ME 132a - Virtual Machine Installation
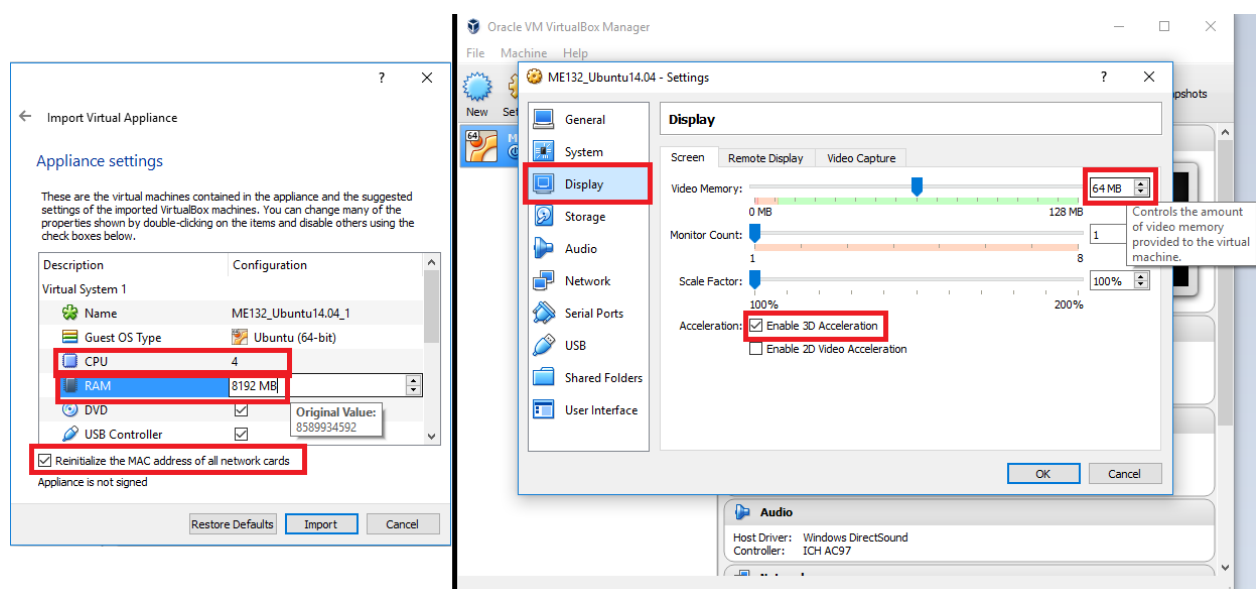
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This guide describes how to open an Ubuntu virtual machine in the program VirtualBox, which will allow you to use the Open Motion Planning Library (OMPL) GUI to test out a range of different path planning algorithms, as well as to use the Robotic Operating System (ROS) to interface with several Parrot quadcopters later in the quarter.

VirtualBox Setup

VirtualBox is a free software package from Oracle that allows users to emulate a fully fledged computer inside another system running Windows, OS X, or Linux. We will be using it to run an Ubuntu 14.04 virtual machine that comes prepackaged with all of the programs and dependencies necessary to run OMPL and ROS with an interface to the Parrot Bebop and AR Drone. You will likely need $\geq$4GB but preferably $\geq$8GB of RAM, and around 20GB of disk space to operate the virtual machine.

1. Download and install VirtualBox for whichever operating system you use (which is referred to as the 'host' OS) from this website: https://www.virtualbox.org/wiki/Downloads

2. Download the ME 132 virtual machine from the class website or from this link: http://robotics.caltech.edu/~jbowkett/ME132_VM.ova

3. Enable the Hardware Virtualization setting in your computer's BIOS settings by restarting and clicking F2/F12/del or otherwise as prompted during startup. The virtualization/VTx/VTd setting can usually be found under a menu named System Security or similar

4. Start VirtualBox and click *File -> Import Appliance*, then select the .ova file you downloaded in the previous step.
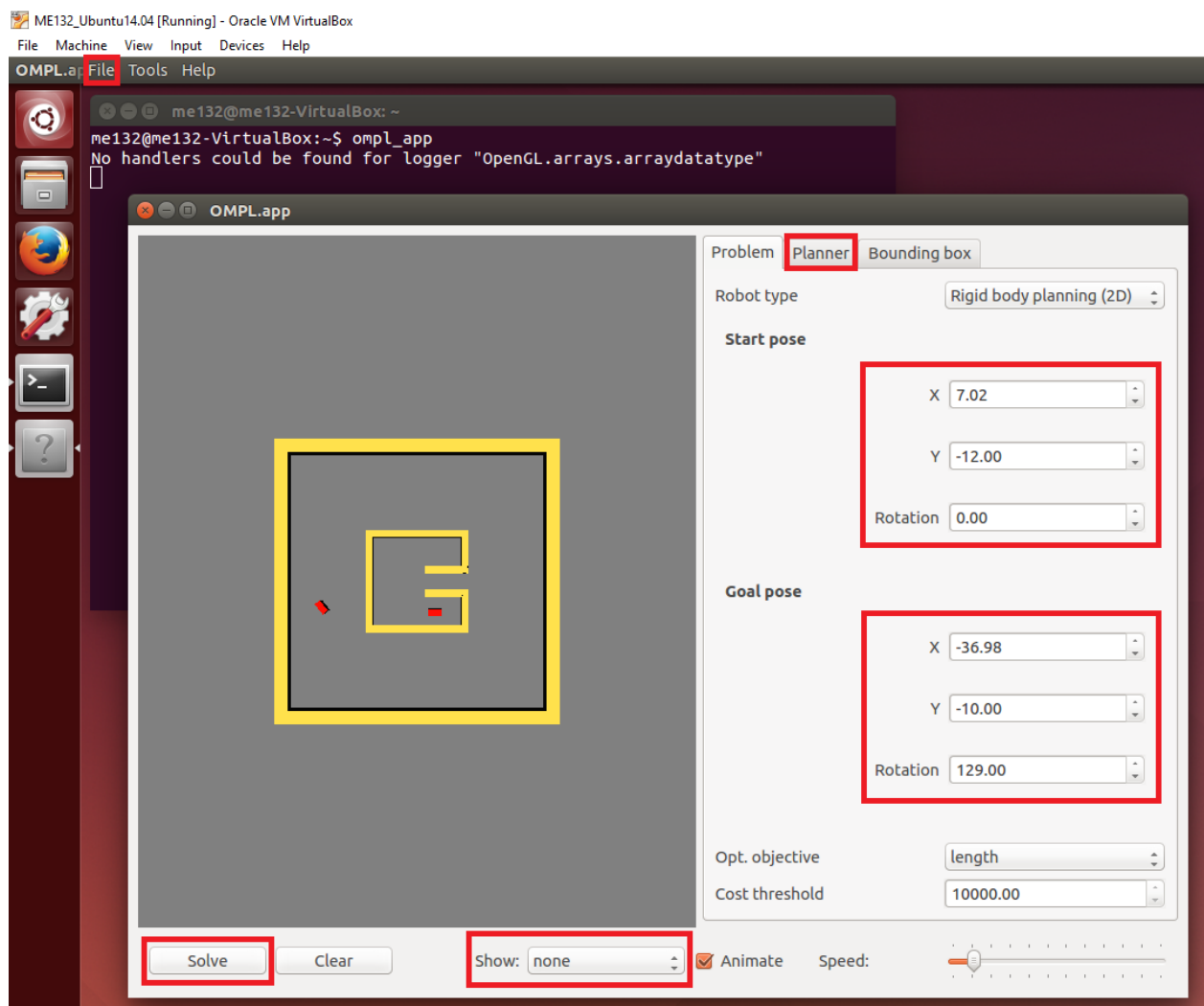
5. Change the CPU number to match the number of processors on your own system, and set RAM to half the amount you have on your system (e.g. for a PC with 8GB of RAM set the VM to 4096MB)

6. Check 'Reinitialize the MAC address...' and then click *Import*

7. Once importing is completed, select the ME132 VM and click *Settings*. Under *Display* set Video Memory to 64MB and check 'Enable 3D Acceleration'

8. Click okay to close the settings menu and then select *Start*. Once the virtual machine has booted you can log in using the password 'me132'

OMPL Introduction

In order to become familiar with the OMPL library we will be using the included GUI to test some of the algorithms in the prepackaged environments.

1. Open a terminal with the command *Ctrl + Alt + T*, enter the command 'ompl_app' and wait for the program to load

2. From the bar at the top of the screen click *File -> Open Problem Configuration* and navigate to *Documents/OMPL/omplapp-1.2.1-Source/Resources/2D* then select BugTrap_planar.cfg

3. Change the 'Start Pose' and 'Goal Pose' of the robot to new locations (that do not lie within an obstacle) and hit solve. You should see the robot move through a motion plan created with the default planner KPIECE.

4. From the drop down box beneath the graphical display named *Show*, select *States and edges*, which will display all of the paths investigated by the planner before it reaches a solution.

5. Under the *Planner* tab, test out different planners (in particular RRT and PRM) by selecting them from the drop down box and clicking solve.

6. Lastly, take a screenshot of your favorite state/edge display from one of the solvers with your personally chosen start and end locations and submit it along with the homework

7. There are plenty of other interesting configurations in both 2D and 3D you can also look through