Raspberry Pi + Python + Minecraft (PyCraft) Teaching Guide

Summary

The goal of this class is to encourage students to program with Python using a very popular computer game, Minecraft, on the affordable Raspberry Pi. Students are first introduced to Ubuntu, then taught where to download RaspbianOS (the official OS for the Raspberry Pi from the Raspberry Pi Foundation), then instructed on flashing the OS onto a MicroSD Card. Afterwards, students begin playing Minecraft before learning how to hack the game using APIs with Python scripting. Instructions for proper handling of the Raspberry Pi are given throughout the session.

Teaching Philosophy

1. Students must be allowed and encouraged to make mistakes and to learn from them.
2. Students must be allowed and encouraged to be creative in their learning and coding.

Learning Objectives

1. Learn to put together a set of hardware to use the Raspberry Pi as a computer.
2. Learn to download and flash an operating system for the Raspberry Pi onto a MicroSD card.
3. Learn basic Minecraft gameplay.
4. Learn how to hack Minecraft using exposed APIs with Python.
5. Demystify the reputation that programming is difficult.

Procedures

1. Start by booting into Ubuntu and familiarise students with basic commands. For example, the Super Key (Windows/Command Key) to trigger the overlay for launching applications.
2. Teach students how to get to the RaspbianOS download page and the difference between the Lite version and the Desktop version. The downloaded zip file should already be available on the computer so students do not need to wait for the completion of the download.
3. Teach students where to download Etcher for flashing RaspbianOS onto the MicroSD Card. Program should be tested before use on Ubuntu.
4. Properly plug in the MicroSD card into an adaptor and plug it into the laptop. Make sure the adaptor is not set to the locked (plastic tab is pushed down) position. In Etcher, select the desktop GUI version of RaspbianOS for the image to flash. Check that the correct MicroSD card the image will be flashed to is selected, then start flashing.

   Note: This procedure will take a while to complete so run the next step first while waiting.

5. Ask the students to begin assembling their monitor, keyboard, mouse, and power adaptors for the Raspberry Pi. Encourage the students to try it for themselves first and intercede only if they are in danger of injuring themselves or damaging the equipment.
6. Once the OS is properly flashed, properly unmount the SD card from the computer before shutting it down to prevent distractions.
7. Plug the MicroSD Card into the hooked up Raspberry Pi before turning it on. If the Raspberry Pi is already on, tell the students to turn off the device and turn it back on again to properly boot up with the MicroSD Card.
8. Tell the students to launch Minecraft and show them how to move their in-game character (WASD), interact with objects (right-click and left-click), jump (spacebar), fly (double-spacebar while on the ground), fall (double-spacebar while floating), accessing the inventory (E), and selecting the blocks on screen (number keys). Let them have fun exploring the game.
9. Tell students to pause the game (Escape key), and launch Python3 IDLE to begin the Python programming part of the class.
10. Follow the procedures in the “Minecraft + Python Cheatsheet” explaining along the way what each command does. Make sure students are not left too far behind, but if there are slower learners, assign class helpers to individual students while moving the class along.

    Note: Students need to switch quickly between their Python script after running it and Minecraft. Show them how to use Alt+Tab to quickly switch between windows.
11. At the end of the class, instruct students to properly shutdown their Raspberry Pi before leaving. Emphasise that these are computers and the OS can get corrupted if they are powered off without properly shutting them down.