " Priority |" << endl;
    else
        cout << endl;
    cout << "+-------------+--------------";
    cout << "+------------+-----------------";
    cout << "+-----------------+--------------+---------------+";
    if (high == true)
        cout << "----------+" << endl;
    else
        cout << endl;
    while (!main_queue.empty())
    {
        temp = to_string(main_queue.top().p_no).length();
        cout << '|' << string(6 - temp / 2 - temp % 2, ' ')
             << main_queue.top().p_no << string(7 - temp / 2, ' ');
        temp = to_string(main_queue.top().start_AT).length();
        cout << '|' << string(7 - temp / 2 - temp % 2, ' ')
             << main_queue.top().start_AT << string(7 - temp / 2, ' ');
        temp = to_string(main_queue.top().BT).length();
        cout << '|' << string(6 - temp / 2 - temp % 2, ' ')
             << main_queue.top().BT << string(6 - temp / 2, ' ');
        temp = to_string(main_queue.top().CT).length();
        cout << '|' << string(8 - temp / 2 - temp % 2, ' ')
             << main_queue.top().CT << string(9 - temp / 2, ' ');
        temp = to_string(main_queue.top().TAT).length();
        cout << '|' << string(8 - temp / 2 - temp % 2, ' ')
             << main_queue.top().TAT << string(9 - temp / 2, ' ');
        temp = to_string(main_queue.top().WT).length();
        cout << '|' << string(7 - temp / 2 - temp % 2, ' ')
             << main_queue.top().WT << string(7 - temp / 2, ' ');
        temp = to_string(main_queue.top().RT).length();
        cout << '|' << string(7 - temp / 2 - temp % 2, ' ')
             << main_queue.top().RT << string(8 - temp / 2, ' ');
        if (high == true)
        {
            temp = to_string(main_queue.top().priority).length();
            cout << '|' << string(5 - temp / 2 - temp % 2, ' ')
                 << main_queue.top().priority << string(5 - temp / 2, ' ');
        }
        cout << "|\n";
        main_queue.pop();
    }
    cout << "+-------------+--------------";
    cout << "+------------+-----------------";
    cout << "+----------------+-------------+--------------+";
    if (high == true)
        cout << "----------+";
    cout << endl;
    temp1 = get_total_CT(tempq);
    cout << "\nTotal Befejezesi ido :- " << temp1
         << endl;
    cout << "Atlagos Befejezesi ido :- " << temp1 / size
         << endl;
    temp1 = get_total_TAT(tempq);
    cout << "\nTotal Atfordulasi ido :- " << temp1
         << endl;
    cout << "Atlagos Atfordulasi ido :- " << temp1 / size
         << endl;
    temp1 = get_total_WT(tempq);
    cout << "\nTotal Varakozasi ido :- " << temp1
         << endl;
    cout << "Atlagos Varakozasi ido :- " << temp1 / size
         << endl;
    temp1 = get_total_RT(tempq);
    cout << "\nTotal Valasz ido :- " << temp1
         << endl;
    cout << "Atlagos Valasz ido :- " << temp1 / size
         << endl;
    temp1 = get_total_BT(tempq);
    cout << "\nTotal CPU ido :- " << temp1
         << endl;
}

// Gantt rajzolasa
void disp_gantt_chart(queue<process> gantt)
{
    int temp, prev = 0;
    queue<process> spaces = gantt;
    cout << "\n\nGantt abra(IS = idle statusz) :- \n\n+";

    // 1. sor
    while (!spaces.empty())
    {
        cout << string(to_string(spaces.front().p_no).length() + (spaces.front().p_no != -1) + 2 *
spaces.front().temp_BT,
                        '-')
             << "+";
        spaces.pop();
    }
    cout << "\n|";
    spaces = gantt;

    // 2. sor
    while (!spaces.empty())
    {
        cout << string(spaces.front().temp_BT, ' ');
        if (spaces.front().p_no == -1)
            cout << "IS" << string(spaces.front().temp_BT, ' ') << '|';
        else
            cout << "P" << spaces.front().p_no
                 << string(spaces.front().temp_BT, ' ') << '|';
        spaces.pop();
    }
    spaces = gantt;
    cout << "\n+";

    while (!spaces.empty())
    {
        cout << (string(to_string(spaces.front().p_no).length() + (spaces.front().p_no != -1) + 2 *
spaces.front().temp_BT,
                         '-'))
             << "+";
        spaces.pop();
    }
    spaces = gantt;
    cout << "\n0";
    // 3. sor
    while (!spaces.empty())
    {
        temp = to_string(spaces.front().CT).length();
        cout << (string(to_string(spaces.front().p_no).length() + (spaces.front().p_no != -1) + 2 *
spaces.front().temp_BT - temp / 2 - prev,
                         ' '))
             << spaces.front().CT;
        prev = temp / 2 - temp % 2 == 0;
        spaces.pop();
    }
    cout << "\n\n";
}

int main()
{
    // Tablak inicializasa
    priority_queue<process> ready_queue;
    priority_queue<process> completion_queue, completion_queue2, completion_queue3, rr_que,
sjf_que, fcfs_que;
    queue<process> gantt, gantt2, gantt3, rr_cpu, sjf_cpu, fcfs_cpu;
    int ms, algo;


    // Adatok bekerdezese
    ready_queue = set_process_data();

    algo = choose_Algo();

    switch (algo)
    {
    case 1:
        // Tabla rajzolas fcfs
        cout << "\n -FCFS-  "
             << endl;
        completion_queue = FCFS_run(ready_queue, &gantt);
        disp(completion_queue, false);
        fcfs_que = completion_queue;
        fcfs_cpu = gantt;
        // Gantt rajzolas fcfs
        disp_gantt_chart(gantt);


        break;
    case 2:
        // Tabla rajzolas sjf
        cout << "\n -SJF-  "
             << endl;
        completion_queue2 = SJF_P_run(ready_queue, &gantt2);
        disp(completion_queue2, false);
        sjf_que = completion_queue2;
        sjf_cpu = gantt2;
        // Gantt rajzolas sjf
        disp_gantt_chart(gantt2);

        break;
    case 3:
        // Tabla rajzolas RR
        ms = set_MS();
        cout << "\n -RR-  "
             << endl;
        completion_queue3 = RR_run(ready_queue, ms, &gantt3);
        rr_que = completion_queue3;
        rr_cpu = gantt3;
        disp(completion_queue3, false);

        cout << "\n MS:- " << ms << endl;

        // Gantt rajzolas RR
        disp_gantt_chart(gantt3);

        break;

    default:
        cout << "Valami nem jo";
        break;
    }

    // Var egy gomb nyomast
    system("pause");
    return 0;
}
```