Robot Operating System (ROS): A Useful Overview

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paper2, March 17, 2017

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Keywords: Cloud, I524, robot, ros, ROS

https://github.com/eunosm3/classes/blob/master/docs/source/format/report/report.pdf

INTRODUCTION

EXAMPLES OF ARTICLE COMPONENTS

The sections below show examples of different article components.

FIGURES AND TABLES

It is not necessary to place figures and tables at the back of the manuscript. Figures and tables should be sized as they are to appear in the final article. Do not include a separate list of figure captions and table titles.

Figures and Tables should be labelled and referenced in the standard way using the `\label{}` and `\ref{}` commands.

Sample Figure

Figure 1 shows an example figure.

Sample Table

Table 1 shows an example table.

Table 1. Shape Functions for Quadratic Line Elements

local node	$\{N\}_m$	$\{\Phi_i\}_m$ $(i = x, y, z)$
$m = 1$	$L_1(2L_1 - 1)$	Φ_{i1}
$m = 2$	$L_2(2L_2 - 1)$	Φ_{i2}
$m = 3$	$L_3 = 4L_1L_2$	Φ_{i3}

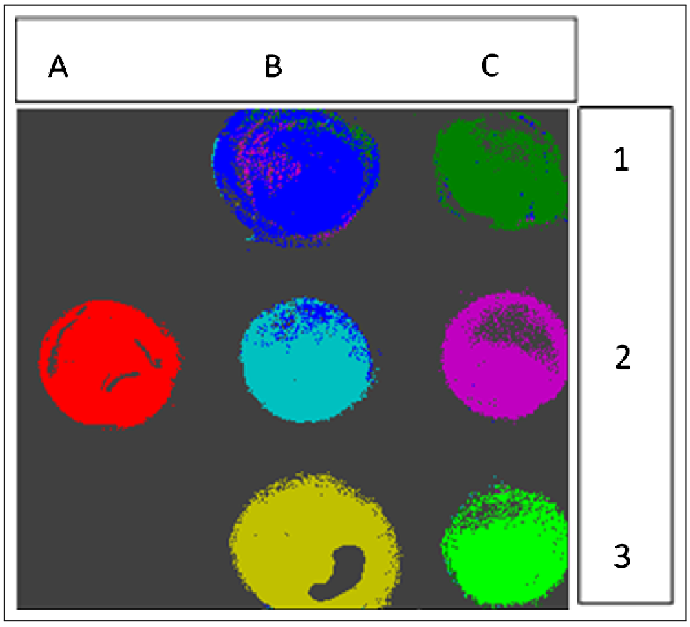

Fig. 1. False-color image, where each pixel is assigned to one of seven reference spectra.

SAMPLE EQUATION

Let $X_1, X_2, \ldots, X_n$ be a sequence of independent and identically distributed random variables with $\mathrm{E}[X_i] = \mu$ and $\mathrm{Var}[X_i] = \sigma^2 < \infty$, and let

$$S_n = \frac{X_1 + X_2 + \cdots + X_n}{n} = \frac{1}{n}\sum_{i}^{n} X_i \quad \textbf{(1)}$$

denote their mean. Then as n approaches infinity, the random variables $\sqrt{n}(S_n - \mu)$ converge in distribution to a normal $\mathcal{N}(0, \sigma^2)$.

SAMPLE ALGORITHM

Algorithms can be included using the commands as shown in algorithm 1.

Algorithm 1. Euclid's algorithm

```
1: procedure EUCLID(a, b)          ▷ The g.c.d. of a and b
2:     r ← a mod b
3:     while r ≠ 0 do              ▷ We have the answer if r is 0
4:         a ← b
5:         b ← r
6:         r ← a mod b
7:     return b                    ▷ The gcd is b
```

Algorithm 2. Python example

```
1  for i in range(0,100):
2    print i
```

REFERENCE MANAGEMENT

The best programs to manage your references is jabref or emacs. You can edit the references and verify them with them for format errors. To cite them use the citation key. You can add multiple bib files to the bibliography command separated by comma. Add citations with the cite command. See [**?**] for an example on how to use multiple clouds. In [**?**] we list the class content.

Here a test of a citation with an underscore in the url [1].

ACKNOWLEDGEMENTS

Funding information should be listed in this section. Please evaluate if you like to list your employer that may have funded your activities here. If you receive grants or project numbers, as shown in the example. This work was in part supported by National Science Foundation (NSF) (1234567, 891012345) (These numbers are invented)

The acknowledgments may also contain any information that is not related to funding:

The authors thank H. Haase, C. Wiede, and J. Gabler for technical support.

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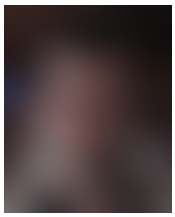
[1] Web Page. [Online]. Available: http://www.google.com/some_underscore

[2] ros.org, "Why Ros?: A distributed, modular design," Web page, mar 2017, accessed 16-mar-2017. [Online]. Available: www.ros.org/is-ros-for-me/

[3] ——, "About ros," Web page, mar 2017, accessed 16-mar-2017. [Online]. Available: http://www.ros.org/about-ros/

[4] Wikipedia, "Bsd licenses — Wikpedia, the free encyclopedia," Web page, mar 2017, accessed 16-mar-2017. [Online]. Available: https://en.wikipedia.org/wiki/BSD_licenses

AUTHOR BIOGRAPHIES



John Smith received his BSc (Mathematics) in 2000 from The University of Maryland. His research interests include lasers and optics.

Alice Smith received her BSc (Mathematics) in 2000 from The University of Maryland. Her research interests also include lasers and optics.

Bruce Wayne received his BSc (Aeronautics) in 2000 from Indiana University. His research interests include lasers and optics.

WORK BREAKDOWN

The work on this project was distributed as follows between the authors:

Matthew Lawson. Matthew researched and wrote all of the material for this paper.

REPORT CHECKLIST

- □ Have you written the report in word or LaTeX in the specified format?
- □ Have you included the report in github/lab?
- □ Have you specified the names and e-mails of all team members in your report. E.g. the username in Canvas?
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- □ Does the report have the project number added to it?
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- □ Have you made sure that the important directories are all lower case and have no underscore or space in it?
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POSSIBLE TECHNOLOGY PAPER OUTLINE

The next sections are just some suggestions, your may want to add sections and subsections as you see fit. Images and references do not count towards the 2 page length. Please use the `\section`, `\subsection`, and `\subsubsection` commands in your paper. do not introduce hardcoded numbers. Use the `\ref` and `\label` commands to refer to the sections.

Abstract 01) ROS provides an OS for robots. It runs exclusively on linux; Ubuntu is suggested «- add citation 02) The main components consist of a) the pubsub communication system, b) something else and c) some final thing. 03) Roboticists and other users can interact w/ ROS via the following methods: a) C++ programs, b) ROS on linux, c) etc. 04) ROS offers a CLI, but no GUI. Gazebo offers a CLI and a GUI, but the GUI only exists as part of the simulation process. 05) The Open Source Robotics Foundation, hereinafter OSRF, distributes ROS under some free license, probably a variant of GPL. 06) Since ROS dominates the robot software market, it has a vast ecosystem of compatible software and hardware. 07) Researchers and robot industry participants use ROS extensively. For instance, a) foo; b) bar; and c) foobar. Big data uses remain limited. 08) Explore ROS more by visiting www.ros.org.

1. Introduction The aptly-named *Robot Operating System*, herinafter ROS, provides a framework for writing operating systems for robots. ROS offers "a collection of tools, libraries, and conventions [meant to] simplify the task of creating complex and robust robot behavior across a wide variety of robotic platforms" [3].

2. Architecture If applicable include a description about architectural details. This may include a figure. Make sure that if you copy a figure you put the [**?**] in the caption also. Otherwise it is plagiarism.

2.1. API comment on the API which could include language bindings

2.2. Shell Access If applicable comment on how the tool can be used from the command line

2.3.Graphical Interface If applicable comment on if the technology has a GUI

3. Licensing The Open Source Robotics Foundation, hereinafter OSRF, distributes the core of ROS under the standard, three-clause BSD license, hereinafter BSD-3 license. The BSD-3 license belongs to a broader class of copyright licenses referred to as *permissive licenses* because it imposes zero restrictions on the software's redistribution as long as the redistribution maintains the license's copyright notices and warranty disclaimers [4].

Other names for BSD-3 include: a) BSD-new; b) New BSD; c) revised BSD; d) The BSD License, the official name used by the Open Source Initiative; and, e) Modfied BSD License, used by the Free Software Foundation.

ROS has more than 3,000 components available from its distributed community, including proof-of-concept algos to industrial-quality software drivers. [2].

4. Use Cases

4.1. Use Cases for Big Data Locate and describe major usecases that demonstrate the technology while focussing on big data related use cases. Make sure you do proper references with the [**?**] command. Do not put URLs in the text.

4.2. Other Use Cases Some technologies may not just be used for big data, find other makor use cases from other areas if applicable. Make sure you do proper references with the [**?**] command. Do not put URLs in the text.

5. Educational material Put information here how someone would find out more about the technology. Use important material and do not list hundrets of web pages, be selective.

6. Conclusion Put in some conclusion based on what you have researched

Acknowledgement Put in the information for this class and who may sponsor you. Examples will be given later

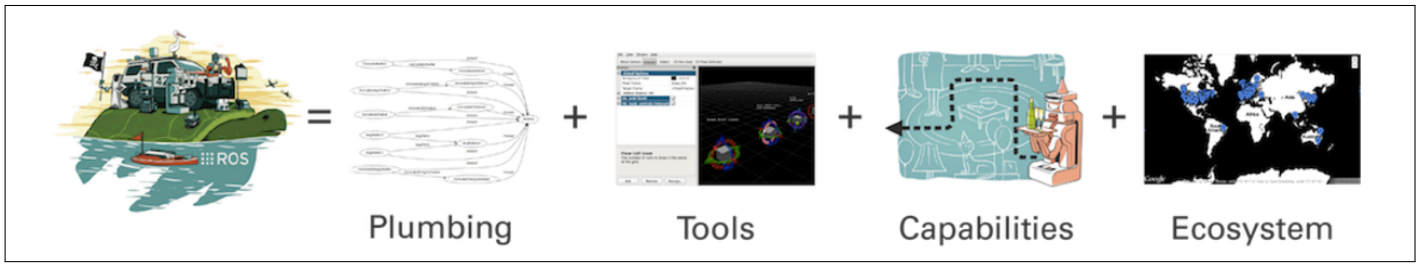

Fig. 2. The Main Elements of ROS - the *R*obot *O*perating *S*ystem [2]