Пермский филиал федерального государственного автономного образовательного учреждения высшего образования

«Национальный исследовательский университет

«Высшая школа экономики» Пермь»

Факультет экономики, менеджмента и бизнес-информатики.

**Оценка количества ошибок и тестов**

студента образовательной программы «Программная инженерия»

по направлению подготовки *09.03.04 Программная инженерия*

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Для лучшего отображения советую закрыть главу “код программы”

# Код программы

from tkinter import \*

import tkinter

import tkinter.ttk

import math

def create\_widgets\_in\_first\_frame():

# Create the label for the frame

first\_window\_label = tkinter.ttk.Label(first\_frame,

text='Choose Language')

first\_window\_label.grid(column=2,

row=0,

pady=10,

padx=10,

sticky=(tkinter.N))

# Create the button for the frame

create\_widgets\_in\_first\_frame.add\_img = tkinter.PhotoImage(file="1.png")

create\_widgets\_in\_second\_frame.add\_img = tkinter.PhotoImage(file="2.png")

create\_widgets\_in\_third\_frame.add\_img = tkinter.PhotoImage(file="3.png")

create\_widgets\_in\_fourth\_frame.add\_img = tkinter.PhotoImage(file="4.png")

first\_window\_next\_button = tkinter.Button(first\_frame,

text="Русский",

image=create\_widgets\_in\_first\_frame.add\_img,

command=call\_second\_frame\_on\_top)

first\_window\_next\_button.grid(column=1,

row=1,

pady=10,

padx=10)

first\_window\_next\_button = tkinter.Button(first\_frame,

text="Английский",

image=create\_widgets\_in\_second\_frame.add\_img,

command=call\_third\_frame\_on\_top)

first\_window\_next\_button.grid(column=1,

row=2,

pady=10,

padx=10)

first\_window\_next\_button = tkinter.Button(first\_frame,

text="Китайский",

image=create\_widgets\_in\_third\_frame.add\_img,

command=call\_fourth\_frame\_on\_top)

first\_window\_next\_button.grid(column=3,

row=1,

pady=10,

padx=10)

first\_window\_next\_button = tkinter.Button(first\_frame,

text="Французский",

image=create\_widgets\_in\_fourth\_frame.add\_img,

command=call\_fifth\_frame\_on\_top)

first\_window\_next\_button.grid(column=3,

row=2,

pady=10,

padx=10)

first\_window\_quit\_button = tkinter.Button(first\_frame,

text="Exit",

command=quit\_program)

first\_window\_quit\_button.grid(column=4,

row=3,

pady=10,

padx=10)

def create\_widgets\_in\_second\_frame():

# Create the label for the frame

second\_window\_label = tkinter.ttk.Label(second\_frame,

text='Введите число:')

second\_window\_label.grid(column=1,

row=0,

pady=10,

padx=10,

sticky=(tkinter.N))

message = StringVar()

entry1 = tkinter.Entry(second\_frame, text='', textvariable=message, width=50,)

entry1.grid(column=2,

row=0,

pady=10,

padx=10,

sticky=(tkinter.N))

second\_window\_label = tkinter.ttk.Label(second\_frame,

text='Точность(<15 знаков):')

second\_window\_label.grid(column=1,

row=1,

pady=10,

padx=10,

sticky=(tkinter.N))

many = StringVar()

message\_entry = Entry(second\_frame, text='', textvariable=many, width=20, )

message\_entry.grid(column=2,

row=1,

pady=10,

padx=10,

sticky=(tkinter.N))

def func1():

try:

x = float(entry1.get())

second\_window\_label1.config(text="{}".format(math.sqrt(x)))

except ValueError:

second\_window\_label1.config(text="Ошибка введите цифры")

second\_window\_label1 = tkinter.Label(second\_frame,

text="Ответ:")

second\_window\_label1.grid(column=2,

row=3,

pady=10,

padx=10,

sticky=(tkinter.N))

second\_window\_label = tkinter.ttk.Label(second\_frame,

text="Ответ:")

second\_window\_label.grid(column=1,

row=3,

pady=10,

padx=10,

sticky=(tkinter.N))

# Create the button for the frame

second\_window\_enter\_button = tkinter.Button(second\_frame, text='Решить', command=func1())

second\_window\_enter\_button.grid(column=2,

row=2,

pady=10,

padx=10)

second\_window\_back\_button = tkinter.Button(second\_frame,

text="Назад",

command=call\_first\_frame\_on\_top)

second\_window\_back\_button.grid(column=0,

row=5,

pady=10,

padx=10)

second\_window\_next\_button = tkinter.Button(second\_frame,

text="Выход",

command=quit\_program)

second\_window\_next\_button.grid(column=5,

row=5,

pady=10,

padx=10)

def create\_widgets\_in\_third\_frame():

# Create the label for the frame

third\_window\_label = tkinter.ttk.Label(third\_frame,

text='输入一个数字:')

third\_window\_label.grid(column=1,

row=0,

pady=10,

padx=10,

sticky=(tkinter.N))

message = StringVar()

entry1 = tkinter.Entry(third\_frame, text='', textvariable=message, width=50, )

entry1.grid(column=2,

row=0,

pady=10,

padx=10,

sticky=(tkinter.N))

third\_window\_label = tkinter.ttk.Label(third\_frame,

text='准确度（<15个字符):')

third\_window\_label.grid(column=1,

row=1,

pady=10,

padx=10,

sticky=(tkinter.N))

many = StringVar()

message\_entry = Entry(third\_frame, text='', textvariable=many, width=20, )

message\_entry.grid(column=2,

row=1,

pady=10,

padx=10,

sticky=(tkinter.N))

def func1():

try:

x = float(entry1.get())

third\_window\_label1.config(text="{}".format(math.sqrt(x)))

except ValueError:

third\_window\_label1.config(text="错误输入数字")

third\_window\_label1 = tkinter.Label(third\_frame,

text="回答:")

third\_window\_label1.grid(column=2,

row=3,

pady=10,

padx=10,

sticky=(tkinter.N))

third\_window\_label = tkinter.ttk.Label(third\_frame,

text="回答:")

third\_window\_label.grid(column=1,

row=3,

pady=10,

padx=10,

sticky=(tkinter.N))

# Create the button for the frame

third\_window\_enter\_button = tkinter.Button(third\_frame, text='解决', command=func1())

third\_window\_enter\_button.grid(column=2,

row=2,

pady=10,

padx=10)

# Create the button for the frame

third\_window\_back\_button = tkinter.Button(third\_frame,

text="向后",

command=call\_first\_frame\_on\_top)

third\_window\_back\_button.grid(column=0,

row=5,

pady=10,

padx=10,

sticky=(tkinter.N))

third\_window\_quit\_button = tkinter.Button(third\_frame,

text="输出",

command = quit\_program)

third\_window\_quit\_button.grid(column=5,

row=5,

pady=10,

padx=10,

sticky=(tkinter.N))

def create\_widgets\_in\_fourth\_frame():

# Create the label for the frame

fourth\_window\_label = tkinter.ttk.Label(fourth\_frame,

text='Enter a number:')

fourth\_window\_label.grid(column=1,

row=0,

pady=10,

padx=10,

sticky=(tkinter.N))

message = StringVar()

entry1 = tkinter.Entry(fourth\_frame, text='', textvariable=message, width=50, )

entry1.grid(column=2,

row=0,

pady=10,

padx=10,

sticky=(tkinter.N))

fourth\_window\_label = tkinter.ttk.Label(fourth\_frame,

text='Accuracy(<15 numbers):')

fourth\_window\_label.grid(column=1,

row=1,

pady=10,

padx=10,

sticky=(tkinter.N))

many = StringVar()

message\_entry = Entry(fourth\_frame, text='', textvariable=many, width=20, )

message\_entry.grid(column=2,

row=1,

pady=10,

padx=10,

sticky=(tkinter.N))

def func1():

try:

x = float(entry1.get())

fourth\_window\_label1.config(text="{}".format(math.sqrt(x)))

except ValueError:

fourth\_window\_label1.config(text="Error enter numbers")

fourth\_window\_label1 = tkinter.Label(fourth\_frame,

text="Answer:")

fourth\_window\_label1.grid(column=2,

row=3,

pady=10,

padx=10,

sticky=(tkinter.N))

fourth\_window\_label = tkinter.ttk.Label(fourth\_frame,

text="Answer:")

fourth\_window\_label.grid(column=1,

row=3,

pady=10,

padx=10,

sticky=(tkinter.N))

# Create the button for the frame

fourth\_window\_enter\_button = tkinter.Button(fourth\_frame, text='Solve', command=func1())

fourth\_window\_enter\_button.grid(column=2,

row=2,

pady=10,

padx=10)

# Create the button for the frame

fourth\_window\_back\_button = tkinter.Button(fourth\_frame,

text="Back",

command=call\_first\_frame\_on\_top)

fourth\_window\_back\_button.grid(column=0,

row=5,

pady=10,

padx=10,

sticky=(tkinter.N))

fourth\_window\_quit\_button = tkinter.Button(fourth\_frame,

text="Exit",

command=quit\_program)

fourth\_window\_quit\_button.grid(column=5,

row=5,

pady=10,

padx=10,

sticky=(tkinter.N))

def create\_widgets\_in\_fifth\_frame():

# Create the label for the frame

fifth\_window\_label = tkinter.ttk.Label(fifth\_frame,

text='Entrez un nombre:')

fifth\_window\_label.grid(column=1,

row=0,

pady=10,

padx=10,

sticky=(tkinter.N))

message = StringVar()

entry1 = tkinter.Entry(fifth\_frame, text='', textvariable=message, width=50, )

entry1.grid(column=2,

row=0,

pady=10,

padx=10,

sticky=(tkinter.N))

fifth\_window\_label = tkinter.ttk.Label(fifth\_frame,

text='Précision(<15 caractères):')

fifth\_window\_label.grid(column=1,

row=1,

pady=10,

padx=10,

sticky=(tkinter.N))

many = StringVar()

message\_entry = Entry(fifth\_frame, text='', textvariable=many, width=20, )

message\_entry.grid(column=2,

row=1,

pady=10,

padx=10,

sticky=(tkinter.N))

def func1():

try:

x = float(entry1.get())

fifth\_window\_label1.config(text="{}".format(math.sqrt(x)))

except ValueError:

fifth\_window\_label1.config(text="Erreur entrez les chiffres")

fifth\_window\_label1 = tkinter.Label(fifth\_frame,

text="Réponse:")

fifth\_window\_label1.grid(column=2,

row=3,

pady=10,

padx=10,

sticky=(tkinter.N))

fifth\_window\_label = tkinter.ttk.Label(fifth\_frame,

text="Réponse:")

fifth\_window\_label.grid(column=1,

row=3,

pady=10,

padx=10,

sticky=(tkinter.N))

# Create the button for the frame

fifth\_window\_enter\_button = tkinter.Button(fifth\_frame, text='Résoudre', command=func1())

fifth\_window\_enter\_button.grid(column=2,

row=2,

pady=10,

padx=10)

# Create the button for the frame

fifth\_window\_back\_button = tkinter.Button(fifth\_frame,

text="Retourner",

command=call\_first\_frame\_on\_top)

fifth\_window\_back\_button.grid(column=0,

row=5,

pady=10,

padx=10,

sticky=(tkinter.N))

fifth\_window\_quit\_button = tkinter.Button(fifth\_frame,

text="Sortir",

command=quit\_program)

fifth\_window\_quit\_button.grid(column=5,

row=5,

pady=10,

padx=10,

sticky=(tkinter.N))

def call\_first\_frame\_on\_top():

# This function can be called only from the second window.

# Hide the second window and show the first window.

second\_frame.place\_forget()

third\_frame.place\_forget()

fourth\_frame.place\_forget()

fifth\_frame.place\_forget()

first\_frame.place(relx=0.1, rely=0.1)

def call\_second\_frame\_on\_top():

# This function can be called from the first and third windows.

# Hide the first and third windows and show the second window.

first\_frame.place\_forget()

second\_frame.place(relx=0.1, rely=0.1)

def call\_third\_frame\_on\_top():

# This function can only be called from the second window.

# Hide the second window and show the third window.

first\_frame.place\_forget()

third\_frame.place(relx=0.1, rely=0.1)

def call\_fourth\_frame\_on\_top():

# This function can only be called from the second window.

# Hide the second window and show the third window.

first\_frame.place\_forget()

fourth\_frame.place(relx=0.1, rely=0.1)

def call\_fifth\_frame\_on\_top():

# This function can only be called from the second window.

# Hide the second window and show the third window.

first\_frame.place\_forget()

fifth\_frame.place(relx=0.1, rely=0.1)

def quit\_program():

root\_window.destroy()

###############################

# Main program starts here :) #

###############################

# Create the root GUI window.

root\_window = tkinter.Tk()

root\_window.title("Калькулятор квадратов")

root\_window.geometry("700x400")

root\_window.resizable(False, False)

# Create frames inside the root window to hold other GUI elements. All frames must be created in the main program, otherwise they are not accessible in functions.

first\_frame = tkinter.ttk.Frame(root\_window, width=750, height=450+300+200)

first\_frame.place(relx=0.1, rely=0.1)

second\_frame = tkinter.ttk.Frame(root\_window, width=750, height=450+300+200)

second\_frame.place(relx=0.1, rely=0.1)

third\_frame = tkinter.ttk.Frame(root\_window, width=750, height=450+300+200)

third\_frame.place(relx=0.1, rely=0.1)

fourth\_frame = tkinter.ttk.Frame(root\_window, width=750, height=450+300+200)

fourth\_frame.place(relx=0.1, rely=0.1)

fifth\_frame = tkinter.ttk.Frame(root\_window, width=750, height=450+300+200)

fifth\_frame.place(relx=0.1, rely=0.1)

# Create all widgets to all frames

create\_widgets\_in\_first\_frame()

create\_widgets\_in\_second\_frame()

create\_widgets\_in\_third\_frame()

create\_widgets\_in\_fourth\_frame()

create\_widgets\_in\_fifth\_frame()

# Hide all frames in reverse order, but leave first frame visible (unhidden).

second\_frame.place\_forget()

third\_frame.place\_forget()

fourth\_frame.place\_forget()

fifth\_frame.place\_forget()

# Start tkinter event - loop

root\_window.mainloop()

Application.EnableVisualStyles()

Application.SetCompatibleTextRenderingDefault(False)

form = MyForm()

Application.Run(form)

# Оценка программы

1. В оцениваемой программе 450 строк.  
   Согласно исторической модели на каждые 100 строк (операторов) приходится 4-8 ошибок. Значит в программе ориентировочно 36 ошибок.  
   Мы хотим выявить эти ошибки так, чтобы результатам можно было доверять на 90%. Воспользуемся моделью Миллса. Внесем в проверяемую программу искусственные ошибки. Посчитаем М через N и С.   
   Для С=90% нам понадобится внести в программу 333 искусственных ошибок.
2. Я прогнал 20 тестов и при этом обнаружили 20 естественных ошибок и 185 искусственных.  
   Оценим количество естественных ошибок по модели Миллса.   
   Оценим С для нового значения N.    
   Если оно нас не устраивает, надо внести дополнительные искусственные ошибки.  
   Оценим кол-во ненайденных ошибок = 16
3. Оценим, сколько тестов нам еще потребуется для завершения тестирования. По 5 таблице, 15 главы, учебника.  
   

Для обнаружения, имеющегося у нас процента ошибок = 55%, нужно было ~20 тестов. Общее количество тестов составит ~53 до нахождения 90% ошибок. Нам осталось прогнать 33 теста.

Для нахождения 100% всех ошибок нам потребуется 157 тестов. Из этого следует вывод что для нахождения всех ошибок осталось прогнать 104 теста.