ГУАП

КАФЕДРА № 43

ОТЧЕТ
ЗАЩИЩЕН С ОЦЕНКОЙ

ПРЕПОДАВАТЕЛЬ

Старший преподаватель		Е.О. Шумова
должность, уч. степень, звание	подпись, дата	инициалы, фамилия

ОТЧЕТ О ЛАБОРАТОРНОЙ РАБОТЕ №7

Порождающие шаблоны проектирования

по курсу: ОБЪЕКТНО ОРИЕНТИРОВАННОЕ ПРОГРАММИРОВАНИЕ

РАБОТУ ВЫПОЛНИЛ

СТУДЕНТ ГР. №	4134к		Костяков Н.А.
		подпись, дата	инициалы, фамилия

Санкт-Петербург 2022

Цель работы

Изучить принципы построения приложений с графическим интерфейсом, использую библиотеку Qt, применив на практике знания базовых синтаксических конструкций языка C++ и объектно-ориентированного программирования

Вид исходной формы

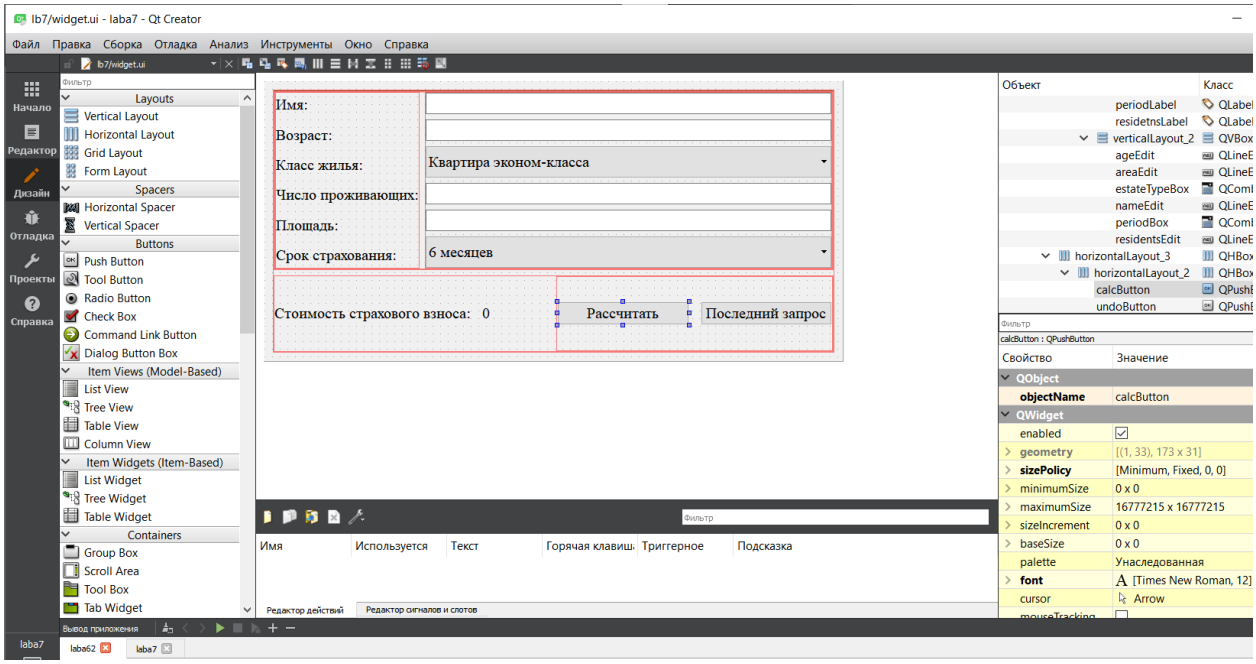


Диаграмма классов для паттерна проектирования

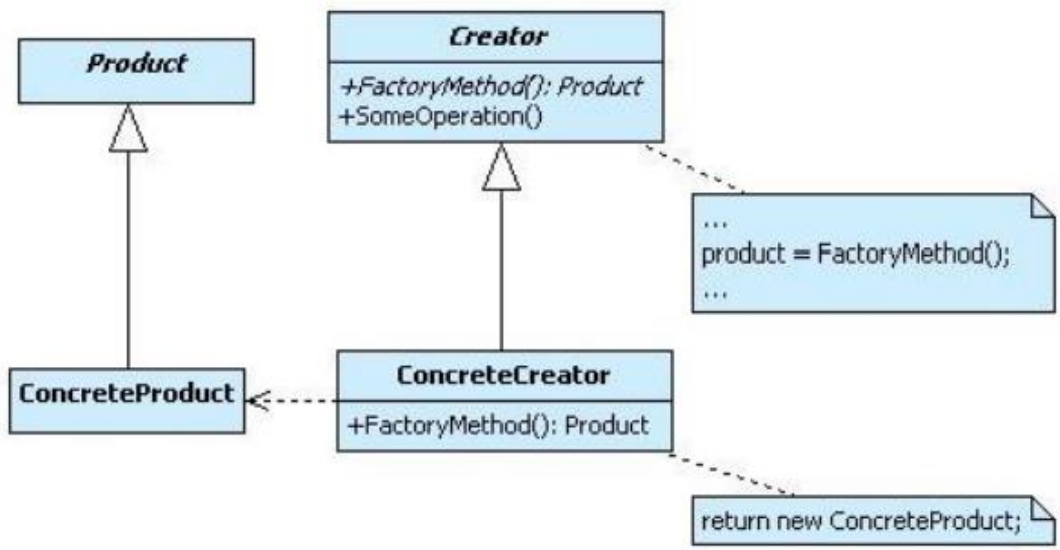


Рис. 1. Диаграмма классов шаблона Factory Method

Листинг программы

abstractcalc.cpp

```
#include "abstractcalc.h"

abstractCalc::abstractCalc()
{

}
```

abstractcalc.h

```
#ifndef ABSTRACTCALC_H
#define ABSTRACTCALC_H

#include <estate.h>
//рефакторинг с помощью двух классов
class abstractCalc
{
public:
    abstractCalc();
    virtual double getCost(estate* value) = 0;
    virtual ~abstractCalc() {}
};

#endif // ABSTRACTCALC_H


// для каждого объекта свой класс дом коттедж и тд + свой метод геткост
```

apartmentcalc.cpp

```
#include "apartmentcalc.h"

double apartmentCalc::getCost(estate *value){
    return (value->getAge() + value->getArea() + value->getMonths() + value->getResidents())
* 1000;
}
```

apartmentcalc.h

```
#ifndef APARTMENTCALC_H
#define APARTMENTCALC_H

#include <abstractcalc.h>

class apartmentCalc : public abstractCalc
{
public:
    virtual double getCost(estate* value);
};

#endif // APARTMENTCALC_H
```

apartmentfactory.cpp

```
#include "apartmentfactory.h"

abstractCalc* apartmentFactory::createCalc(){
    return new apartmentCalc;
}
```

apartmentfactory.h

```
#ifndef APARTMENTFACTORY_H
#define APARTMENTFACTORY_H

#include <calcfactory.h>

class apartmentFactory : public calcFactory
{
public:
    abstractCalc* createCalc();
    ~apartmentFactory() {}
};

#endif // APARTMENTFACTORY_H
```

calcfactory.cpp

```
#include "calcfactory.h"

calcFactory::calcFactory()
{

}
```

calcfactory.h

```
#ifndef CALCFACTORY_H
#define CALCFACTORY_H

#include <apartmentcalc.h>
#include <cottagecalc.h>
#include <luxuriouscalc.h>
#include <townhousecalc.h>

class calcFactory
{
public:
    calcFactory();
    virtual abstractCalc* createCalc() = 0;
    virtual ~calcFactory() {}

};

#endif // CALCFACTORY_H

//рефакторинг с помощью двух классов
```

//создание объектов нужных для вычисления + своя именная факторка

calculationfacade.cpp

```
#include "calculationfacade.h"

apartmentFactory* calculationFacade::apartment_factory =  new apartmentFactory;
luxuriousFactory* calculationFacade::luxurious_factory =  new luxuriousFactory;
cottageFactory* calculationFacade::cottage_factory =  new cottageFactory;
townhouseFactory* calculationFacade::townhouse_factory =  new townhouseFactory;

calculationFacade::calculationFacade(QObject *parent)
    : QObject{parent}
{

}

calculationFacade::~calculationFacade(){

}

double calculationFacade::getCost(estate *value){
    abstractCalc* house;
    switch(value->getType()){
    case estate::EstateType::ECONOM:{
        house = apartment_factory->createCalc();
        break;
    }
    case estate::EstateType::LUXURIOUS:{
        house = luxurious_factory->createCalc();
        break;
    }
    case estate::EstateType::TOWN_HOUSE:{
        house = townhouse_factory->createCalc();
        break;
    }
    case estate::EstateType::COTTAGE:{
        house = cottage_factory->createCalc();
        break;
    }
    default:{

        break;
    }
 }
    return house->getCost(value);
}
```

// обстрактный дом + нужный тип данных для вычислений, для подключения нужной фабрики

calculationfacade.h

```
#ifndef CALCULATIONFACADE_H
#define CALCULATIONFACADE_H

#include <QObject>
#include <apartmentfactory.h>
#include <luxuriousfactory.h>
#include <cottagefactory.h>
#include <townhousefactory.h>

class calculationFacade : public QObject
{
    Q_OBJECT
public:
    explicit calculationFacade(QObject *parent = nullptr);
    static double getCost(estate *value);
    ~calculationFacade();
private:
    static apartmentFactory* apartment_factory;
    static luxuriousFactory* luxurious_factory;
    static cottageFactory* cottage_factory;
    static townhouseFactory* townhouse_factory;
};

#endif // CALCULATIONFACADE_H


// ститические объекты для избежания утечек памяти
```

cottagecalc.cpp

```
#include "cottagecalc.h"

double cottageCalc::getCost(estate *value){
    return (value->getAge() + value->getArea() + value->getMonths() + value->getResidents())
* 3000;
}
```

cottagecalc.h

```
#ifndef COTTAGECALC_H
#define COTTAGECALC_H

#include <abstractcalc.h>

class cottageCalc : public abstractCalc
{
public:
    virtual double getCost(estate* value);

};

#endif // COTTAGECALC_H
```

cottagefactory.cpp

```
#include "cottagefactory.h"

abstractCalc* cottageFactory::createCalc(){
    return new cottageCalc;
}
```

cottagefactory.h

```
#ifndef COTTAGEFACTORY_H
#define COTTAGEFACTORY_H

#include <calcfactory.h>

class cottageFactory : public calcFactory
{
public:
    abstractCalc* createCalc();
    ~cottageFactory() {}
};

#endif // COTTAGEFACTORY_H
```

estate.cpp

```
#include "estate.h"
#include <widget.h>

estate::estate(QObject *parent)
    : QObject{parent}
{

}

estate::estate(const QString owner, const int age, const int type,
               const int residents, const double area, const QString months){
    if (owner == "" || age == 0 || residents == 0 || area == 0)
        throw myException("Заполните все поля формы.");
    this->age = age;
    this->area = area;
    this->residents = residents;
    this->months = months.split(" ")[0].toInt();
    this->owner = owner;
    this->type = static_cast<EstateType>(type);
}

estate::EstateType estate::getType() const{
    return this->type;
}

int estate::getAge() const{
    return this->age;
}
```

```
double estate::getArea() const{
    return this->area;
}

int estate::getMonths() const{
    return this->months;
}

int estate::getResidents() const{
    return this->residents;
}

QString estate::getOwner() const{
    return this->owner;
}
```

estate.h

```
#ifndef ESTATE_H
#define ESTATE_H

#include <QObject>

class estate : public QObject
{
    Q_OBJECT
public:
    explicit estate(QObject *parent = nullptr);
    enum EstateType{
        ECONOM,
        LUXURIOUS,
        TOWN_HOUSE,
        COTTAGE
    };
    estate(const QString owner, const int age, const int type,
           const int residents, const double area, const QString months);
    EstateType getType() const;
    int getAge() const;
    int getMonths() const;
    double getArea() const;
    int getResidents() const;
    QString getOwner() const;

private:
    int age, residents, months;
    double area;
    EstateType type;
    QString owner;
};

#endif // ESTATE_H
```

exception.h

```
#ifndef EXCEPTION_H
#define EXCEPTION_H

#include <QException>
#include <QMessageBox>

class myException : public QException
{
public:
    myException(QString const &text = " ") noexcept : msg(text) {}
    myException(const myException &err) { this->msg = err.msg; }
    ~myException() override {}
    void raise() const override { throw *this; }
    myException *clone() const override { return new myException(*this); }
    const char *what() const noexcept override { return this->msg.toStdString().c_str(); }
private:
    QString msg;
};

#endif // EXCEPTION_H
```

luxuriouscalc.cpp

```
#include "luxuriouscalc.h"

double luxuriousCalc::getCost(estate *value){
  return (value->getAge() + value->getArea() + value->getMonths() + value->getResidents()) *
1500;
}
```

luxuriouscalc.h

```
#ifndef LUXURIOUSCALC_H
#define LUXURIOUSCALC_H

#include <abstractcalc.h>

class luxuriousCalc : public abstractCalc
{
public:
    virtual double getCost(estate* value);

};

#endif // LUXURIOUSCALC_H
```

luxuriousfactory.cpp

```
#include "luxuriousfactory.h"

abstractCalc* luxuriousFactory::createCalc(){
    return new luxuriousCalc;
}
```

luxuriousfactory.h

```
#ifndef LUXURIOUSFACTORY_H
#define LUXURIOUSFACTORY_H

#include <calcfactory.h>

class luxuriousFactory : public calcFactory
{
public:
    abstractCalc* createCalc();
    ~luxuriousFactory() {}
};

#endif // LUXURIOUSFACTORY_H
```

main.cpp

```
#include "widget.h"

#include <QApplication>

int main(int argc, char *argv[])
{
    QApplication a(argc, argv);
    Widget w;
    w.show();
    return a.exec();
}
```

states.cpp

```
#include "states.h"

states::states(QObject *parent)
    : QObject{parent}
{
    actualData = nullptr;
}

states::~states(){
    if (actualData){
        delete actualData;
        actualData = nullptr;
    }

    qDeleteAll(array);
    array.clear();
}

bool states::hasStates(){
    return !(array.isEmpty());
}

estate* states::getActualData(){
    return actualData;
```

```
}

void states::add(estate* value){
    array.append(value);
}

void states::undo(){
    if (hasStates()){
        array.pop_back();
        actualData = array.last();
        emit notifyObservers();
    }
    else actualData = nullptr;
}

int states::getSize(){
    return array.size();
}
```

states.h

```
#ifndef STATES_H
#define STATES_H

#include <QObject>
#include <estate.h>

class states : public QObject
{
    Q_OBJECT
public:
    explicit states(QObject *parent = nullptr);
    ~states();

    void undo();
    bool hasStates();
    estate *getActualData();
    void add(estate *value);
    int getSize();

signals:
    void notifyObservers();
private:
    QList<estate*> array;
    estate *actualData;
};

#endif // STATES_H
```

townhousecalc.cpp

```
#include "townhousecalc.h"

double townhouseCalc::getCost(estate *value){
```

```
  return (value->getAge() + value->getArea() + value->getMonths() + value->getResidents()) *
2500;
}
```

townhousecalc.h

```
#ifndef TOWNHOUSECALC_H
#define TOWNHOUSECALC_H

#include <abstractcalc.h>

class townhouseCalc : public abstractCalc
{
public:
   virtual double getCost(estate* value);

};

#endif // TOWNHOUSECALC_H
```

townhousefactory.cpp

```
#include "townhousefactory.h"

abstractCalc* townhouseFactory::createCalc(){
   return new townhouseCalc;
}
```

townhousefactory.h

```
#ifndef TOWNHOUSEFACTORY_H
#define TOWNHOUSEFACTORY_H

#include <calcfactory.h>

class townhouseFactory : public calcFactory
{
public:
   abstractCalc* createCalc();
   ~townhouseFactory() {}
};

#endif // TOWNHOUSEFACTORY_H
```

widget.cpp

```
#include "widget.h"
#include "ui_widget.h"

Widget::Widget(QWidget *parent)
   : QWidget(parent)
   , ui(new Ui::Widget),
     forIntValidator(QRegularExpression("^[0-9]+$")),
     forDoubleValidator(QRegularExpression("^[0-9]*[.]?[0-9]+$")),
     forOwnerValidator(QRegularExpression("^([А-Я][а-я]+)\\s([А-Я][а-яА-Я-]+)$")),
     info(this)
```

```
{
    ui->setupUi(this);
    ui->undoButton->setEnabled(false);
    ui->ageEdit->setValidator(&forIntValidator);
    ui->residentsEdit->setValidator(&forIntValidator);
    ui->areaEdit->setValidator(&forDoubleValidator);
    ui->nameEdit->setValidator(&forOwnerValidator);

    connect(&info, SIGNAL(notifyObservers()), this, SLOT(update()));
    connect(ui->calcButton, SIGNAL(pressed()), this, SLOT(calcPressed()));
    connect(ui->undoButton, SIGNAL(pressed()), this, SLOT(undoPressed()));
}

Widget::~Widget()
{
    delete ui;
}

void Widget::update(){
    auto value = info.getActualData();
    if (value != nullptr) fillForm(value);
    ui->undoButton->setEnabled(info.hasStates());
    value = nullptr;
}

void Widget::calcPressed(){
    try {
    auto value = processForm();
    showCost(value);
    info.add(value);
    ui->undoButton->setEnabled(true);
    value = nullptr;
    }
    catch(const myException &error){
        QMessageBox msg;
        msg.setWindowTitle("Ошибка!");
        msg.setFixedSize(500,400);
        msg.setText(error.what());
        msg.exec();
        return;
    }
    if(info.getSize() >= 2) ui->undoButton->setEnabled(true);
    if(info.getSize() <= 1) ui->undoButton->setEnabled(false);
}

void Widget::undoPressed(){

    if (info.getSize() > 1) info.undo();
    if(info.getSize() <= 1) ui->undoButton->setEnabled(false);
    else return;
}
```

```
estate *Widget::processForm(){
   return new estate(ui->nameEdit->text(), ui->ageEdit->text().toInt(), ui->estateTypeBox->currentIndex(),
                     ui->residentsEdit->text().toInt(), ui->areaEdit->text().toDouble(), ui->periodBox->currentText());
}

void Widget::fillForm(estate *value){
   ui->nameEdit->setText(info.getActualData()->getOwner());
   ui->ageEdit->setText(QString::number(info.getActualData()->getAge()));
   ui->residentsEdit->setText(QString::number(info.getActualData()->getResidents()));
   ui->periodBox->setCurrentIndex((info.getActualData()->getMonths() / 6) - 1);
   ui->areaEdit->setText(QString::number(info.getActualData()->getArea()));
   switch (info.getActualData()->getType()){
   case estate::EstateType::ECONOM:
      ui->estateTypeBox->setCurrentIndex(0);
      break;
   case estate::EstateType::LUXURIOUS:
      ui->estateTypeBox->setCurrentIndex(1);
      break;
   case estate::EstateType::TOWN_HOUSE:
      ui->estateTypeBox->setCurrentIndex(2);
      break;
   case estate::EstateType::COTTAGE:
      ui->estateTypeBox->setCurrentIndex(3);
      break;
   }
   showCost(value);
}

void Widget::showCost(estate *value)
{

   ui->costLabel->setText("Стоимость страхового взноса: " + QString::number(calculationFacade::getCost(value)));
}
```

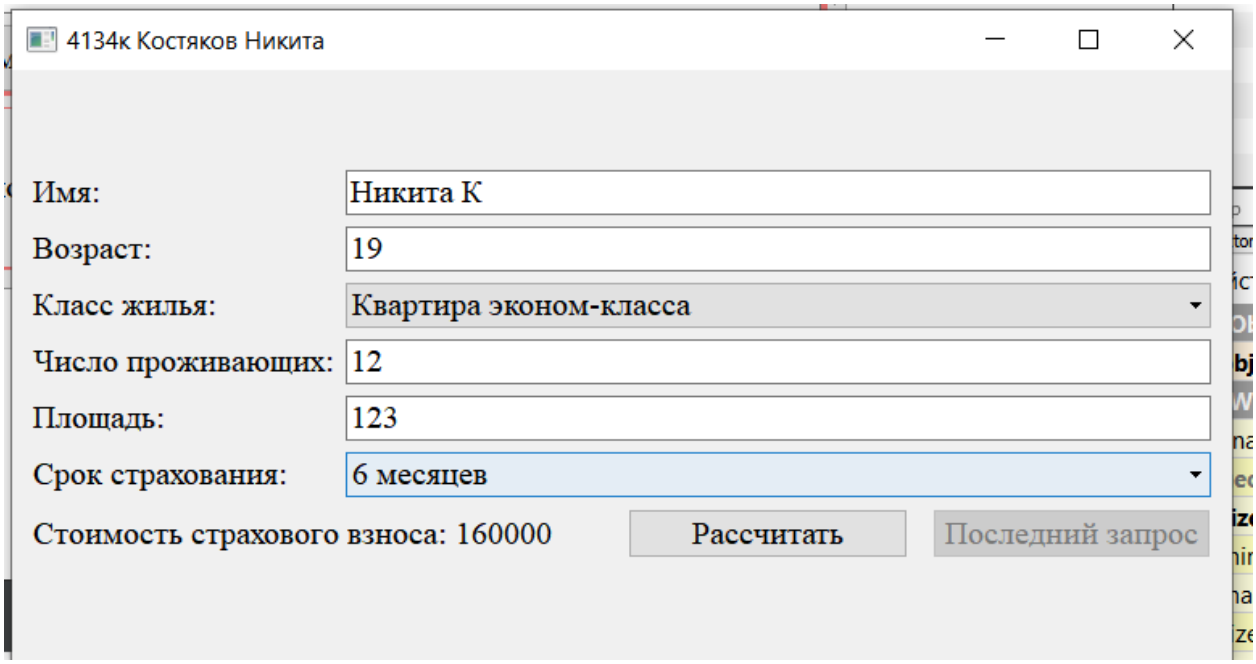
widget.h

```
#ifndef WIDGET_H
#define WIDGET_H

#include <QWidget>
#include <states.h>
#include <estate.h>
#include <calculationfacade.h>
#include <exception.h>
#include <QRegularExpressionValidator>
#include <QRegularExpression>

QT_BEGIN_NAMESPACE
namespace Ui { class Widget; }
QT_END_NAMESPACE
```

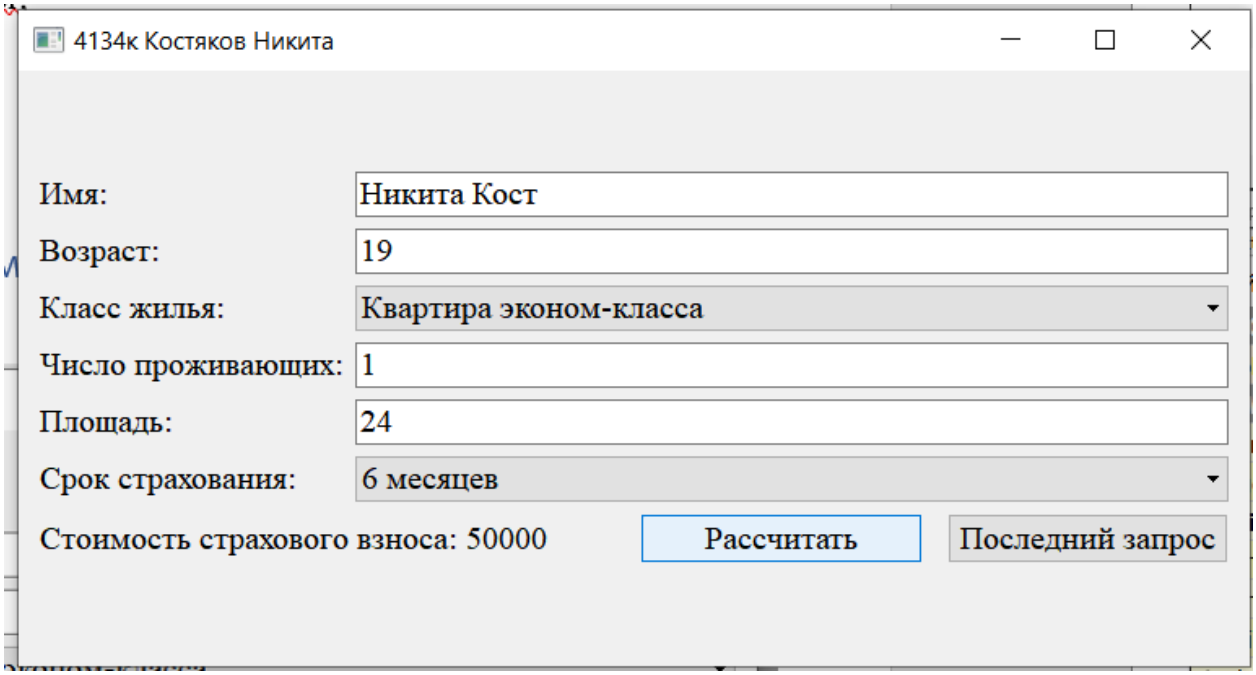
```
class Widget : public QWidget
{
    Q_OBJECT

public:
    Widget(QWidget *parent = nullptr);
    ~Widget();

public slots:
    void update();

private slots:
    void calcPressed();
    void undoPressed();

private:
    estate *processForm();
    void fillForm(estate *value);
    void showCost(estate *value);

private:
    Ui::Widget *ui;
    QRegularExpressionValidator forIntValidator, forDoubleValidator,
                                forOwnerValidator;
    states info;
};
#endif // WIDGET_H
```

Результат работы программы

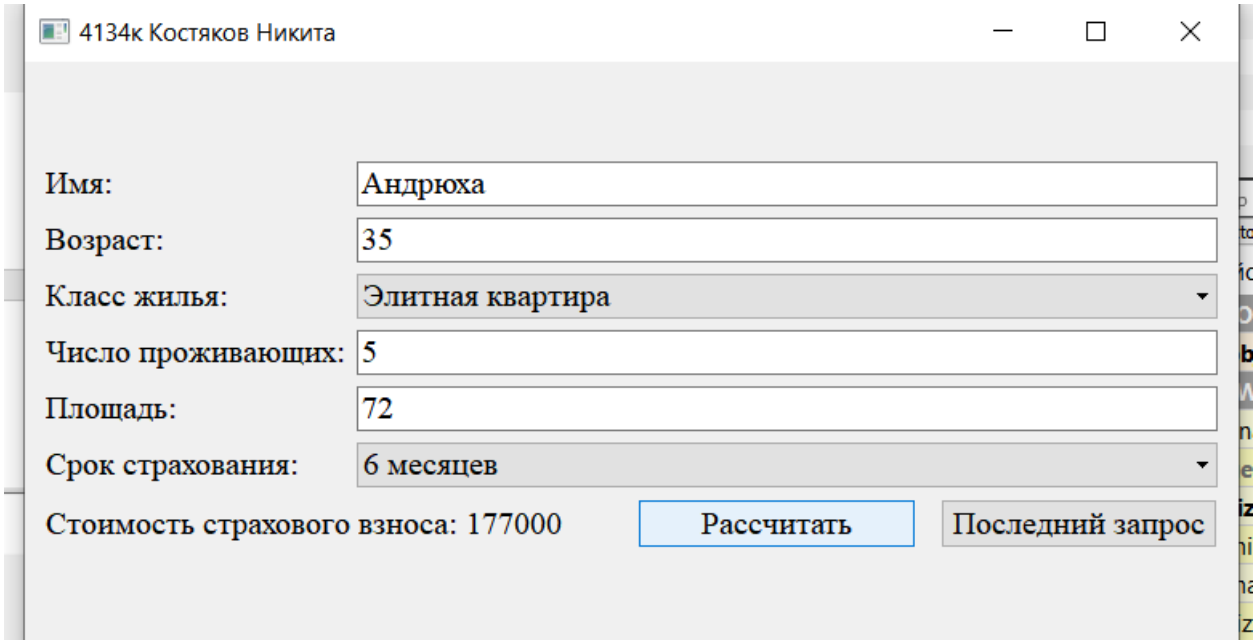
Расчет 1



Рассчет2

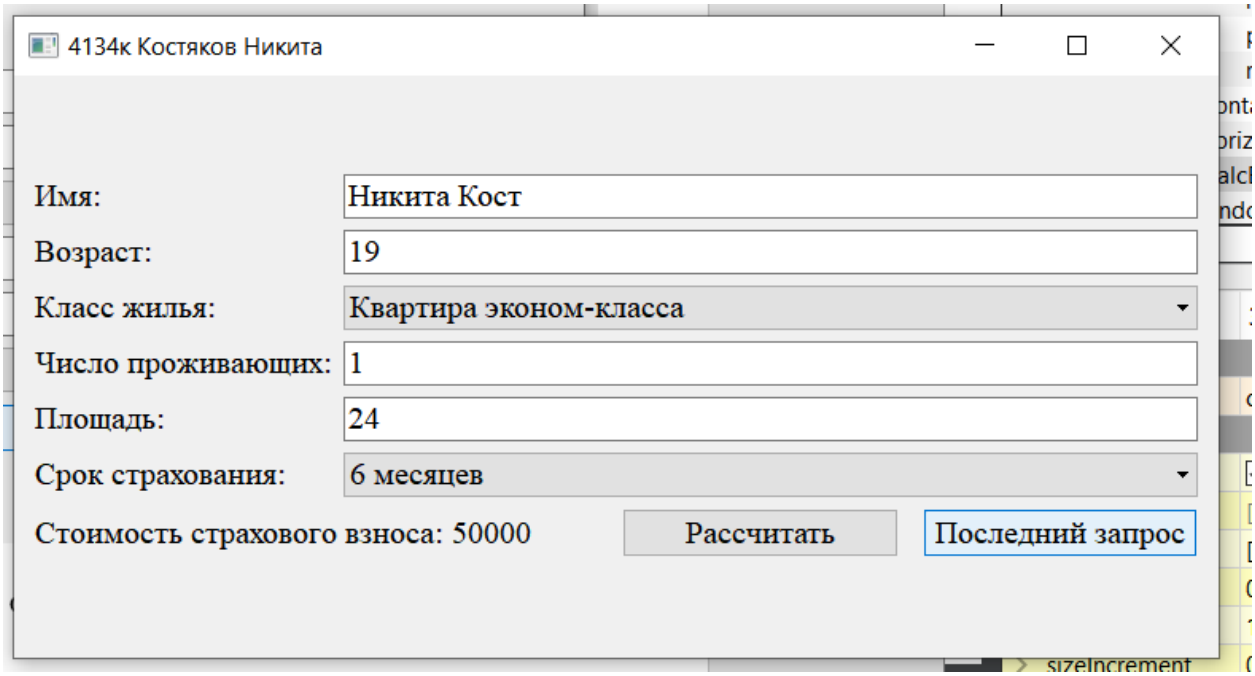


Расчет 3

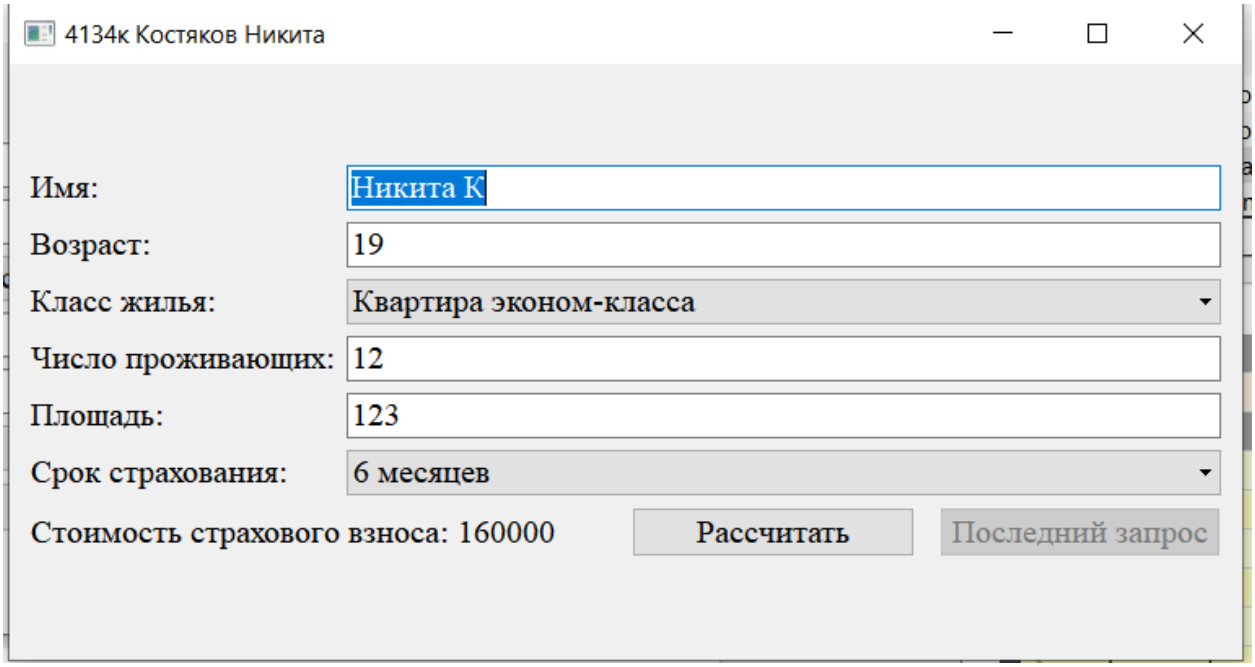


Работы кнопки Последнего запроса откатывает форму на предыдущий запрос

1 нажатие



Нажатие 2



Выводы

Я изучил принципы построения приложений с графическим интерфейсом