Design Document
Group Project - CS 162

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Requirements:

Tool Parent Class :

Data members: int strength, char type

Functions: void setStrength(int), virtual bool fight(tool)

Sub-Classes:

Rock	Paper	Scissors
Type =r	type=p	type=s
setStrength(1)	setStrength(1)	setStrength(1)
bool fight(tool)	bool fight(tool)	bool fight(tool)

RPSGame Class:

Tool *p1

Tool *p2

Human_wins

Computer_wins

Ties

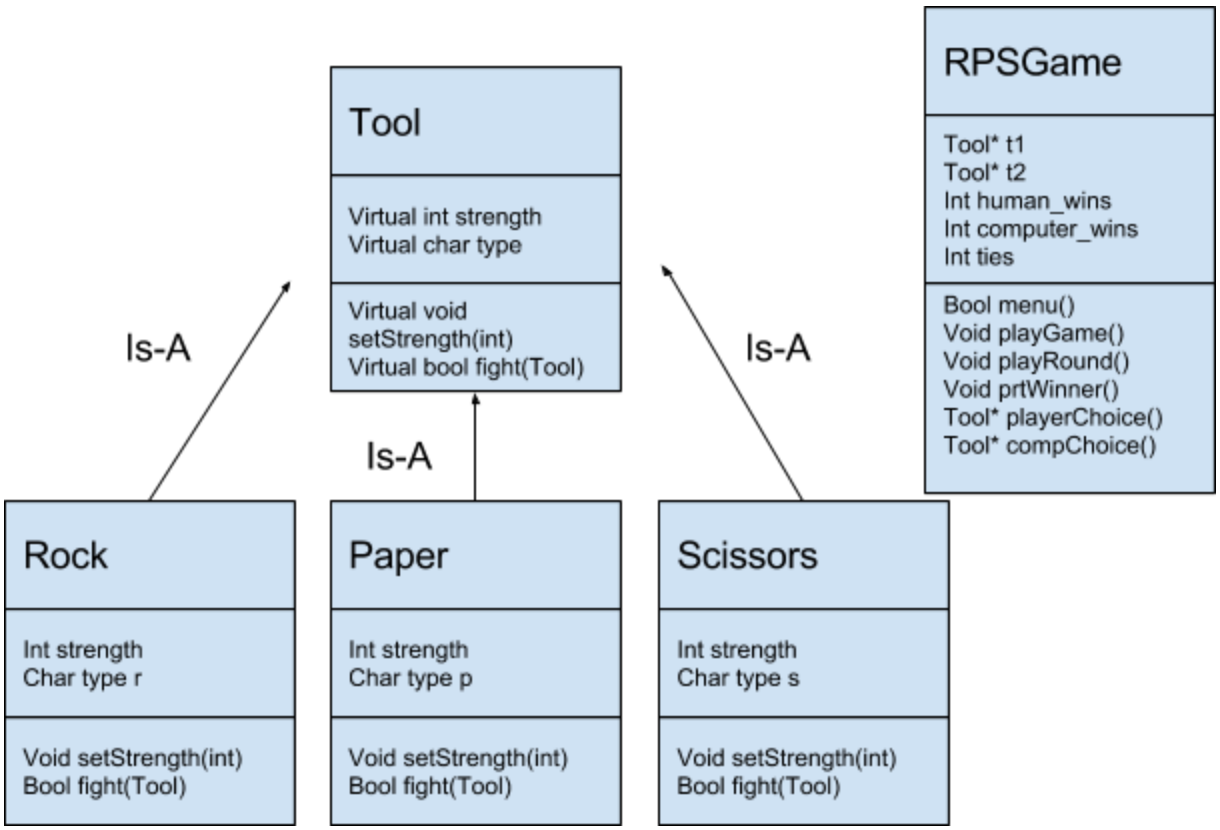
Design Overview:

The workload is largely on two fronts: the tool hierarchy and the game class functions.
The tool hierarchy has an abstract tool parent class. Each sub-class will overload the fight(tool) function based on each tool's strengths and weaknesses. Each sub-class requires its own constructor.
The game class functions need to provide a user interface by which to play a game against the computer, probably via a menu function. It will need a function to determine what the computer is picking (using rand and a switch to select the computer's tool), as well as a function to allow the user to select the tool he wants to use that round against the computer. Another function can facilitate calling the computer and player turn functions, call the fight(tool) function, and record the score of the round. Finally, a print() function would be a reasonable addition. The menu function could have as its options: play a game of RPS, print the current score, or exit the program.

Design Implementation:

- Tool Class (base class) with derived classes:
    - Rock Class
    - Scissors Class
    - Paper Class
- RPS class:
    - playGame function (possibly only a playRound function)
        - Design Choice: Play to a best of n, where n is a val set by the user?
        - How about play one round, then would you like to play another round? y/n
        - Just play one game at a time and keep a tally per instance?
    - compChoice and playerChoice functions
        - Input validation required for user choice
- Main:
    - Game Menu function
        - Input validation required for user choice

Class Hierarchy Diagram:



Pseudo Code design

```
Tool
protected:
Int strength =1
        Virtual int strength = 0
        Virtual char type('r', 'p', 's') =0
        Virtual void setStrength(int)
        Virtual bool fight(Tool) = 0
Rock, Paper, Scissor (int strength)
        int strength = 1;
        Char type= 'r', 'p', 's';
Virtual int strength {return strength;}
Virtual char type {return type;}
Virtual void setStrength(int) {set strength to input}
Virtual bool fight(Tool) {
Compare strengths of the Human tool and computer tool
return 0 for loss or 1 for win;}

RPSGame(Tool *Human[], Tool *Computer[])
int human_wins = 0;
int computer_wins = 0;
int ties  = 0;
void Menu();
        int human_wins {return ++human_wins; }
        int computer_wins {return ++computer_wins; }
        int ties {return ++ties; }


Main.cpp
Create dynamic array for
Tool *Human[] = {new rock(1), new paper(1), new Scissor(1)}
Tool *Computer[] = {new rock(1), new paper(1), new Scissor(1)}
Create object RPSGame Game();
char type = 'r'   //set as initial value
While(char type !=e)
        Game menu
        Switch
                Case 1 : Ask user to set strength
                Case 2 : Ask user to to set computer strength
        Ask user to input char y
                Cin >> y;
        if y == 'r' {y=0}
                Cout << "User picked rock"
```

```
        else If y == 'p' {y=1}
                cout << "User picked paper"
        else If y == 's' {y=2}
                cout << "User picked scissor"
        Computer picks a tool at random,  int x = rand()%2
        bool h = Human[user input y]->fight(Tool Computer);
        bool c = Computer[random input x]->fight(Tool Human);
If h ==1 && c==0
cout Human win!
        Game.human_wins
Else If h ==0 && c==1
cout Computer win!
        Game.computer_wins
else
cout << "Tie";
        Game.ties
cout
Game.computer_wins
Game.human_wins
Game.ties
} end while loop
Deallocate dynamic memory
```

Testing:

Test Case	**Input**	**Driver functions**	**Expected Outcome**	**Observed Outcome**
Rock (player) v. rock(computer)	Choice = r	game_play(); RPSGame();	Tie	Tie
Rock v. paper	Choice = r	game_play(); RPSGame();	Computer win count incremented	Computer win count incremented
Rock v. Scissors	Choice = r	game_play(); RPSGame();	Player win count incremented	Player win count incremented
Scissors v. paper	Choice = s	game_play(); RPSGame();	Player win count incremented	Player win count incremented
Scissors v. rock	Choice = s	game_play(); RPSGame();	Computer win count incremented	Computer win count incremented
Scissors v. scissors	Choice = s	game_play(); RPSGame();	Tie	Tie

Paper v. paper	Choice = p	game_play(); RPSGame();	Tie	Tie
Paper v. scissors	Choice = p	game_play(); RPSGame();	Computer win count incremented	Computer win count incremented
Paper v. rock	Choice = p	game_play(); RPSGame();	Player win count incremented	Player win count incremented

Player plays with augmented strength	Answer == y;
	humanStrength = 3;
	comStrength = 1;
		game_play();
		RPSGame();
			Player will win every round	Player will win every round

Computer plays with augmented strength	Answer == y
	humanStrength = 1;
	comStrength = 3;
		game_play();
		RPSGame();
			Computer will win every round	Computer will win every round

Player plays with augmented strength by 1	Answer == y;
	humanStrength = 6;
	comStrength = 5;
		game_play();
		RPSGame();
			All normal play except human will win the tie	All normal play except human will win the tie

Both play with equally augmented strength	Answer == y;
	humanStrength = 3;
	comStrength = 3;
		game_play();
		RPSGame();
			Same likelihood of winning as normal powered rounds	Same likelihood of winning as normal powered rounds

User exits program	Choice = e	RPSGame play();	Program ends	Program ends

Follow-Up and Reflections:

As to be expected during the creation of any program, certain aspects of the initial design had to be changed as we implemented the code.

One aspect that changed was the AI for the Computer object's pick for each round. Originally, our group had planned to add in functionality that used the user's last pick to help the computer guess for the current round. After reviewing the assignment document, we interpreted that the Computer object choosing tools in a random way was more in line with the specifications. The implemented AI passes a randomly generated integer between 0 - 2 into the Computer object. Each of these integers correlates to one of the tools (rock, paper, scissors).

Another aspect that changed was where we decided to implement the functionality for choosing which Tool object the user and the computer would use for each turn and the game menu. Originally, we had planned to implement all of this in the RPSGame class using three member

functions - compChoice(), playerChoice(), and menu(). Instead, we decided to implement this “choice” functionality and the game menu in the play_game file for the sake of simplicity.

Other minor changes were made during implementation of our initial design. One example, was the names for the getter functions in the RPSGame class. Used to get the number of computer wins, user wins, and ties for each game, they were originally named computer_wins(), human_wins(), and ties(). These function names were creating conflicts when compiled because there were data members that had the same name. We rectified this by adding the prefix “get” to each of the getter functions.