Benchmarks for Verification of Autonomous Vehicles

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Abstract

In order to ease the lives of authors, editors, and trees, we present an easy-to-read guide to the easy-to-use easychair LaTeX2e document style class for EasyChair-based electronic and on-paper publishing of workshop and conference proceedings.

1 Introduction

- Need for AV verification
- Why it is hard
- Contributions/Benchmarks
  - Scenario 1: Obstacle avoidance on a sharp curve
  - Scenario 2: T-Junction
  - Scenario 3: Obstructed T-Junction

2 State of the Art

- Types of Autonomy
- Levels of Abstraction
- Verification Methods and Tools
  - Control Perspective: Lyapunov Functions
  - Software Perspective: Model Checking
  - Logic Perspective: Theorem Proving

3 Models

Key new idea: Examine continuous evolution of ego-vehicle, but only discrete evolution of environment. Give environment grid-based abstraction. We don't know the control inputs for the environment anyway

Vehicle

- Vehicle Dynamics: Bicycle Model
- Planning
- Perception
- Computation and Scheduling
- Traffic Participants

Traffic Control

- Stop Sign
- Speed Limit
- Yield
- Traffic Light

Pedestrians

- Dynamics
- Grid based abstraction
- Non determinism

4 Scenarios

The following are the general default parameters easychair introduces into the typesetting aspect of articles. If you use easychair for proceedings or other kinds of publishing through EasyChair, do not alter these – papers deviating from the formatting standards will be rejected by EasyChair.

5 Verification Engines

6 Results

7 Conclusions

1. The default paper size is US letter. It can be explicitly set to A4 (`a4paper`) or letter (`letterpaper`) paper in the document class entry, e.g.:
`\documentclass[a4paper]{easychair}`
2. The print area for both letter and A4 paper sizes is 145x224 mm. This size has been selected to allow for inexpensive printing using our current print-on-demand publisher.
3. The base font is Computer Modern. The base font size is 10pt. If you use any other font size, there is no guarantee that the produced document will look nice or fit into our standard page size.
4. The references list is condensed. The default bibliography styles, such as `plain`, `abbrv`, and `alpha`, are suggested.
5. PNG, JPG, and PDF images are supported, i.e., those that are supported by the standard `graphicx` package [1], and render nicely in online versions of PDF documents. This document shows some examples of JPG and PDF images, for example in Figure **??**. If the papers are designed for publishing in print, the images should be at least 300dpi in resolution.

ATP System	LTB	Avg	Prfs	SOTA	μ	CYC	MZR	SMO
Vampire-LTB 11.0	69	24.5	69	0.37	28.1	23	22	24
iProver-SInE 0.7	67	76.5	0	0.36	8.8	28	14	25

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Figure 1: Original table and tables with `tabcolsep` set to 5pt, 3pt, and 1pt

7.1 Tables

Many page overflows happen because of large tables. In many case these overflows can be easily removed by slightly reducing padding added by LaTeX to every column. It is controlled by the LaTeX command `\tabcolsep` whose value by default is 6pt. Even small changes in the value of this command may give drastic reductions in the width of tables. This is illustrated in Figure 1 on page 3. Note though that there is no free lunch: smaller values for this command may result in lower redability.

7.2 Images

Images included using `\includegraphics` are easy to resize since one can specify the size of the result explicitly. For example, Figure **??** shows three copies of the same image having different sizes obtained using the following commands:

```
\includegraphics[width=0.5\textwidth]{throneEC.jpg}
\includegraphics[width=0.3\textwidth]{throneEC.jpg}
\includegraphics[width=0.15\textwidth]{throneEC.jpg}
```

7.3 A Universal Recipe

LaTeX has a very powerful weapon for reducing the size of almost anythings. More precisely, it can reduce anything producing what LaTeX considers a box. This weapon is called `\scalebox`. Consider an example (check the source of this file to see how it was produced).

year	users
2007	47,753
2008	114,494
2009	207,506
2010	371,054

The number of users of EasyChair and one of its logos, scaled to the number of users in 2010

This is what happens when we put (almost) the same LaTeX code in `\scalebox{0.55923}{...}` to scale it down to the number of users in 2009:

year	users
2007	47,753
2008	114,494
2009	207,506
2010	371,054

The number of users of EasyChair and one of its logos, scaled to the number of users in 2009

We can scale it down even further to the 2008 figure using `\scalebox{0.30856}{...}`:

year	users
2007	47,753
2008	114,494
2009	207,506
2010	371,054

The number of users of EasyChair and one of its logos, scaled to the number of users in 2008

or further down to 2007:

This size reduction technique is very efficient: using the right scale you may post your whole article on Twitter in a single tweet. However, it may also may parts of your text virtually unreadable with an unfortunate side effect of annoying reviewers.

References

[1] David Carlisle. graphicx: Enhanced support for graphics. http://www.ctan.org/tex-archive/help/Catalogue/entries/graphicx.html, last viewed April 2010, 1995–1999.

A easychair Requirements Specification

The following high-level requirements were set for the development of the easychair class, and were refined as development went along.

1. The style should be easy to use. The average LaTeX user should not need to read a long manual.
2. It should be economical in space but the text should be nice-to-read.
3. It should use fonts producing a reasonable-quality PDF.
4. The bibliography should produce hyperlinks.
5. Sections should produce menu sections in PDF.
6. The text should look good on both A4 and letter paper.
7. The style should be single-column for convenience of scrolling.
8. The print area should be convenient for printing using print-on-demand publishers.
9. Running heads.