Installing leJOS on Linux and Mac OS X

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1   Introduction

In this appendix it will be explained how to install the leJOS[1] software
developer kit (SDK) on both Linux and Mac OS X. The procedure have
been tested on Slackware 10.1, Ubuntu 5.04 and Mac OS X 10.4.1. A basic
knowledge of Unix is assumed. Also it is assumed that a 3.x version of
GCC, various programs such as Make and Java are installed. All of these are
installed by default in Slackware and Mac OS X. Ubuntu users will need to
download Java separately.

Only the bare minimum for setting up leJOS will be explained. If the
reader wishes to use the Eclipse IDE[7][8] for leJOS development, a thorough
guide is available in appendix ? in the thesis of Bjarne Ridderberg[6].

1.1   Background

LeJOS is a Java SDK for the Lego RCX embedded computer, which is a part
of the Mindstorms kit. It has it's origin in the TinyVM project[2], but has
evolved since then, as the two projects have different goals. TinyVM focuses
on a small footprint, whereas leJOS focuses on features.

Besides basic methods for reading from sensors and activating actuators,
leJOS also contains some basic frameworks for robot behaviour and infrared
communication. On the PC side, a framework for using the Lego web-cam,
or any other supported web-cam for that matter, is available.

1.2   Installation on Linux

Please note that in order to use the USB tower, a recent version of the 2.6
kernel series is needed - at the time of writing the latest is 2.6.11.12, but
anything above 2.6.8 will do. It is possible to use a 2.4 kernel, but the
driver is no longer maintained for this branch, and it is not recommended.
Make sure the `legousbtower` driver is compiled either into the kernel or
as a module. Compiling a kernel and modules is beyond the scope of this
appendix and will not be described. To make sure the tower is recognised,
plug the tower into an available USB port, and run `dmesg` from a terminal.
If the tower is recognised, a few messages from the driver is visible at the end
of the output. Also, make sure the device file `/dev/usb/legousbtower0` is
both readable and writable. Note some distributions place the device file in
`/dev/legousbtower0`.

1.2.1 leJOS

In the current release of leJOS - in the time of writing 2.1.0 - the USB tower is not supported in Linux. The version in the CVS repository does however support it. The latest version can be checked out with the following commands:

```
cvs -d:pserver:anonymous@cvs.sourceforge.net:/cvsroot/lejos\
    login

cvs -z4 -d:pserver:anonymous@cvs.sourceforge.net:/cvsroot/lejos\
    co -P lejos
```

To avoid problems with the inherent volatile nature of a cvs repository, a version can be downloaded from the thesis website[3].

Next, a number of environment variables need to be set in order for leJOS to function properly. Assuming the user is using the Bash shell, add the following to ~/.profile. In this example leJOS is installed in /home/jalp/lejos_2_1_0.

```
export LEJOS_HOME=/home/jalp/lejos_2_1_0
export RCXTTY=/dev/usb/legousbtower0
export CLASSPATH=$CLASSPATH:$LEJOS_HOME/lib/classes.jar\
        :$LEJOS_HOME/lib/pcrcxcomm.jar
export LD_LIBART_PATH=$LD_LIBRARY_PATH:$LEJOS_HOME/bin
export PATH=$PATH:$LEJOS_HOME/bin
```

To compile leJOS, enter the root of the lejos_2_1_0 directory and execute:

```
make
```

At this point, leJOS is ready for use.

1.3 Mac OS X

As of Mac OS X 10.2.6, leJOS works with the USB tower, and no additional work is needed. Note that the leJOS website labels USB support for Mac as experimental.

1.3.1 leJOS

Download the latest leJOS release and extract it to a suitable location. In the time of writing this is 2.1.0. The cvs version is at present time not functional with Mac OS X.

Again, some environment variables need to be set. In the example below, leJOS is installed in `/Users/jalp/Programs/lejos_2_1_0`

```
export LEJOS_HOME=/Users/jalp/Programs/lejos_2_1_0
export RCXTTY=usb
export CLASSPATH=$CLASSPATH:$LEJOS_HOME/lib/classes.jar\
       :$LEJOS_HOME/lib/pcrcxcomm.jar
export DYLD_LIBART_PATH=$DYLD_LIBRARY_PATH:$LEJOS_HOME/bin
export PATH=$PATH:$LEJOS_HOME/bin
```

The default compiler for Mac OS X 10.4.1 is GCC 4.0. This poses a problem since leJOS cannot be compiled with this compiler. Two solutions exists for this problem. The first solution is to execute the following command in a terminal as root:

```
gcc_select 3.3
```

This will make GCC 3.3 the default compiler. The second solution is to replace the file `cctest.sh` in the leJOS directory with a file containing the following:

```
#!/bin/sh
echo gcc-3.3
```

Make the file executable with the command: `chmod 755 cctest.sh`. The latter solution is useful if root access is not available. Next, in a terminal, simply execute:

```
make
```

When the compilation is complete, leJOS is ready for use.

1.4 Vision

The Vision class implements a basic framework for image capturing, motion detection, colour detection, etc, using a native video input. Currently, this framework is only functional on Linux and Windows, and thus only installation for Linux is explained in the following.

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Download the Java Media Framework(JMF) for Linux from the Sun website[5]. Extract the downloaded file in a suitable location. As it was the case with leJOS, a few environment variables need to be set. Add the following to `~/.profile`.

```
export JMFHOME=/home/jalp/JMF-2.1.1e
export CLASSPATH=$CLASSPATH:$JMFHOME/lib/jmf.jar:\
       $LEJOS_HOME/lib/vision.jar
```

Before an application can make use of the camera, the name of the device must be declared in the file `video.properties`, which must be located in the same directory as the application. The name of the device is determined by running `jmfinit` in the `$JMFHOME/bin` directory. In the case of the Lego web-cam, the video device is to be set as follows:

```
video-device-name=v4l:Logitech QuickCam USB:0
```

To verify that the installation is working, a few examples are available in `$LEJOS_HOME/examples/vision`.

References

[1] lejos.sourceforge.net

[2] tinyvm.sourceforge.net

[3] www.daimi.au.dk/~jalp/thesis

[4] www.daimi.au.dk/~jalp/lejos_jdk1.5.patch

[5] java.sun.com/products/java-media/jmf/index.js

[6] ?

[7] www.eclipse.org

[8] lejos.sourceforge.net/tools/eclipse/ldt/