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//
// main.cpp
// HW5
//
// Created by Benny on 3/15/15.
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//

#include <iostream>
#include <fstream>
#include <cmath>
#include <iomanip>
using namespace std;

string promptForString(string &message){
    cin>>message;
    return message;
}

double promptForDouble(double &data){
    cin>>data;
    return data;
}

void introduction(istream &is, ostream &os, string target, string
replacement)
{
    string line;
    while (getline(is,line)) {
        while(line.find(target) != -1) {
            line.replace(line.find(target),
target.length(),replacement);
        }
        os << line << endl;
    }
}

void updateStatus(double &velocity, double burnAmount, double
&fuelRemaining, double &height){
    fuelRemaining-=burnAmount;
    velocity+=5.0-burnAmount;
    height-=(2.0*velocity-5.0+burnAmount)/2.0;
}

void touchdown(double &elapsedTime, double &velocity, double
&burnAmount, double &height){
    float delta,oldVelocity,oldHeight;
    oldVelocity=velocity+5-burnAmount;
    oldHeight=height+(velocity+oldVelocity)/2.0;
}

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        if(burnAmount==5){
            delta=oldHeight/oldVelocity;
        }
        else{
            delta=(sqrt((oldVelocity*oldVelocity)+oldHeight*(10.0-(2.0*burnAmount)))-oldVelocity)/(5.0-burnAmount);
        }
        elapsedTime+=delta-1.0;
        velocity=oldVelocity+(5.0-burnAmount)*delta;
    }

    void finalAnalysis(ostream &os, double velocity){
        if(velocity==0){
            os<<"Congratulations! A perfect landing!! Your license will be renewed...later.";
        }
        if(velocity>0&&velocity<2){
            os<<"A little bumpy.";
        }
        if(velocity>=2&&velocity<5){
            os<<"You blew it!!!!!! Your family will be notified...by post.";
        }
        if(velocity>=5&&velocity<10){
            os<<"Your ship is a heap of junk !!!!! Your family will be notified...by post.";
        }
        if(velocity>=10&&velocity<30){
            os<<"You blasted a huge crater !!!!! Your family will be notified...by post.";
        }
        if(velocity>=30&&velocity<50){
            os<<"Your ship is a wreck !!!!! Your family will be notified...by post.";
        }
        if(velocity>=50){
            os<<"You totaled an entire mountain !!!!! Your family will be notified...by post.";
        }
    }

    int main(){
        string target="$SPACECRAFT",replacement,line;
        char intro,play,again='y';
        filebuf infile;
        infile.open("input.txt",ios::in);
        istream is(&infile);
        cout<<"Welcome to my World! Do you want some advises?(y/n):";
        cin>>intro;
    }

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cout<<"\n";
if(intro=='y'){
cout<<"Enter you SPACECRAFT name:";
replacement=promptForString(replacement);
cout<<"\n";
introduction(is, cout, target,replacement);
cout<<"\n";
}
cout<<"Are you ready to landing right now?(y/n):";
cin>>play;
cout<<"\n";
if(play=='n'){
    cout<<"See you next time!";
    exit(0);
}
while(again=='y'){
    double
height=1000.0,time=0.0,velocity=50.0,fuelRemaining=150.0,burnAmount=0.0;
    while(fuelRemaining>0&&height>0){
        cout<<"Status of you "<<replacement<<" spacecraft:"<<endl;
        cout<<"Time: "<<time<<" seconds"<<endl;
        cout<<"Height: "<<height<<" feet"<<endl;
        cout<<"Speed: "<<velocity<<" ft/sec"<<endl;
        cout<<"Fuel: "<<fuelRemaining<<endl;
        cout<<"Enter fuel burn amount:";
        burnAmount=promptForDouble(burnAmount);
        updateStatus(velocity,burnAmount,fuelRemaining,height);
        time++;
        cout<<"\n";
    }
    if(fuelRemaining<=0||height<=0){
        fuelRemaining=0.0;
        cout<<"Status of you "<<replacement<<" spacecraft:"<<endl;
        cout<<"Time: "<<time<<" seconds"<<endl;
        cout<<"Height: "<<height<<" feet"<<endl;
        cout<<"Speed: "<<velocity<<" ft/sec"<<endl;
        cout<<"Fuel: "<<fuelRemaining<<endl;
        cout<<"\n";
        touchdown(time, velocity, burnAmount, height);
        cout<<"**** OUT OF FUEL ****"<<endl<<endl;
        cout<<"***** CONTACT *****"<<endl;
        cout<<"Touchdown at "<<setprecision(5)<<time<<"
seconds."<<endl;
        cout<<"Landing velocity = "<<setprecision(5)<<velocity<<"
ft/sec."<<endl;
        cout<<fuelRemaining<<" units of fuel remaining"<<endl;
        finalAnalysis(cout, velocity);
    }
    cout<<"\n";
}

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    cout<<"\n";  
    cout<<"Try again?(y/n):";  
    cin>>again;  
    cout<<"\n";  
}  
}
```

Welcome to my World! Do you want some advises?(y/n):y

Enter you SPACECRAFT name:DREXEL

LUNAR LANDER INSTRUCTIONS

You are landing on the moon and have taken over manual control 1000 feet above a good landing spot. You have a downward velocity of 50 feet/sec. 150 units of fuel remain.

Here are the rules that govern your DREXEL space-craft:

- (1) After each second, the height, velocity, and remaining fuel will be reported via DIGBY, your on-board computer.
- (2) After each report, enter the number of units of fuel you wish to burn during the next second. Each unit of fuel will slow your descent by 1 foot/sec.
- (3) The maximum thrust of your engine is 30 feet/sec/sec or 0 units of fuel per second.
- (4) When you contact the lunar surface, your descent engine will automatically shut down and you will be given a report of your landing speed and remaining fuel.
- (5) If you run out of fuel, you will no longer be prompted to enter the number of units to burn each second. Your second by second reports will continue until you contact the lunar surface.

Are you ready to landing right now?(y/n):y

Status of you DREXEL spacecraft:

Time: 0 seconds

Height: 1000 feet

Speed: 50 ft/sec

Fuel: 150

Enter fuel burn amount:5

Status of you DREXEL spacecraft:

Time: 1 seconds

Height: 950 feet

Speed: 50 ft/sec

Fuel: 145

Enter fuel burn amount:0

Status of you DREXEL spacecraft:

Time: 2 seconds

Height: 897.5 feet

Speed: 55 ft/sec

Fuel: 145

Enter fuel burn amount:5

Status of you DREXEL spacecraft:

Time: 3 seconds

Height: 842.5 feet

Speed: 55 ft/sec

Fuel: 140

Enter fuel burn amount:20

Status of you DREXEL spacecraft:

Time: 4 seconds

Height: 795 feet

Speed: 40 ft/sec

Fuel: 120

Enter fuel burn amount:10

Status of you DREXEL spacecraft:

Time: 5 seconds

Height: 757.5 feet

Speed: 35 ft/sec

Fuel: 110

Enter fuel burn amount:5

Status of you DREXEL spacecraft:

Time: 6 seconds

Height: 722.5 feet

Speed: 35 ft/sec

Fuel: 105

Enter fuel burn amount:10

Status of you DREXEL spacecraft:

Time: 7 seconds

Height: 690 feet

Speed: 30 ft/sec

Fuel: 95

Enter fuel burn amount:1

0

Status of you DREXEL spacecraft:

Time: 8 seconds

Height: 658 feet

Speed: 34 ft/sec

Fuel: 94

Enter fuel burn amount:10

Status of you DREXEL spacecraft:

Time: 9 seconds

Height: 626.5 feet

Speed: 29 ft/sec

Fuel: 84

Enter fuel burn amount:10

Status of you DREXEL spacecraft:

Time: 10 seconds

Height: 600 feet

Speed: 24 ft/sec

Fuel: 74

Enter fuel burn amount:10

Status of you DREXEL spacecraft:

Time: 11 seconds

Height: 578.5 feet

Speed: 19 ft/sec

Fuel: 64

Enter fuel burn amount:10

Status of you DREXEL spacecraft:
Time: 12 seconds
Height: 562 feet
Speed: 14 ft/sec
Fuel: 54
Enter fuel burn amount:10

Status of you DREXEL spacecraft:
Time: 13 seconds
Height: 550.5 feet
Speed: 9 ft/sec
Fuel: 44
Enter fuel burn amount:10

Status of you DREXEL spacecraft:
Time: 14 seconds
Height: 544 feet
Speed: 4 ft/sec
Fuel: 34
Enter fuel burn amount:3

Status of you DREXEL spacecraft:
Time: 15 seconds
Height: 539 feet
Speed: 6 ft/sec
Fuel: 31
Enter fuel burn amount:2

Status of you DREXEL spacecraft:
Time: 16 seconds
Height: 531.5 feet
Speed: 9 ft/sec
Fuel: 29
Enter fuel burn amount:5

Status of you DREXEL spacecraft:
Time: 17 seconds
Height: 522.5 feet
Speed: 9 ft/sec
Fuel: 24
Enter fuel burn amount:3

Status of you DREXEL spacecraft:
Time: 18 seconds
Height: 512.5 feet
Speed: 11 ft/sec
Fuel: 21
Enter fuel burn amount:4

Status of you DREXEL spacecraft:
Time: 19 seconds
Height: 501 feet
Speed: 12 ft/sec
Fuel: 17
Enter fuel burn amount:5

Height: 522.5 feet
Speed: 11 ft/sec
Fuel: 21
Enter fuel burn amount:4

Status of you DREXEL spacecraft:
Time: 19 seconds
Height: 501 feet
Speed: 12 ft/sec
Fuel: 17
Enter fuel burn amount:5

Status of you DREXEL spacecraft:
Time: 20 seconds
Height: 489 feet
Speed: 12 ft/sec
Fuel: 12
Enter fuel burn amount:2

Status of you DREXEL spacecraft:
Time: 21 seconds
Height: 475.5 feet
Speed: 15 ft/sec
Fuel: 10
Enter fuel burn amount:
5

Status of you DREXEL spacecraft:
Time: 22 seconds
Height: 460.5 feet
Speed: 15 ft/sec
Fuel: 5
Enter fuel burn amount:2

Status of you DREXEL spacecraft:
Time: 23 seconds
Height: 444 feet
Speed: 18 ft/sec
Fuel: 3
Enter fuel burn amount:3

Status of you DREXEL spacecraft:
Time: 24 seconds
Height: 425 feet
Speed: 20 ft/sec
Fuel: 0

**** OUT OF FUEL ****

***** CONTACT *****
Touchdown at 35.812 seconds.
Landing velocity = 47.624 ft/sec.
0 units of fuel remaining
Your ship is a wreck !!!!! Your family will be notified...by post.

Try again?(y/n):

Welcome to my World! Do you want some advises?(y/n):n

Are you ready to landing right now?(y/n):y

Status of you spacecraft:

Time: 0 seconds

Height: 1000 feet

Speed: 50 ft/sec

Fuel: 150

Enter fuel burn amount:10

Status of you spacecraft:

Time: 1 seconds

Height: 952.5 feet

Speed: 45 ft/sec

Fuel: 140

Enter fuel burn amount:10

Status of you spacecraft:

Time: 2 seconds

Height: 910 feet

Speed: 40 ft/sec

Fuel: 130

Enter fuel burn amount:10

Status of you spacecraft:

Time: 3 seconds

Height: 872.5 feet

Speed: 35 ft/sec

Fuel: 120

Enter fuel burn amount:10

Status of you spacecraft:

Time: 4 seconds

Height: 840 feet

Speed: 30 ft/sec

Fuel: 110

Enter fuel burn amount:10

Status of you spacecraft:

Time: 5 seconds

Height: 812.5 feet

Speed: 25 ft/sec

Fuel: 100

Enter fuel burn amount:10

Status of you spacecraft:

Time: 6 seconds

Height: 790 feet

Speed: 20 ft/sec

Fuel: 90

Enter fuel burn amount:10

Status of you spacecraft:

Time: 7 seconds

Height: 772.5 feet

All Output ↕



Height: 670.5 feet

Speed: 9 ft/sec

Fuel: 29

Enter fuel burn amount:5

Status of you spacecraft:

Time: 17 seconds

Height: 667.5 feet

Speed: 9 ft/sec

Fuel: 24

Enter fuel burn amount:5

Status of you spacecraft:

Time: 18 seconds

Height: 658.5 feet

Speed: 9 ft/sec

Fuel: 19

Enter fuel burn amount:5

Status of you spacecraft:

Time: 19 seconds

Height: 649.5 feet

Speed: 9 ft/sec

Fuel: 14

Enter fuel burn amount:5

Status of you spacecraft:

Time: 20 seconds

Height: 640.5 feet

Speed: 9 ft/sec

Fuel: 9

Enter fuel burn amount:5

Status of you spacecraft:

Time: 21 seconds

Height: 631.5 feet

Speed: 9 ft/sec

Fuel: 4

Enter fuel burn amount:5

Status of you spacecraft:

Time: 22 seconds

Height: 622.5 feet

Speed: 9 ft/sec

Fuel: 0

**** OUT OF FUEL ****

***** CONTACT *****

Touchdown at 91.167 seconds.

Landing velocity = 9 ft/sec.

0 units of fuel remaining

Your ship is a heap of junk !!!!! Your family will be notified...by post.

Try again?(y/n):

All Output ↕

