Project 3

Introduction to Programming

March 2017

Synopsis

We implement a martian lander game, not unlike those with which American astronauts trained for the moon-shot. However, our martian lander only moves up and down. The player wins if the lander reaches the surface with a small velocity. The player controls a single thruster that offers vertical lift. The player only has a limited amount of fuel.

Physics

The lander is subject to two forces, the constant gravitational force downwards and the potential force of the thruster upwards. The physics has discrete timing, where we calculate the velocity of the thruster every Δ seconds. A typical frame rate is 20 frames per second, for a Δ of 50 msec. The downward velocity v changes proportionally to the difference between the gravitationally force and the thruster force

$$v_{\text{new}} - v_{\text{old}} \sim f_{\text{grav}} - f_{\text{thr}}$$

There are several ways that you can implement the thruster action. You can use the numerical keys to control the amount of fuel going into the thruster and hence the fuel consumption and the thruster force. Or you can allow a thruster that is either on or off depending on whether the player presses a thruster key.

Implementation

We will use tkinter in order to implement the game. You will be given a few games you can use as a template.

Game Experience

One of the more difficult designs in gaming is the experience of the user. Besides reasonable graphics, in this one the setting of the contants is most important. If you are not careful, then a thruster burst throws the lander into outer space or even at full thrusters, the lander crashes on the surface. Finally, the amount of fuel given to the player should allow for a good gaming experience. It should not be too easy, but not too frustrating either.