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How to write an article for GAMMAS and a longer title

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Abstract: *This tutorial is a ready-to-run LaTeX example that prospective authors of GAMMAS may substitute with their own content. Moreover, it contains information about some journal policies.*
(abstract: max. 250 words for research papers and tutorials, max. 150 words for technical briefs)

Keywords: mathematics, mechanics, LaTeX
(max. 5 keywords)

1 Introduction

Many students do research during their theses, their work as an assistant or their internship, and obtain results of public interest. GAMMAS is the channel for this research in the fields of applied mathematics and mechanics. The scope of this journal is to publish all the small progress, which were hidden to the scientific community otherwise. It also attempts to accelerate the getting-started into a current topic, where no textbooks exist yet and document all the details to arrive at the state of the art. It is emphasized that also *failures* are of interest and others should be warned of *dead-ends*, i.e., methods and tools that do not work for specific problems.

This article is structured as follows. In section 2 we list guidelines and information for authors that plan to submit an article to GAMMAS. The remaining sections are used to give some examples of formulas (section 3), figures and tables (section 4), and source code (sections 5 and 6).

2 Guidelines and Information

Typesetting and language All manuscripts that are send to GAMMAS for publication must be typesetted in LaTeXwith the `gammas` documentclass[1]. To get started with LaTeX there is a bunch of literature, e.g. [3], and endless tutorials out there. The official journal language is english (american).

Page policy The articles for GAMMAS are limited to 3-6 or 5-15 pages according to the sections technical brief or research paper, respectively. All articles will be distributed in pdf format and should not exceed 10 MB.

Author information Titles should be short as possible and reflect the content well. All authors (max. 6) must provide full names and affiliations. The use of ORCID iD[2] is very welcome. Additionally, the corresponding

[1] `https://ctan.org/pkg/gammas`
[2] `https://orcid.org`

author must provide an e-mail address and a phone number. Note that only students until one year after graduation (M.Sc.) are permitted as authors, except for the tutorial sections. The latter aims students as readers and experienced researchers (no age limit) may use this section in order to report about new teaching projects or to introduce innovative tools.

Abstract The abstract is limited to 250/150/250 words (research paper/technical brief/tutorial) and should indicate methods and main conclusions in comparison to the state of the art. The abstract is supposed as a standalone text. Thus there should be neither bibliographic references nor formulas.

Keywords The authors must provide up to five keywords, where one keyword may be a word compound such as *system-dynamics*, *multi-body-systems*, or *finite-element-method*. Since sorting and indexing are based on keywords, they should reflect the content well.

Units GAMMAS requires all authors to use the commands of the `siunitx` package for proper typesetting of numbers and units.

Graphics Graphics inside the document need to be provided as TikZ code, in the pdf-format, or as a bitmap (png, jpg, gif) with a minimal resolution of 300 dpi. The authors need to ensure that the graphics are readable if the paper is printed in color and black/white. For pictures that are generated with MATLAB we recommend to use the toolbox `matlab2tikz`[3]. Note that the caption is always placed under the figure.

Tables For a proper layout of your tables, the `gammas` article class loads the `booktabs` package. We kindly ask the authors to follow the style guide of `booktabs`[4] tables. Note that the caption is always placed above the table.

Code availability All manuscripts that provide simulation results are required to have a statement about the availability of code (see Code Availability). This statement ensures the reproducibility of the simulation results. Please use the environment `gammcode` to provide the details.

[3] `https://github.com/matlab2tikz/matlab2tikz`
[4] `https://ctan.org/pkg/booktabs`

References References must be fully specified and traced back to the originals, if possible. If there are several options, long-term archived and well accessible references should be preferred. For electronic references, DOIs are strongly recommended and for books ISBN numbers. Page numbers should be given for references to specific formulas in books.

Cross-referencing If authors want to make a reference within the manuscript, for instance to a figure or a table, we recommend to use the commands of the `cleveref` package, i.e., the commands `Cref` and `cref`. Equations may be referenced with the command `eqref`.

Supplementary material It is strongly encouraged to supplement the paper by animations, interactive graphics, and datasets (max. 25 MB). Supplementary files are accepted in the following file formats: tif, jpg, gif, png, pdf, mp3, wav, mpg, avi, mov. Also, source code is often beneficial for understanding and reconstruction. Source files (c, py, m, …) should be compressed into zip- or tar-archives and also contain the plain-text documentation files: README, AUTHORS, INSTALL, CHANGELOG, LICENSE (see the forthcoming section 6). Please follow the advice for best practice of sharing computer-based experiments [1].

Review process All manuscripts are subject to peer-review (double-open) before publication. For revisions, we kindly ask the authors to use `latexdiff` to highlight all changes and submit the resulting file along with the manuscript.

Journal information GAMMAS is an open-access online journal. All content is published under the Creative Commons License *Attribution 4.0 International (CC BY 4.0)*. The journal is managed by the GAMM Juniors (see `www.gamm-juniors.de` for further details), the forum of young scientists within the International Association of Applied Mathematics and Mechanics (GAMM e.V.). It is hosted by the library of the TU Chemnitz.

3 Formulas

Although Stephen Hawking claims *"Equations are just the boring part of mathematics. I attempt to see things in terms of geometry."*, there is a need for formulas in mathematical papers. For demonstration, the seventeen most important equations according to Ian Stewart [4] follow next. On the first place stands the Pythagorean Theorem

$$a^2 + b^2 = c^2, \tag{1}$$

which we refer to as eq. (1) or simply (1). The logarithm rule

$$\log(xy) = \log x + \log y \tag{2}$$

ties for the second place. It is followed by eq. (3) the definition of the differential

$$\frac{\mathrm{d}f}{\mathrm{d}x} = \lim_{h\to 0} \frac{f(x+h) - f(x)}{h} \tag{3}$$

and Newton's law of gravitation

$$F = G\frac{m_1 m_2}{d^2}. \tag{4}$$

Notice that only equations, which are referenced in the text, should get an equation number. Here we break this rule in order to indicate the ranking made by Ian Stewart, but we will give an example afterward. If authors want to reference a bunch of equations, they can do so with the `cref` command that produces something like eqs. (1), (3) and (4).

The list continues with the imaginary unit

$$i^2 = -1. \tag{5}$$

Euler's polyhedron formula

$$F - E + V = 2. \tag{6}$$

The normal distribution of probability

$$\phi(x) = \frac{1}{\sqrt{2\pi\sigma^2}} \exp\left(-\frac{(x-\mu)^2}{2\sigma^2}\right). \tag{7}$$

The wave equation

$$\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}. \tag{8}$$

Fourier transformation

$$F(\omega) = \int_{-\infty}^{\infty} \mathrm{e}^{-i\omega\tau} f(\tau)\,\mathrm{d}\tau, \tag{9a}$$

$$f(\tau) = \frac{1}{2\pi} \int_{-\infty}^{\infty} \mathrm{e}^{i\omega\tau} F(\omega)\,\mathrm{d}\omega. \tag{9b}$$

Navier-Stokes equations of fluid dynamics

$$\frac{\partial \mathbf{v}}{\partial t} + \mathbf{v}\cdot\nabla\mathbf{v} = -\frac{\nabla p}{\varrho} + \frac{\eta}{\varrho}\nabla^2\mathbf{v} + \mathbf{b}. \tag{10}$$

Maxwell's equations of electromagnetism

$$\nabla\cdot\mathbf{E} = 0, \tag{11a}$$

$$\nabla\cdot\mathbf{H} = 0, \tag{11b}$$

$$\nabla\times\mathbf{E} = -\frac{1}{c}\frac{\partial \mathbf{H}}{\partial t}, \tag{11c}$$

$$\nabla\times\mathbf{H} = \frac{1}{c}\frac{\partial \mathbf{E}}{\partial t}. \tag{11d}$$

Second law of thermodynamics

$$\mathrm{d}S \geq 0. \tag{12}$$

Einstein's mass-energy equivalence

$$E = mc^2. \tag{13}$$

Schrödinger equation of quantum mechanics

$$i\hbar\frac{\partial \psi}{\partial t} = \hat{H}\psi. \tag{14}$$

Shannon entropy of an information source

$$H = -\sum_x p(x)\log p(x). \tag{15}$$

The logistic map from the theory of deterministic chaos

$$x_{k+1} = a x_k (1 - x_k). \tag{16}$$

The list concludes with the Black-Scholes equation from mathematical finance about the price evolution of options

$$\frac{1}{2}\sigma^2 S^2 \frac{\partial^2 V}{\partial S^2} + rS\frac{\partial V}{\partial S} + \frac{\partial V}{\partial t} - rV = 0. \tag{17}$$

Now comes an unhappy equation, attributed to S. Ramanujan, which is not numbered

$$1 + 2 + 3 + 4 + \cdots = -\frac{1}{12},$$

since it is not referenced in the text.

For more information about formulas and mathematical symbols, consult the documentation of the AMS packages[5]. If authors want to summarize their findings in the form of a theorem or a lemma, they can do so as well.

Lemma 1. *Let $w : \Omega \to \mathbb{R}$ be continuous and assume*

$$\int_\Omega w(x)\,v(x)\,\mathrm{d}x = 0 \qquad \textit{for all } v \in \mathscr{C}_0^\infty(\Omega).$$

Then $w(x) = 0$ for all $x \in \Omega$.

For this you have to define your theorem like environment in the preamble. Referencing to such environments – like Lemma 1 – is possible using the cleveref package. For a concise introduction to scientific writing in mathematics, we refer to the excellent monograph [2].

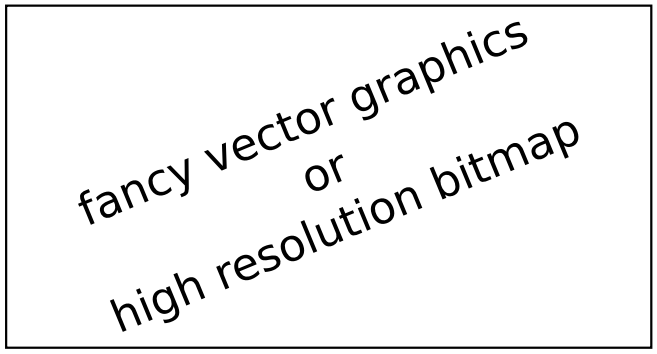
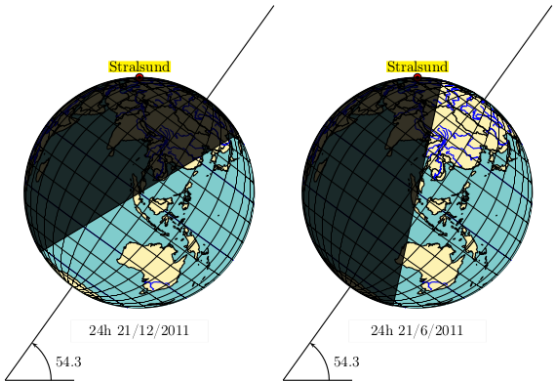


Figure 1 – A good figure says more than thousands words



(a) winter (b) summer

Figure 2 – Earth's axis is an imaginary pole going right through the center of Earth from top to bottom

4 Figures and Tables

Authors should be aware that many papers are printed in black and white. Thus authors should avoid overloading colors with information — Figure 1 for instance looks printed b/w as expressive as in color. However, authors may refer to innovative and colorful graphics via links in their paper and upload them as supplementary material. The caption is always placed under the figure.

Our next example shows how to use the LaTeX package `subfigures` and by the way, explains summer and winter. It is summer in June in the Northern Hemisphere, because the sun's rays hit that part of Earth more directly than at any other time of the year. It is winter in December in the Northern Hemisphere, because that is when it is the South Pole's turn to be tilted toward the sun. The meaning of the two previous sentences will become clear after looking at Figure 2(a) and Figure 2(b).

If there are parameters to be listed or results, whose numerical values are of importance, then use tables like Table 1. In contrast to figures, the caption is placed above the object. If your table is not fitting in the two column layout, you can use the `table*` environment as in Table 2. Besides, this table highlights the use of the multicolumn command.

Table 1 – There is no need for many lines in modern tables

	Type A	Type B	Type C
mass m [kg]	1.0	1.1	1.1
stiffness c [N/m]	1.1	1.0	1.1
frequency f_0 [Hz]	0.167	0.157	0.159

5 Listings for Program Code

Sometimes algorithms are explained best by code listings, such as in Listing 1. Listing 2 for instance shows how to find the maximum in an array. For more details consult the documentation of the `listings` package at CTAN[6].

Listing 1 – Some code

```
int main(void)
{
  myint64 j;
  double x=0.0;
  DOUBLE_TYP x_hat=0.0;
  return x; // wrong return
}
```

Listing 2 – Enjoy the highlighted keywords `myint64` and `DOUBLE_TYP` as well as the line numbering, which should always be at the outer side

```
static inline __attribute__((
    always_inline))
DOUBLE_TYP max_norm( myint64 num,
  const DOUBLE_TYP * __restrict__ vec_A )
{
  myint64 i;
  int j;
  DOUBLE_TYP value = 0.0;
// for( i=num-1; i>=0; i--)
  for( i=0; i<num; i++)
  {
    value = MAX( value, ABS(*vec_A) );
    vec_A++;
  }
  return value;
}
```

6 Documentation of Source Code

For the documentation of your source code (uploaded as supplementary material) the following files are mandatory:

[5] `https://ctan.org/pkg/amsmath`

[6] `https://ctan.org/pkg/listings`

Table 2 – Quite a bit of fancy data

simulation	g	ρ	T_{end}	h_{n}	μ	ν	λ	E
parameter	9.81	940	3	0.01	2e7	0.4792	4e8	5.9e7
elem type	T20	H8	H27	H64	T4		T10	
n_{gph}	43	8	27	64	1		14	
n_{el}	784	2080	304	304	14088		1129	
n_{dof}	15960	10620	10464	31536	11187		7635	
total CPU time	95.6	22.8	50.9	463.5	18.2		23.7	
NEWTON	3.71	3.76	3.68	3.78	3.44		3.68	

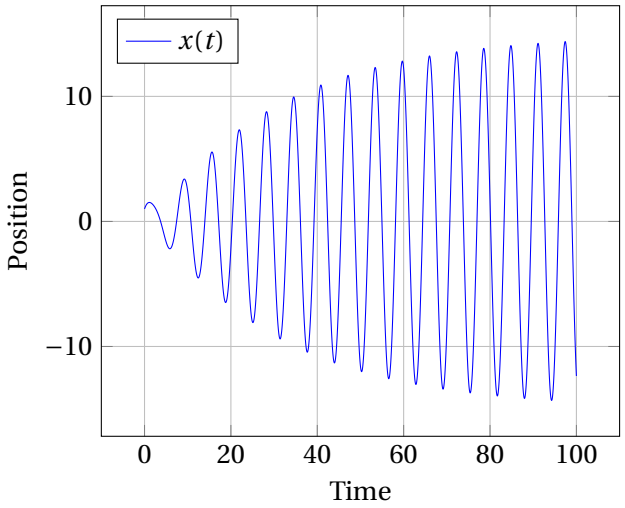


Figure 3 – Motion of a mass attached to a spring

`README`	general information,
`AUTHORS`	credits
`INSTALL`	installation instructions,
`LICENSE`	copyright and licensing information.

Additionally, one may provide details about previous versions of the code, in form of the following optional files:

`CHANGELOG`	a detailed changelog, intended for programmers,
`NEWS`	a basic changelog, intended for users.

For example we provide (see Code Availability) a python-script for simulations of a linear oscillator

$$m\ddot{x}(t) + d\dot{x}(t) + cx(t) = \sin(t),$$

with $m = 1$, $d = 0.1$ and $c = 1$. Figure 3 shows transient oscillations as consequence of the initial conditions $x(0) = \dot{x}(0) = 1$.

Code Availability: Both, the LaTeX source code for this paper as well as the python-script for the simulation, are available as supplementary material and can be obtained under the

DOI: 10.14464/gammas.v1i1.417.

If the source code is not shared, a simple statement should be given for explanation, e.g., for license issues, non-disclosure agreements or trade secrets. For *best practices* for code we refer to [1].

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We thank Martin Bauschmann and Ute Blumtritt from the TU Chemnitz library for their advice and cooperation in founding this journal.

A Appendix

Here authors may list figures and derivations for the sake of completeness that would distract the reader of the manuscript from the important information.

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