



ÉCOLE POLYTECHNIQUE
FÉDÉRALE DE LAUSANNE



BIOLOGICALLY INSPIRED
ROBOTICS GROUP (BIRG)



BLUEMOVE

Bluemove User Manual

Semester Project
Winter 2004-2005

Cyril Jaquier - Kévin Drapel

February 14, 2005

Contents

1	Bluemove short manual	2
1.1	Installation	2
1.1.1	J2SE 5.0	2
1.1.2	Java Bluetooth stack	2
1.1.3	Bluemove	3
1.1.4	Launching the application	3
1.2	User interface	3
1.2.1	The menu	3
1.2.2	The tool bar	3
1.2.3	Timelines tab	4
1.2.4	Modules Manager tab	4
1.2.5	Console tab	4
1.2.6	The status bar	5
1.3	Tutorial: a small example	5
1.3.1	Step one: add a module	5
1.3.2	Step two: edit a module	5
1.3.3	Step three: add an actuator	6
1.3.4	Step four: add another module	6
1.3.5	Step five: draw a module trajectory (spline)	6
1.3.6	Step six: draw a module trajectory (linear)	6
1.3.7	Step seven: save the project	7
1.3.8	Step eight: play	7
1.3.9	Conclusion	7

Chapter 1

Bluemove short manual

This chapter quickly describes the user interface of the Bluemove application. It is divided into three parts: the first one explains how to install the software and its requirements, the second one gives an overview of the user interface and, finally, the third part provides a step by step example which shows how to create a simple project with Bluemove.

1.1 Installation

In order to run properly, Bluemove requires some additional softwares and libraries. The following list summarizes the requirements for this application:

- A Linux system on a x86 machine
- J2SE 5.0 (Java JDK 5.0 or JRE 5.0)
- Java Bluetooth stack JSR-82 compliant

Other needed libraries (log4j, xerces, ...) are already included into the application. You do not need to care about them.

1.1.1 J2SE 5.0

Bluemove needs the J2SE 5.0 from Sun Microsystems. Bluemove takes advantage of the latest features of J2SE 5.0. In order to get the best performance, it is important to use the latest J2SE 5.0 version. You can choose to install the *J2SE Development Kit (JDK)* or the *J2SE Runtime Environment (JRE)* depending on whether you are a developer or not. You can find the latest J2SE 5.0 here [5]. We will not present the installation of the Java Environment. Instructions are available in the downloaded archive.

In order to see if the J2SE 5.0 is correctly installed, open a new terminal and type the following command.

```
$ java -version
java version "1.5.0_01"
...
```

You should get a string with "1.5". If not, please reinstall the J2SE environment and follow carefully the instructions.

1.1.2 Java Bluetooth stack

In order to communicate with the module, you need a Java Bluetooth stack. There is a lot of different stacks available for Linux, Windows and embedded systems. Rococo [7] offers a free implementation of the JSR-82 [4] called *Impronto* for University students. Other Java Bluetooth stacks can be found here [2]. By default, Bluemove is compiled to run with the Rococo Impronto stack.

Rococo Impronto

Rococo distributes its Impronto Developer Kit for students under a license which does not allow us to distribute it with our software. Instead you must fill in the form available on Rococo website¹ and wait for the confirmation e-mail. After you get the `impronto-1.3-1.i386.rpm`, you can simply install the Rococo Bluetooth stack with `rpm -ivh impronto-1.3-1.i386.rpm`. This should install the required BlueZ libraries [1]. If you encounter any problems, please make sure that BlueZ is correctly installed and configured on your system. Further information about the Impronto installation can be found in the file `impronto/user_guide.pdf` of the Bluemove archive.

Finally, you have to read and agree the `LinuxLicense.txt` file. If you agree with the

¹http://www.rococosoftware.com/registration_linux.html

license, you must copy it into the same directory as `Bluemove.jar`. The Impronto stack will not work without this license file.

1.1.3 Bluemove

Bluemove is distributed as a JAR archive. Everything you need to run the application is embedded into this file. Thus, the only thing you need to install Bluemove is to copy the JAR archive named `Bluemove.jar` in a directory. We recommend to unpack the Bluemove archive in your home directory and run the application directly from that location.

As seen above, do not forget to copy the Impronto license file in the same directory as Bluemove.

1.1.4 Launching the application

Once the J2SE 5.0, the Java Bluetooth stack and Bluemove are installed, you can finally launch the application. To start with, you need to initialise your Bluetooth device. Open a terminal and type the following command as "root".

```
# hciconfig hci0 up
# hciconfig hci0
hci0:   Type: USB
        BD Address: 00:0C:76:48:87:7A
        ...
```

Your "BD Address" should not be equal to 00:00:00:00:00:00. If so, please check your kernel configuration and make sure that the needed modules are loaded or compiled into the kernel.

You can now go into the Bluemove directory and type the following command.

```
$ LD_LIBRARY_PATH=/usr/lib java \
-classpath ./Bluemove.jar \
birg.bluemove.main.core.Bluemove
```

The path `/usr/lib` represents the location of the file `libimpronto.so` which is normally installed in `/usr/lib`.

You should now see the Bluemove splash screen and then the main screen. If not, please check that all the previous steps were successfully completed.

You are ready to discover the power of Bluemove and the pleasure of modular robotic.

1.2 User interface

When you start Bluemove, you see the main view of the application which contains four important parts:

- the menu bar
- the tool bar
- the tabbed pane
- the status bar

The tabbed pane contains several tabs which are respectively used to draw the module curves, to manage the modules, and to view the log messages. In the next section, we will take a close look at the different items available in the menu bar.

1.2.1 The menu

The menu bar is located at the top of the window. It is composed of three menus, each one containing several menu items.

The File menu

This menu allows you to do the main operations on a project. You can create a new project, open or save a project. You can also quit the application. The last opened or saved project is remembered and can thus be quickly reopened.

The Options menu

This menu allows you to set the properties of the application. All the settings are locally stored on your computer.

The Help menu

This menu contains a menu entry called "Help". It opens your favourite browser and redirects it to the Bluemove help site. The menu item "About" displays information about your system.

1.2.2 The tool bar

The toolbar contains shortcuts for useful actions like creating a new project, saving or opening a project.

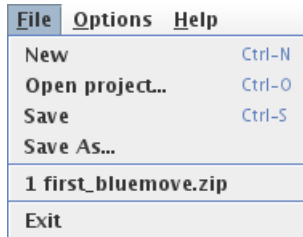


Figure 1.1: Menu

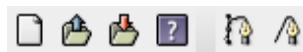


Figure 1.2: Tool bar

1.2.3 Timelines tab

The timelines tab is the heart of Bluemove together with the modules manager. You can draw trajectories for modules in the timelines listed there.

Left part

Each module is composed of one or more actuators². Sensors can also be part of a module. At the moment, sensors are displayed but no management is available. The name and the address of the module is displayed.

Right part

In this right part, you will be able to draw the trajectories of an actuator. There are two key types:

- Linear key
- Hermite spline key

You can mix these two kind of keys in the same actuator timeline without any restriction. The interpolation algorithm will take care of curves composed of these two types of keys.

1.2.4 Modules Manager tab

Within the modules manager you can declare the different parts of your modular robot. You can describe every module, set its name and address. Each module can have several actuators. These components have a name and a

²A YaMoR module contains one actuator (a "S-71" servo)

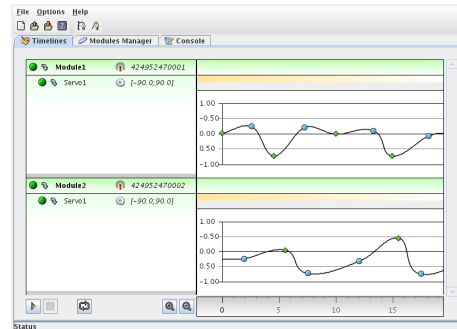


Figure 1.3: Timelines

range which will be used to send the position to the module.

Please notice that the YaMoR servo name is "Servo1". You *must* use this name for the actuator when using a YaMoR unit.

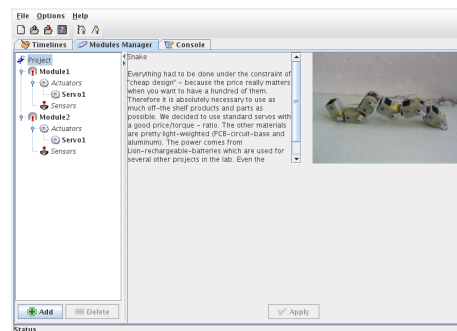


Figure 1.4: Modules Manager

1.2.5 Console tab

The console tab displays the log messages generated by Bluemove. You can set the level of the output and the refresh rate. There are five levels of messages:

- DEBUG: messages useful in order to debug the application
- INFO: information messages
- WARN: a problem leading to an error occurred
- ERROR: something that should not have happened
- FATAL: unrecoverable error

Each level is displayed in a distinct colour with its specific icon. This allows you to quickly diagnose what appended in the application.

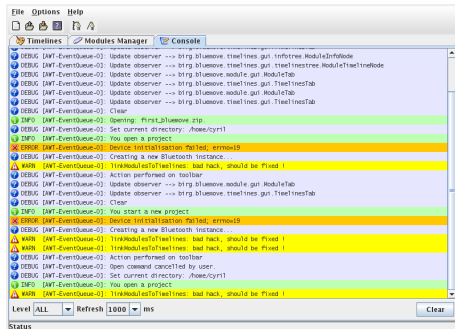


Figure 1.5: Console

1.2.6 The status bar

The status bar displays information about the current action. It is also used to display important messages.

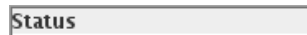


Figure 1.6: Status bar

1.3 Tutorial: a small example

In this section, you will get to know how to create a simple Bluemove project. We consider that you have already installed the application and that you are able to start it. You will also need to have two functional YaMoR units.

1.3.1 Step one: add a module

First of all, start the Bluemove application. After the splash screen, you get a window similar to Figure 1.7.

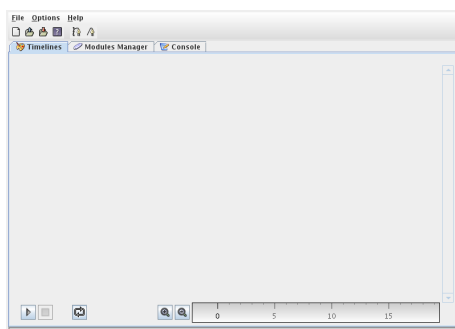


Figure 1.7: Main screen

Now you have to describe the modular robot physically. In order to do this, switch to the modules manager tab. At the top of the left part, you should see a small icon representing a salamander followed by the text "Project". Click on this label. This should enable the "Add" button at the bottom of the left part. Click on "Add". A new module called "Module1" is inserted.

1.3.2 Step two: edit a module

Click on the label "Module1". You should get a screen similar to Figure 1.8.

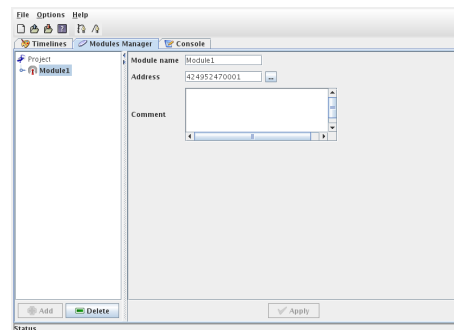


Figure 1.8: Modules manager

Now, on the right part, edit the "Module name" field and type "Head". Enter the address corresponding to this module. Here we suppose that our module has the address "424952470001"³. Edit the "Comment" text area and type "This is the head of our modular robot.". You can now click on the "Apply" button. Your window should look like Figure 1.9.

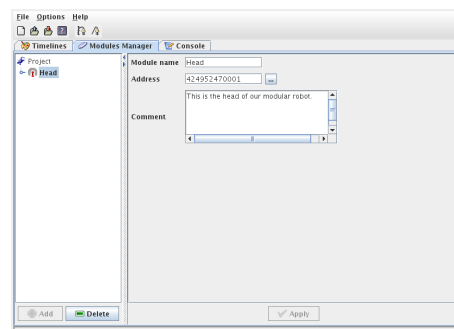


Figure 1.9: Module edition

³You can also use the inquiry function to find the available modules.

1.3.3 Step three: add an actuator

A module without an actuator can not move. The YaMoR units have one actuator named "Servo1". Let us add it to our "Head" module. Expand the node "Head" on the left part. Two nodes should appear: "Actuators" and "Sensors". Click on "Actuators" and then click on the "Add" button. You get a new actuator called "Actuator1". Click on the label "Actuator1". You notice that the right part has changed. Edit the field "Actuator name" and type "Servo1". This is the servo name of the YaMoR units. Set a "Min value" of "-90" and a "Max value" of "90". Click on "Apply". Your window should be similar to Figure 1.10.

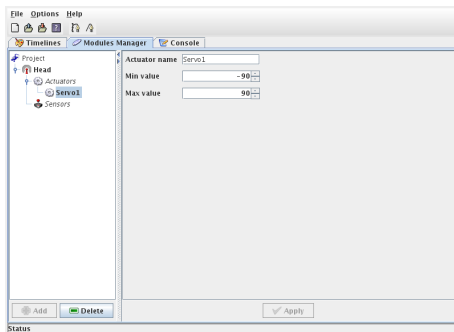


Figure 1.10: Actuator edition

1.3.4 Step four: add another module

You should now be able to add another module without any problems. So restart at step one and add a new module called "Tail" with one actuator named "Servo1" which range is between "-90" and "90". We suppose that this module address is "424952470002". You should end with a screen similar to Figure 1.11.

1.3.5 Step five: draw a module trajectory (spline)

We have finished the physical description of our modular robot. In order to see our animal moving, we have to draw the trajectory of its actuators. Here you will see the power of this software. Let us move to the "Timelines tab". Your screen should look like Figure 1.12.

Expand the "Head" module by clicking on the small blue arrow located close to the label. Do the same with the actuator "Servo1". Now you

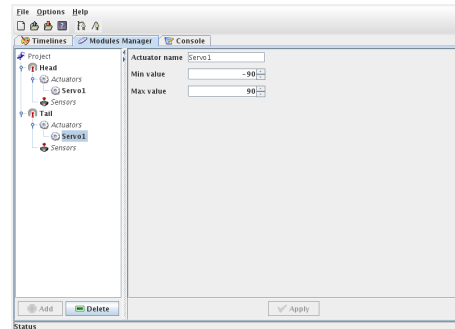


Figure 1.11: Second module

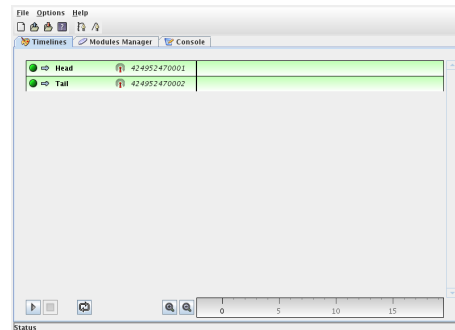


Figure 1.12: Timelines tab

should see the timeline on the right. Enlarge the timeline a bit by dragging the bottom line. Select the "Spline tool" in the tool bar. Draw the same curve as the one on Figure 1.13. You surely noticed that spline keys are represented by a blue round.

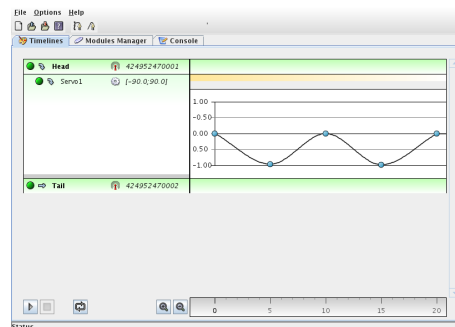


Figure 1.13: The first curve with spline keys

1.3.6 Step six: draw a module trajectory (linear)

Repeat the above step for the "Tail" module. This time you will use only linear keys. Select the "Linear tool" in the tool bar. Linear keys

are represented by a green rhombus. You should end with a window similar to Figure 1.14.

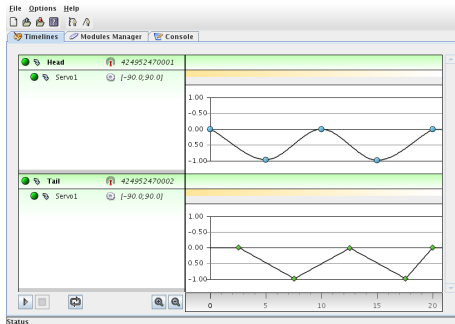


Figure 1.14: The second curve with linear keys

1.3.7 Step seven: save the project

Before going further, it is high time to save your project. Click on the menu named "File" and select the item "Save As...". A file chooser dialog appears. Choose the directory you want and name your project "first_bluemove.zip" like on Figure 1.15. You probably noticed that Bluemove projects are simply ZIP archives.

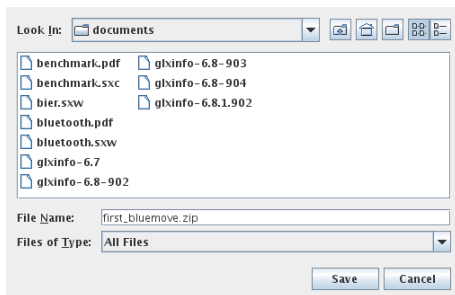


Figure 1.15: Saving a project

1.3.8 Step eight: play

We arrive at the last step of this tutorial. Power on the modules and program the YaMoR FPGA. This operation is described at section 7.3.3 of [6]. Build the modular robot as shown on Figure \ref{fig:step-10}. Click on the "Play" button located at the bottom of the timelines tab. After a few seconds, the modules should start to move. If so, congratulations, you have successfully completed this tutorial. If nothing is moving then maybe your Bluetooth device is not correctly initialised. You can switch to the

"Console" tab and set the debug level to "ALL". Retry this step and look at the console.

1.3.9 Conclusion

We briefly looked at the basic operations of Bluemove. There are a lot of other features that were not described in this tutorial. However, you should be able to discover them on your own. Do not forget to periodically check the help website [3]. Lots of information on Bluemove are available there.

Bibliography

- [1] Bluez. <http://www.bluez.org>.
- [2] Java bluetooth. <http://www.javablueetooth.com>.
- [3] Kévin Drapel and Cyril Jaquier. Using bluetooth to control a yamor modular robot. <http://birg.epfl.ch/page56602.html>.
- [4] JCP. Jsr-82. <http://www.jcp.org/aboutJava/communityprocess/review/jsr082/>.
- [5] Sun Microsystems. J2se 5.0. <http://java.sun.com/j2se/1.5.0/download.jsp>.
- [6] Rico Möckel. Getting started user guide. <http://birg.epfl.ch/page53075.html>, 2004.
- [7] Rococo. <http://www.rococosoft.com>.

Index

Bluetooth
 stack, 2

FPGA, 7

Java
 J2SE, 2
 JAR, 3
 JSR-82, 2
 log4j, 2
 xerces, 2

Rococo, 2
 Impronto, 2
 license, 3