

URBI Doc for urbiengine-surveyor

Devices documentation

(book compiled from Revision 418M)

**Thomas Moulard
Guillaume Deslandes**

URBI Doc for urbiengine-surveyor: Devices documentation: (book compiled from Revision 418M)

by Thomas Moulard and Guillaume Deslandes

Published

Copyright © 2006-2007 Gostai

This document is released under the Attribution-NonCommercial-NoDerivs 2.0 Creative Commons licence (<http://creativecommons.org/licenses/by-nc-nd/2.0/deed.en>).

Table of Contents

1. Introduction	1
2. Quickstart	2
3. First commands	4
Forewords	4
Device quick list	4
Simple commands	4
4. Devices	6
Camera	6
Motors	6
IR emitters	7
5. SRV-1 scripting	8
Forewords	8
Bumper	8
Navigator	8
6. Troubleshooting and FAQ	10
Troubleshooting	10
Frequently Asked Questions	10
A. Copyright	11

List of Tables

- 3.1. Devices' characteristics 4
- 4.1. Camera attributes 6
- 4.2. Camera methods 6
- 4.3. Motor characteristics 6
- 4.4. Motor attributes 7
- 4.5. Motor characteristics 7
- 4.6. IR's attributes 7

Chapter 1. Introduction

This documentation contains informations about the Surveyor SRV-1 Robot URBI engine (SRV-1 URBI engine, or SRV-1 engine for short).

You may be interested in reading information about the SRV-1 at *surveyor.com* [<http://www.surveyor.com/>] if you are not familiar with it yet.

The first chapters provide quicklaunch instructions and a short tutorial for using URBI on the SRV-1.

The remainder of the documentation contains an exhaustive reference for the SRV-1 URBI engine and more advanced URBI script examples.

Chapter 2. Quickstart

First, make sure your SRV-1 Robot is operational. You may have to install driver [<http://www.surveyor.com/srvdownload/index.html>] for the radio module if it is not done yet.

Once you have a working robot you can install the SRV-1 engine. The installation procedure may vary depending on your system, but it should not be unfamiliar to you. Once it is completed, you will be provided with a bin directory in which you will find the `urbi-server-surveyor` binary. Other important files are located in the data directory.

Before launching the engine, you may need to change the `system.comport` value in the `data/config.u` file. It should have a value like `COM1` on MS Windows, `/dev/cu.SLAB_USBtoUART` on Mac OS X or `/dev/ttyUSB0` on Linux. The engine will abort if the port specified is incorrect or doesn't have the proper permissions.

Go to your SRV-1 install directory, change to the bin directory and launch `urbi-server-surveyor`. The following help message should appear :

```
usage: ./urbi-server-surveyor [options] period [path1 path2 ...]
  period : base URBI interval in milliseconds
  path items are absolute or relative path elements searched in order
           for files when 'load' is called.
  options:
  -p port : specify the tcp port URBI will listen to.
  -b address: bind to a specific ip address.
  -n      : disable networking.
  -r      : enable reporting of time taken by URBI loop to execute
  -s <period>: shell-mode (no network) with given period
  -f      : enable fast mode: the server will run as fast
           as possible and emulate the period specified
```

To quickly launch the SRV-1 engine, just type :

```
./urbi-engine-surveyor 50 ../data
```

The engine will display a header and say it is ready. If all is right, nothing more should happen. If your robot is switched off, or unreachable, the engine should say *Can't connect to the robot. Waiting...*

At this time, your engine should be running. To test the connection, use either a tool specially provided by Gostai, or a simple telnet client (please note that all URBI engine ports default to 54000).

```
telnet localhost 54000
```

If no error occurs, your telnet client should receive the same kind of header you saw in the engine window. The last line should give your connection id and be of the form :

```
[65000000:ident] *** ID: U135766920
```

If this is not the case, please make sure you correctly installed the engine and followed the previous steps. Please refer to Troubleshooting and FAQ if you still have problems launching the server afterwards.

You are now ready to send commands to your robot through the Surveyor SRV-1 URBI engine. For exemple try :

```
vars;  
...  
[00004004:notag] *** Camera = OBJ  
...
```

The first line asks for all variables known by the server and the following, which you don't have to take care of, list symbols and their respective values.

Chapter 3. First commands

Forewords

This chapter will introduce basic concepts for the use of the SRV-1 URBI engine. It may be skipped if you are already familiar with URBI engines.

For further instructions and informations on URBI commands, please read the first chapters of the URBI tutorial [<http://www.gostai.com/doc/en/urbi-tutorial-1.0>].

Before anything else, make sure the steps presented in the Quickstart chapter succeeded.

Device quick list

Here is a quick list of the devices available on the SRV-1 which you can control through the engine.

Table 3.1. Devices' characteristics

Name	Type	Description
camera	Sensor	Main camera device
wheelL	Actor	Left wheel
wheelR	Actor	Right wheel
wheels	Actor group	Both wheels
irF	Sensor	Front IR emitter
irB	Sensor	Back IR emitter
irL	Sensor	Left IR emitter
irR	Sensor	Right IR emitter
irs	Sensor group	All IR emitters

Simple commands

Try this first command in your telnet session :

```
irF;  
[00000476:notag] 0.000000
```

The first line asks for the value of the front IR emitter. The second is the answer from the SRV-1 engine. The first integer value is a timestamp for the answer (in milliseconds from the engine startup). It is followed by a `tag`. Please refer to the URBI tutorial [<http://www.gostai.com/doc/en/urbi-tutorial-1.0>] for mode details. What is important here is the floating point value ending the line. It is the value stored in the front IR emitter. Here *0.000000* indicates nothing is in front of the robot. With your hand right in front of the robot, you should get a value close to *150.000000*.

Please note that the next commands will be enclosed in `+end: { . . . } ;`. This is to make the engine warn you when the command comes to an end.

Try the following :

```
+end:{wheels = 40; wait (2s) | wheels = 0};  
[00002622:notag] *** end
```

Your robot should go forward for 2 second, and then stop. Now try to make it come back to its initial position with a similar command.

Next try :

```
+end:{wheelL = -50; wheelR = 50; wait (2s) | wheels = 0};  
[00005095:notag] *** end
```

Your robot should turn on itself for 2 seconds.

The last simple command will be :

```
irFDetect:at (irF > 100) echo "Front obstacle : " + irF;
```

Now try to put your hand close to the front of your SRV-1. You should get a message like :

```
[00008215:notag] *** irF : 150
```

The `at` keyword allows you to detect events and make your SRV-1 act accordingly.

You should now be able to play with the SRV-1 URBI engine. The next chapters will give you complete details about the engine, but what we saw here is enough to get used with the SRV-1 and URBI.

Chapter 4. Devices

Camera

The SRV-1's camera is accessed through the `camera` object of the engine. The following tables describe the camera attributes and methods.

Table 4.1. Camera attributes

Name	Description
<code>val</code>	Image (jpeg image, binary data)
<code>blind</code>	If different than 0, the camera image is not automatically requested by the server.
<code>resolution</code>	Camera resolution: 1 = 80x64px, 3 = 160x128px, 5 = 320x240px
<code>dump_path</code>	Default directory for writing images from camera. Changing value is not secure, please use <code>set_dump_path</code>

Trying `camera.val ; righth` into a telnet session will result in displaying raw data in your terminal. Use the following methods to get the images. Please note that the `dump` functions override the `blind` attribut for the image to be written.

Table 4.2. Camera methods

Name	Returns	Arguments	Description
<code>adump</code>	none	none	Dump camera to file, autonaming the file.
<code>dump</code>	none	string:filename	Dump camera to given file.
<code>set_dump_path</code>	0/1	string:path	Set directory where camera is dumped. Defaults to current dir.

Motors

The SRV-1 motors are accessed through the `wheelX` objects and have the following carateristics :

Table 4.3. Motor characteristics

Name	Rangemin	Rangemax	Description
<code>wheelL</code>	-128	127	Left wheel
<code>wheelR</code>	-128	127	Right wheel
<code>wheels</code>	-128	127	Both wheels (device group)

A motor has the following attributes:

Table 4.4. Motor attributes

Name	Description
val	Motor speed.

IR emitters

The SRV-1 Infra Red Emitters are accessed through the `irX` objects and have the following characteristics :

Table 4.5. Motor characteristics

Name	Rangemin	Rangemax	Description
irF	0	154	Front IR emitter
irB	0	154	Back IR emitter
irL	0	154	Left IR emitter
irR	0	154	Right IR emitter
irs	0	154	All IR emitters

An IR emitter has the following attributes:

Table 4.6. IR's attributes

Name	Description
val	Sensor input

The hardware group that contains all devices is also available.

Chapter 5. SRV-1 scripting

Forewords

This chapter will introduce a few simple scripts. To use them type

```
load ("filename.u");
```

Depending on the version of the SRV-1 URBI engine you got, some scripts may be available in the `data` or `scripts` folders of your installation directory.

Before anything else, make sure you are familiar with the previous parts of this document.

For further instructions and informations on URBI commands, please read the first chapters of the URBI tutorial [<http://www.gostai.com/doc/en/urbi-tutorial-1.0>].

Bumper

```
/* ----- Bumper for SRV-1 ----- */

bumper:at (irF > 100)          // at obstacle detection
{
  wheels = 0 | wait (500ms);  // stop and wait a bit
  wheels = -50 | wait (1s);   // go backward
  wheels = 0 time:1s |        // stop smoothly
  wheels = 40;                // go forward
};

wheels = 40;                  // initial start

/* ----- Bumper for SRV-1 ----- */
```

This should make your SRV-1 go forward, stop before the first obstacle, go back for a bit and go again. You will have to figure how to make it stop.

Navigator

```
/* ----- Navigator for SRV-1 ----- */

WHEEL_SLOW = 40;              // moving speed
WHEEL_FAST = 60;              // turning speed
NAV.side = 1;                 // way to turn

navigator:at (irF > 100)      // at obstacle detection
{
  wheels = 0 | wait (500ms);  // wait a bit
  wheels = -40 | wait (500ms); // go back
  NAV.side = NAV.side * -1;   // change way
}
```

```
wheelL = NAV.side * WHEEL_FAST &           // turn
  wheelR = - NAV.side * WHEEL_FAST;
waituntil (irF < 50) | wheels = WHEEL_SLOW; // wait for clear way
                                           // and go forward
};

wheels = WHEEL_SLOW;           // initial start

/* ----- Navigator for SRV-1 ----- */
```

This script should make your robot turn either left or right upon obstacle detection until it finds a clear way. It then will go forward again until the next obstacle.

Chapter 6. Troubleshooting and FAQ

Troubleshooting

Frequently Asked Questions

Appendix A. Copyright

THE WORK (AS DEFINED BELOW) IS PROVIDED UNDER THE TERMS OF THIS CREATIVE COMMONS PUBLIC LICENSE ("CCPL" OR "LICENSE"). THE WORK IS PROTECTED BY COPYRIGHT AND/OR OTHER APPLICABLE LAW. ANY USE OF THE WORK OTHER THAN AS AUTHORIZED UNDER THIS LICENSE OR COPYRIGHT LAW IS PROHIBITED.

BY EXERCISING ANY RIGHTS TO THE WORK PROVIDED HERE, YOU ACCEPT AND AGREE TO BE BOUND BY THE TERMS OF THIS LICENSE. THE LICENSOR GRANTS YOU THE RIGHTS CONTAINED HERE IN CONSIDERATION OF YOUR ACCEPTANCE OF SUCH TERMS AND CONDITIONS.

1. Definitions

1. "Collective Work" means a work, such as a periodical issue, anthology or encyclopedia, in which the Work in its entirety in unmodified form, along with a number of other contributions, constituting separate and independent works in themselves, are assembled into a collective whole. A work that constitutes a Collective Work will not be considered a Derivative Work (as defined below) for the purposes of this License. 2. "Derivative Work" means a work based upon the Work or upon the Work and other pre-existing works, such as a translation, musical arrangement, dramatization, fictionalization, motion picture version, sound recording, art reproduction, abridgment, condensation, or any other form in which the Work may be recast, transformed, or adapted, except that a work that constitutes a Collective Work will not be considered a Derivative Work for the purpose of this License. For the avoidance of doubt, where the Work is a musical composition or sound recording, the synchronization of the Work in timed-relation with a moving image ("synching") will be considered a Derivative Work for the purpose of this License. 3. "Licensor" means the individual or entity that offers the Work under the terms of this License. 4. "Original Author" means the individual or entity who created the Work. 5. "Work" means the copyrightable work of authorship offered under the terms of this License. 6. "You" means an individual or entity exercising rights under this License who has not previously violated the terms of this License with respect to the Work, or who has received express permission from the Licensor to exercise rights under this License despite a previous violation.

2. Fair Use Rights. Nothing in this license is intended to reduce, limit, or restrict any rights arising from fair use, first sale or other limitations on the exclusive rights of the copyright owner under copyright law or other applicable laws.

3. License Grant. Subject to the terms and conditions of this License, Licensor hereby grants You a worldwide, royalty-free, non-exclusive,

perpetual (for the duration of the applicable copyright) license to exercise the rights in the Work as stated below:

1. to reproduce the Work, to incorporate the Work into one or more Collective Works, and to reproduce the Work as incorporated in the Collective Works; 2. to distribute copies or phonorecords of, display publicly, perform publicly, and perform publicly by means of a digital audio transmission the Work including as incorporated in Collective Works;

The above rights may be exercised in all media and formats whether now known or hereafter devised. The above rights include the right to make such modifications as are technically necessary to exercise the rights in other media and formats, but otherwise you have no rights to make Derivative Works. All rights not expressly granted by Licensor are hereby reserved, including but not limited to the rights set forth in Sections 4(d) and 4(e).

4. Restrictions. The license granted in Section 3 above is expressly made subject to and limited by the following restrictions:

1. You may distribute, publicly display, publicly perform, or publicly digitally perform the Work only under the terms of this License, and You must include a copy of, or the Uniform Resource Identifier for, this License with every copy or phonorecord of the Work You distribute, publicly display, publicly perform, or publicly digitally perform. You may not offer or impose any terms on the Work that alter or restrict the terms of this License or the recipients' exercise of the rights granted hereunder. You may not sublicense the Work. You must keep intact all notices that refer to this License and to the disclaimer of warranties. You may not distribute, publicly display, publicly perform, or publicly digitally perform the Work with any technological measures that control access or use of the Work in a manner inconsistent with the terms of this License Agreement. The above applies to the Work as incorporated in a Collective Work, but this does not require the Collective Work apart from the Work itself to be made subject to the terms of this License. If You create a Collective Work, upon notice from any Licensor You must, to the extent practicable, remove from the Collective Work any reference to such Licensor or the Original Author, as requested.
2. You may not exercise any of the rights granted to You in Section 3 above in any manner that is primarily intended for or directed toward commercial advantage or private monetary compensation. The exchange of the Work for other copyrighted works by means of digital file-sharing or otherwise shall not be considered to be intended for or directed toward commercial advantage or private monetary compensation, provided there is no payment of any monetary compensation in connection with the exchange of copyrighted works.
3. If you distribute, publicly display, publicly perform, or publicly digitally perform the Work, You must keep intact all copyright notices for the Work and give the Original Author credit reasonable to the medium or means You are utilizing by conveying the name (or pseudonym if applicable) of the Original Author if supplied; the title of the Work if supplied;

and to the extent reasonably practicable, the Uniform Resource Identifier, if any, that Licensor specifies to be associated with the Work, unless such URI does not refer to the copyright notice or licensing information for the Work. Such credit may be implemented in any reasonable manner; provided, however, that in the case of a Collective Work, at a minimum such credit will appear where any other comparable authorship credit appears and in a manner at least as prominent as such other comparable authorship credit. 4.

For the avoidance of doubt, where the Work is a musical composition:

1. Performance Royalties Under Blanket Licenses. Licensor reserves the exclusive right to collect, whether individually or via a performance rights society (e.g. ASCAP, BMI, SESAC), royalties for the public performance or public digital performance (e.g. webcast) of the Work if that performance is primarily intended for or directed toward commercial advantage or private monetary compensation.
2. Mechanical Rights and Statutory Royalties. Licensor reserves the exclusive right to collect, whether individually or via a music rights agency or designated agent (e.g. Harry Fox Agency), royalties for any phonorecord You create from the Work ("cover version") and distribute, subject to the compulsory license created by 17 USC Section 115 of the US Copyright Act (or the equivalent in other jurisdictions), if Your distribution of such cover version is primarily intended for or directed toward commercial advantage or private monetary compensation.
5. Webcasting Rights and Statutory Royalties. For the avoidance of doubt, where the Work is a sound recording, Licensor reserves the exclusive right to collect, whether individually or via a performance-rights society (e.g. SoundExchange), royalties for the public digital performance (e.g. webcast) of the Work, subject to the compulsory license created by 17 USC Section 114 of the US Copyright Act (or the equivalent in other jurisdictions), if Your public digital performance is primarily intended for or directed toward commercial advantage or private monetary compensation.

5. Representations, Warranties and Disclaimer

UNLESS OTHERWISE MUTUALLY AGREED BY THE PARTIES IN WRITING, LICENSOR OFFERS THE WORK AS-IS AND MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND CONCERNING THE WORK, EXPRESS, IMPLIED, STATUTORY OR OTHERWISE, INCLUDING, WITHOUT LIMITATION, WARRANTIES OF TITLE, MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, NONINFRINGEMENT, OR THE ABSENCE OF LATENT OR OTHER DEFECTS, ACCURACY, OR THE PRESENCE OF ABSENCE OF ERRORS, WHETHER OR NOT DISCOVERABLE. SOME JURISDICTIONS DO NOT ALLOW THE EXCLUSION OF IMPLIED WARRANTIES, SO SUCH EXCLUSION MAY NOT APPLY TO YOU.

6. Limitation on Liability. EXCEPT TO THE EXTENT REQUIRED BY APPLICABLE LAW, IN NO EVENT WILL LICENSOR BE LIABLE TO YOU ON ANY LEGAL THEORY FOR ANY SPECIAL, INCIDENTAL, CONSEQUENTIAL, PUNITIVE OR

EXEMPLARY DAMAGES ARISING OUT OF THIS LICENSE OR THE USE OF THE WORK, EVEN IF LICENSOR HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

7. Termination

1. This License and the rights granted hereunder will terminate automatically upon any breach by You of the terms of this License. Individuals or entities who have received Collective Works from You under this License, however, will not have their licenses terminated provided such individuals or entities remain in full compliance with those licenses. Sections 1, 2, 5, 6, 7, and 8 will survive any termination of this License. 2. Subject to the above terms and conditions, the license granted here is perpetual (for the duration of the applicable copyright in the Work). Notwithstanding the above, Licensor reserves the right to release the Work under different license terms or to stop distributing the Work at any time; provided, however that any such election will not serve to withdraw this License (or any other license that has been, or is required to be, granted under the terms of this License), and this License will continue in full force and effect unless terminated as stated above.

8. Miscellaneous

1. Each time You distribute or publicly digitally perform the Work or a Collective Work, the Licensor offers to the recipient a license to the Work on the same terms and conditions as the license granted to You under this License. 2. If any provision of this License is invalid or unenforceable under applicable law, it shall not affect the validity or enforceability of the remainder of the terms of this License, and without further action by the parties to this agreement, such provision shall be reformed to the minimum extent necessary to make such provision valid and enforceable. 3. No term or provision of this License shall be deemed waived and no breach consented to unless such waiver or consent shall be in writing and signed by the party to be charged with such waiver or consent. 4. This License constitutes the entire agreement between the parties with respect to the Work licensed here. There are no understandings, agreements or representations with respect to the Work not specified here. Licensor shall not be bound by any additional provisions that may appear in any communication from You. This License may not be modified without the mutual written agreement of the Licensor and You.