EOOP- Preliminary Project

Date: Semester: Spring 2025

Author and Group: Damian Piechocki 102

Subject (Keyword): Presidential Election

I. Description of the project

1. Overview of the project

Voting Pole stores the votes submitted by the voters. The votes are counted and converted to percentages in respect to the general population as well as individual voivodships. Candidates gain support by means of submitted votes. The winner of the election is determined according to the statistics, which are shown at the end.

2. Class and data structures overview

There are the following classes: Election, Voter, Candidate, Voivodship.

The Election will contain a vector of voivodships, which will contain information about submitted votes. The Election will include a counter, which will store the total amount of votes. The main goal is to determine the winner of the election and express the Candidate's support in percentage with respect to the general population. The Election will also display the backing with respect to age, with the following categories: young adults <age 18-40), middle aged <40,65) and elders <65,). The election attendance will also be computed based on the voivodships.

The Voter will store basic information about voters like age, name, boolean value indicating vote submission, voivodship they live in and a helper boolean value indicating registration status. It will most importantly include the functionality of submitting a vote.

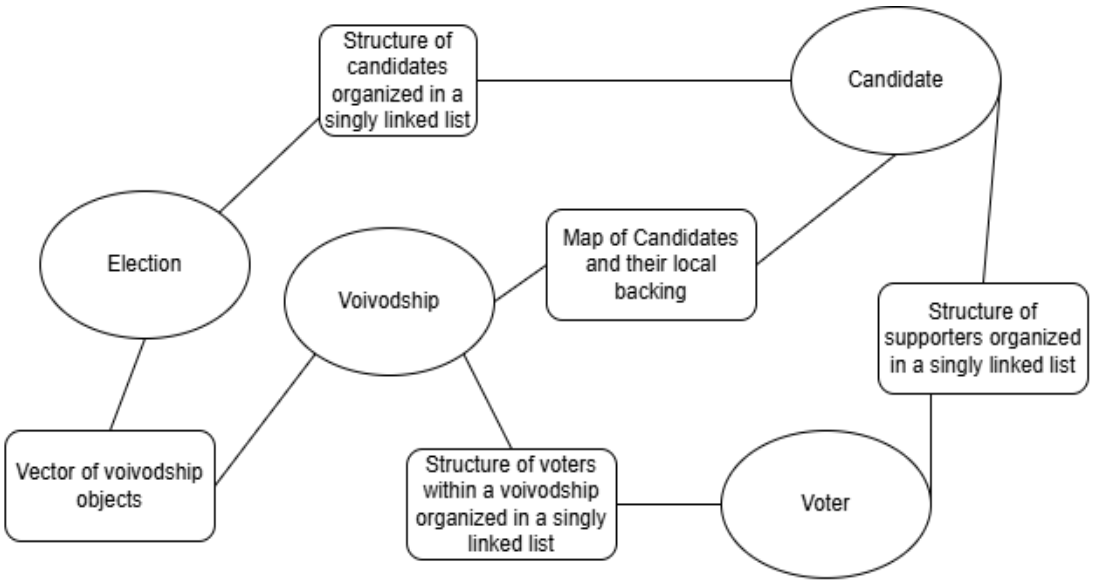
The Candidate will store information about the candidate, namely the support. It will inherit from the Voter, as candidates do have the voting rights. The backing increases, as the number of votes submitted in favor is greater. The Candidate will also store all the voters who submitted the vote on him/her. By default, the candidate can only vote for himself/herself.

The voivodship will include a singly linked list storing all the registered voters living within the voivodship and a map of candidates and their backing. It will additionally store the number of citizens living within (not all people decide to vote) and a name. Its goal is to determine a" local" election winner and present the support of respective candidates in percentage.

3. Restrictions, limits, assumptions

R1. Voter must be at least 18 years of age to vote.
R2. The number of voters cannot outnumber the number of citizens of voivodship.
R3. Each vote has the same weight and can be submitted only once.
R4. Candidates must be at least 35 years of age to part-take.
R5. Candidates can also be voters, they can vote.
R6. Candidates cannot have the number of votes greater than the total amount of votes.

II. Case study (a memory map)



While the election is generally considered to be a single object, the Voivodship, Voter and Candidate will have multiple instances within the program, the diagram does not introduce such additional objects, as then the graph would be significantly less readable.

III. Declaration of the classes

classes.h file:

```
#include <vector>
#include <map>
using namespace std;


class Election{
    private:
        unsigned int counter; //Integer variable storing the amount of all
votes.
        vector<Voivodship> voivodships; //Vector containing Voivodship objects.
It is meant for determining the election winner as well the support in respect
to group age.
        struct Candidates{  //Singly linked list of Candidate objects.
            Candidate* candidate; //Candidate object.
            Candidates* next; //Next Candidate instance.
        };
        Candidates* headC; //Head of the singly linked list for candidates.
    public:
        //Constructor for the election, the counter(amount of all votes) is
assumed to be zero initially, takes the vector of voivodship objects as an
argument as well.
        Election(const vector<Voivodship>& voivodship,const unsigned int
counter=0);
        //Destructor for Election class.
        ~Election();
```

```
        //Determines an election winner and displays total support of each
candidate in percantages.
        void determine_winner();
        //Shows the backing of candidates with respect to the age group of
voters. Age(18-39]= Young adults, Age[40,65)= Middle aged, Age(65,..)= Elders.
        void support_by_age_group();
        //Appends the candidate to the structure of Candidates following prior
validations. Takes Candidate node to be added as an argument.
        bool register_candidate(Candidate* candidate);
        //Displays all registered candidates(without their support).
        void display_registered_candidates();
        //Sends the list of candidates to all the voivodships.
        void distribute_candidates_to_voivodships();
        //Returns the counter private member as a reference.
        int& refAttendance();
};

class Voter{
    protected:
        bool validity;//boolean validity of a voter, indicating registartion
status, by default false
        char* name;//Name of a voter.
        unsigned int age;//Age of a voter.
        bool vote;//Boolean status of vote submission.
        char* voivodship;//Name of a voivodship the voter lives in.
    public:
        //Constructor of voter, taking up the private variables. The vote
submission status is assumed to be false at object creation.
        Voter(const char* name, const unsigned int age,const char*
voivovship,bool vote=false,const bool validity=false);
        //Destructor for voter instance.
        ~Voter();
        //Submits the vote for a candidate, increasing his backing and setting
the vote submission status to true.
        void submit_vote(const Candidate& candidate);
        //Returns the age of a voter.
        int get_age();
        char* get_voivodship();
        //Returns the vote submission status.
        bool has_voted();
        //Displays the voters information.
        void display();
};

//Candidate inherits from Voter class as candidates do have the voting rights,
despite part-taking in an election.
class Candidate:public Voter{
    private:
        int support; //Numerical value representing the amount of votes  a
candidate has gathered. At creation initialized to zero.
        struct Supporters{ //Singly linked list of voters who submitted the
votes on the candidate.
            Voter* voter; //Voter instance.
            Supporters* next; //Next supporters instance.
```

```
        };
        Supporters* headS; //Head of the supporters structure.
    public:
        //Constructor for candidate object, inherits from voter instance
        Candidate(const char* name,const unsigned int age, const char*
voivodship,const bool vote=false,const bool validity=false,const int
support=0): Voter(name, age, voivodship,vote,validity){};
        //Destructor for candidate instance.
        void vote();
        ~Candidate();
        //Returns the candidate's support as a reference
        int ref_support();
        //Displays all voters that submitted their vote on the candidate.
        void display_voters();
};

class Voivodship{
    private:
        char* name; //Name of the voivodship.
        int citizens; //Number of all citizens living within the voidvodship.
The number voters can not exceed this number.
        struct Voters{ //Singly linked list of all registered voters(who
submitted their vote).
            Voter* voter; //Voter instance.
            Voters* next; //Next Voters entry.
        };
        Voters* headV; //Head of singly linked list of all registered voters.
        map<Candidate*, int> localVotes; //Map of Candidates and their backing
WITHIN THE VOIVODSHIP.
    public:
        //Constructor for the voivodship instance.
        Voivodship(const char* name, const int citizens);
        //Destructor for voivodship object.
        ~Voivodship();
        //Appends the voter to the registerd voters.
        bool register_voter(Voter* voter);
        //Displays all registered voters within a voivodship.
        void display_registered_voters();
        //Displays the local support of each candidate in percantages.
        void display_local_support();
        //Returns the number of all registered voters.
        int number_of_voters();

};
```

IV. Functional test cases

test.cpp file:

```
#include <iostream>
#include <vector>
#include <map>
#include "classes.h"
using namespace std;
```

```
/*
Assumptions and Restrictions:
R1. Voter must be at least 18 years of age to vote.
R2. The number of voters cannot outnumber the number of citizens of voivodship.
R3. Each vote has the same weight and can be submitted only once.
R4. Candidates must be at least 35 years of age to part-take.
R5. Candidates can also be voters, they can vote.
R6. Candidates cannot have the number of votes greater than the total amount of
votes.
*/


int main(){
    Voter* voter1 = new Voter("Marvin Beak", 18, "Masovian");
    Voter* voter2 =new Voter("Agent 5.5",24,"Lesser Poland");
    Voter* voter4=new Voter("Cheese",16,"Lesser Poland");//Invalid args
    Voter* voter5=new Voter("Jim Pork",20,"Great Poland");
    Voter* voter6=new Voter("Bob Bacon",21,"test");
    Voivodship v1("Masovian",100);
    Voivodship v2("Lesser Poland",40);
    Voivodship v3("Great Poland",20);
    Voivodship v4("test",0);
    if(v4.register_voter(voter6)) cerr<<"Number of citizens is smaller than
amount of registered voters"<<endl;
    if(!v1.register_voter(voter1)){
        cerr<<"Valid voter not registered correctly"<<endl;
    }else{
        if(v1.register_voter(voter1))
            cerr<<"Voter registered twice to a single voivodship"<<endl;
    }
    if(v2.register_voter(voter1)){
        cerr<<"Voter assigned to a different voivodship"<<endl;
    }
    if(v2.register_voter(voter4)){
        cerr<<"Voter of age<18 registered successfully"<<endl;
    }
    v2.register_voter(voter2);
    v3.register_voter(voter5);
    if(v1.number_of_voters()!=1) cerr<<"Invalid number of voters in v1"<<endl;
    if(v2.number_of_voters()!=1) cerr<<"Invalid number of voters in v2"<<endl;
    if(v3.number_of_voters()!=1) cerr<<"Invalid number of voters in v3"<<endl;

    v1.display_registered_voters(); //Expected information of voter1
    v2.display_registered_voters(); //Expected information of voter2
    v3.display_registered_voters(); //Expected information of voter5
    vector<Voivodship> voivodships={v1,v2,v3};
    Election e(voivodships);
    Candidate* c1=new Candidate("Tim Cheese",36,"Masovian");
    Candidate* c2=new Candidate("John Pork",34,"Lesser Poland");
    Candidate* c3=new Candidate("Tiger Sam",40,"Great Poland");
    if(!e.register_candidate(c1)){
        cerr<<"Valid candidate not registered successfully"<<endl;
```

```
    }if(e.register_candidate(c2)){
        cerr<<"Candidate with invalid age registered successfully"<<endl;
    }
    e.register_candidate(c3);
    e.display_registered_candidates(); //Expected information abot c1, c3
    e.distribute_candidates_to_voivodships();
    c1->vote();
    if(c1->ref_support()!=1) cerr<<"Candidates support not incremented after
self vote"<<endl;
    c1->vote();
    if(c1->ref_support()==2) cerr<<"Candidates vote status not changed after
initial self vote"<<endl;

    voter1->submit_vote(*c1);
    if(c1->ref_support()!=2) cerr<<"Invalid support of candidate c1 after valid
Voter vote cast"<<endl;
    v1.display_local_support(); //Expected: Masovian: Tim Cheese: 100%
    voter2->submit_vote(*c3);
    v2.display_local_support(); //Expected: Lesser Poland: Tiger Sam: 100%
    voter5->submit_vote(*c1);
    v3.display_local_support();// Expected: Great Poland: Tim Cheese: 100%

    e.determine_winner(); //Expected: Tim Cheese:66.6%, Tiger Sam: 33.3%
    e.refAttendance();//  3/160 *100(This is in percantages,160 is sum of
citizens, 3 is the counter)
    e.support_by_age_group(); //Expected: Young adults:100% Middle aged:0%
Elders:0%


    return 0;
}
```