CS 162 LAB #9 – Polymorphism and Vectors

In order to get credit for the lab, you need to be checked off by the end of lab. You can earn a maximum of 3 points for lab work completed outside of lab time, but you must finish the lab before the next lab and get checked off with your lab TAs during their office hours. For extenuating circumstances, contact your lab TAs and the instructor.

This lab is worth 15 points total. Here's the breakdown:

- 5 points: Worksheet
- 6 points: Polymorphism
- 4 points: Vector

(5 pts) Part 1: Worksheet

This session will be led by your lab TAs. Please follow their instructions, participate, and complete worksheet 9:

https://classes.engr.oregonstate.edu/eecs/winter2024/cs162-001/labs/WS9.docx (pdf version)

In this lab, you'll start to work with polymorphism and vectors in C++.

(6 pts in total) Part 2: Basic Polymorphism Practice

(3 pts) Use classes from lab 8 (Vehicle, Car, Bus, and Delivery Bot) to create polymorphism. Answer the questions below and implement the polymorphism.

- Which function are you going to make virtual?
- How will you make it polymorphic?
- Can it be a pure virtual function?
- Which class have you made an abstract base class?
- Do any of the destructors need to be virtual? If so, which one(s)?

(3 pts) Modify your main.cpp file (the driver file) to show polymorphism by making a `void print_vehicle_info ()` function. **(Note: this function should not be a member function of any classes!!!)** In this function, you will print the brand, year, and gas price of the vehicle (the vehicle can be a car, a bus, or a delivery bot). You should pass your vehicle by reference (or address explicitly) to have polymorphism.

```
void print_vehicle_info (Vehicle &);
```

OR

```
void print_vehicle_info (Vehicle *);
```

(4 pts in total) Part 3: Vectors

Now, create a vector of Vehicle pointers, i.e., `vector <Vehicle *> vehicle_vec`, then insert 10 different vehicles (car, bus, delivery bots) into the vector using `push_back()` (The insertion order is up to you). These vehicles need to be dynamically allocated. Print all vehicle info in the vector using `print_vehicle_info()` that you implemented above. Then answer the following questions:

- What is the size and capacity of the vector? How to check them?
- Does your program have any memory leaks? Do you need to manually free the memory? Why or why not?

Show your completed work and answers to the TAs for credit. You will not get points if you do not get checked off!

Submit your work to TEACH for our records **(Note: you will not get points if you don't get checked off with a TA!!!)**

1. Create a **zip file** that contains all files you've created in this lab:
2. Transfer the zip file from the ENGR server to your local laptop.
3. Go to TEACH.
4. In the menu on the right side, go to **Class Tools → Submit Assignment**.
5. Select **CS162 Lab 9** from the list of assignments and click "**SUBMIT NOW**"
6. Select your files and click the Submit button.