A Demonstration of the LaTeX 2ε Class File for the Numerical Mathematics: Theory, Methods and Applications

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Abstract. The abstract should provide the application context and briefly summarise the main findings. It should not be too long — normally no longer than half a page.

1. Preparation of manuscript

The Title Page should contain the article title, authors' names and complete affiliations, footnotes to the title, and the postal address for manuscript correspondence (including e-mail address). The Abstract should provide a brief summary of the main findings of the paper.

1.1. Header information

The heading for any file using nm.cls is like this;

```
\documentclass{nm}

\setcounter{page}{1}
\renewcommand\thisnumber{x}
\renewcommand\thisyear {20xx}
\renewcommand\thismonth{x}
\renewcommand\thisvolume{xx}

\begin{document}
```

---
*Corresponding author. *Email addresses:* firstauthor@xxx.xxx (F. Author), co-auhor(s)@xxx.xxx (A. Co-Author)

```
\markboth{F. Author and A. Co-Author(s)}{Short Title}

\title{Make the Title in Title Case}

\author[F. Author and A. Co-Author(s)]{First Author\affil{1}, Second
Author\affil{2}\comma\corrauth and Third Author\affil{1}}

\address{
\affilnum{1}\ Address for first and third authors\\
\affilnum{2}\ Address for second author
}

\emails{
{\tt Email address of First Author} (F. Author),
{\tt Email address of Second Author} (S. Author),
{\tt Email address of Third Author} (T. Author)
}

\begin{abstract}
Text here, no equation, no citation, no reference.
\end{abstract}

\keywords{list here}

\ams{list here}

\maketitle

\section{Introduction}

\end{document}
```

2. Introduction

The Introduction should provide details of the application context and previous relevant publications, leading to a brief summary of the direction of the research undertaken and the following structure of the article (Sections).

2.1. Equations

For preparation of the manuscript we strongly recommend examples provided here.

Thus equations should be typewritten by using equation, subequations, align, alignat, aligned environments. For example, for numbered one-line formulas use

the construction

```
\begin{equation}\label{eq2.1}
\text{This is a  sample equation:}\quad ax=c.
\end{equation}
```

to obtain

$$\text{This is a sample equation:} \quad ax = c. \tag{2.1}$$

Please avoid the obsolete `\eqnarray` **environment, which has several bugs.**

2.2. Numbered multi-line equations

Example 2.1. The equation

$$v_h(x,y) = V_1(x,y), \tag{2.2}$$
$$v_h^+(x,y) = v_h^-(x,y). \tag{2.3}$$

can be written as

```
\begin{align}
&v_h(x,y)=V_1(x,y),\label{eq2.2}\\
&v_h^+(x,y)=v_h^-(x,y).\label{eq2.3}
\end{align}
```

Example 2.2. The equation

$$\begin{aligned}
v_h(x,y) &= V_1(x,y), \\
v_h^+(x,y) &= v_h^-(x,y).
\end{aligned} \tag{2.4}$$

can be written as

```
\begin{equation}\label{eq2.4}
\begin{aligned}
&v_h(x,y)=V_1(x,y),\\
&v_h^+(x,y)=v_h^-(x,y).
\end{aligned}
\end{equation}
```

Do not use the construction

```
\begin{equation*}
\begin{aligned}
&v_h(x,y)=V_1(x,y),\\
&v_h^+(x,y)=v_h^-(x,y).
\end{aligned}
\end{equation*}
```

It should be `align*` instead.

```
\begin{align*}
&v_h(x,y)=V_1(x,y),\\
&v_h^+(x,y)=v_h^-(x,y).
\end{align*}
```

Example 2.3. The equation

$$v_h(x,y) = V_1(x,y) + v_h^-(x,y)$$
$$+ V_2(x,y) + v_h^+(x,y). \tag{2.5}$$

can be written as

```
\begin{align}
v_h(x,y)&=V_1(x,y)+v_h^-(x,y)\nonumber\\
        &\quad +V_2(x,y)+v_h^+(x,y).\label{eq2.5}
\end{align}
```

Equations should be cited by using the `\eqref` command and the form `Eq.~\eqref{eq2.1}` or simply `\eqref{eq2.1}`. In the text they appear as Eq. (2.1) or (2.1).

2.3. Non-numbered equations

For non-numbered equations, please use the command `equation*`, rather than `$$ $$` and `\[    \]`. For example, the equation

$$a \neq b$$

should be written as

```
\begin{equation*}
 a\neq b
\end{equation*}
```

2.4. Theorems, corollaries, lemmas, definitions, propositions, examples, remarks

For theorems, corollaries, lemmas, definitions, propositions, examples, conditions, conclusions, assumptions and remarks special environments are predefined. Please use the following constructions:

For theorems:

```
\begin{theorem}\label{thm1}
Text of theorem
\end{theorem}
```

For corollaries:

```
\begin{corollary}\label{col1}
Text of corollary
\end{corollary}
```

For lemmas:

```
\begin{lemma}\label{lem1}
Text of lemma
\end{lemma}
```

For definitions:

```
\begin{definition}\label{def1}
Text of definition
\end{definition}
```

For propositions:

```
\begin{proposition}\label{prop1}
Text of proposition
\end{proposition}
```

For examples:

```
\begin{example}\label{exm1}
Text of example
\end{example}
```

For remarks:

```
\begin{remark}\label{rem1}
Text of remark
\end{remark}
```

For proofs:

```
\begin{proof}
Proof of the statement
\end{proof}
```

For results from other sources:

```
\begin{theorem}[cf. Author \& Co-Author \cite{firstauthor}]
\label{thm1}
Text of theorem
\end{theorem}
```

2.5. Cross-referencing

The use of the LaTeX cross-reference system for figures, tables, equations and citations is encouraged.

2.6. Figures

Figures should be in a finished form suitable for publication (in eps format). Number figures consecutively with Arabic numerals. Lettering on drawings should be generated by high-resolution computer graphics and large enough to withstand appropriate reduction for publication.

Here are some templates for figures:

```
\begin{figure}[!tbh]
\centering
\includegraphics[width=1in,height=2.5in]{filename}
\caption {Example 1.}
\label{fig1}
\end{figure}
```


Figure 1: Example 1.

```
\begin{figure}[!tbh]
\centering
\includegraphics[width=\textwidth]{filename}
\caption {Example 2.}
\label{fig2}
\end{figure}
```

Figure 2: Example 2.

```
\begin{figure}[!tbh]
\centering
\includegraphics[scale=0.8]{filename}
\caption {Example 3.}
\label{fig3}
\end{figure}
```


Figure 3: Example 3.

```
\begin{figure}[!tbh]
\centering
\includegraphics[height=4cm]{filename}
\caption {Example 4.}
\label{fig4}
\end{figure}
```
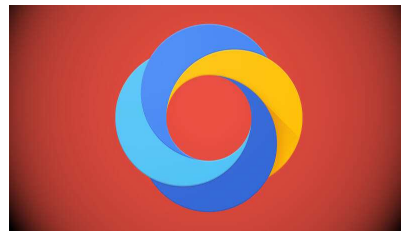
Figure 4: Example 4.

Figure 5: Example 5.

```
\begin{figure}[!tbh]
\centering
\begin{minipage}{0.47\textwidth}
\centering
\includegraphics[height=3cm]{filename}
\end{minipage}
\begin{minipage}{0.47\textwidth}
\centering
\includegraphics[height=3cm]{filename}
\end{minipage}
\caption {Example 5.}
\label{fig5}
\end{figure}
```

2.7. Tables

Here are some templates for tables:

Table 1: Example 1.

N_t	L_∞ Error	CR	L_∞ Error	CR
8	6.3603e-01	-	5.2903e-02	-
16	2.1078e-01	1.59	1.0824e-02	2.29
32	7.9903e-02	1.40	2.6661e-03	2.02
64	3.5422e-02	1.17	6.7627e-04	1.98

```
\begin{table}[!tbh]
\caption{Example 1.}
\label{ex_1}
\centering
\medskip\small\renewcommand{\arraystretch}{1.15}
\begin{tabular}{||ccccc||}
\hline
$N_t$  & $L_\infty$ Error & CR  &$L_\infty$ Error & CR  \\
\hline
8   & 6.3603e-01  & -    & 5.2903e-02 & -\\
16  & 2.1078e-01  & 1.59 & 1.0824e-02 & 2.29  \\
32  & 7.9903e-02  & 1.40 & 2.6661e-03 & 2.02  \\
64  & 3.5422e-02  & 1.17 & 6.7627e-04 & 1.98  \\
\hline
\end{tabular}
\end{table}
```

Table 2: Example 2.

	N_t	L_∞ Error	CR	L_∞ Error	CR
1	8	6.3603e-01	-	5.2903e-02	-
2	16	2.1078e-01	1.59	1.0824e-02	2.29
3	32	7.9903e-02	1.40	2.6661e-03	2.02

```
\begin{table}[!tbh]
\caption{Example 2.}
\label{ex_2}
\centering
\medskip\small\renewcommand{\arraystretch}{1.15}
\begin{tabular}{||l|ccccc||}
\hline
&$N_t$  & $L_\infty$ Error & CR  &$L_\infty$ Error & CR  \\
\hline
1 & 8   & 6.3603e-01  & -    & 5.2903e-02 & -\\
2 & 16  & 2.1078e-01  & 1.59 & 1.0824e-02 & 2.29  \\
3 & 32  & 7.9903e-02  & 1.40 & 2.6661e-03 & 2.02  \\
4 & 64  & 3.5422e-02  & 1.17 & 6.7627e-04 & 1.98  \\
\hline
\end{tabular}
\end{table}
```

Table 3: Example 3.

Accuracy of time discretisation, $N_x \times N_y = 4096^2$									
N_t	L_∞ Error	CR	L_∞ Error	CR	N_t	L_∞ Error	CR	L_∞ Error	CR
8	6.3603e-01	-	5.2903e-02	-	4	8.0540e-02	-	1.7316e-02	-
16	2.1078e-01	1.59	1.0824e-02	2.29	8	7.7251e-03	3.38	1.1771e-03	3.89
32	7.9903e-02	1.40	2.6661e-03	2.02	16	1.0326e-03	2.90	8.9444e-05	3.72

```
\begin{table}[!tbh]
\caption{Example 3.}
\label{t3}
\centering
\medskip\small\renewcommand{\arraystretch}{1.15}
\begin{tabular}{||ccccc|ccccc||}
\hline
\multicolumn{10}{||c||}{Accuracy of time discretisation} \\
\hline
$N_t$ & $L_\infty$ Error & CR & $L_\infty$ Error & CR & $N_t$ &
$L_\infty$ Error & CR & $L_\infty$ Error & CR \\
\hline
8  & 6.3603e-01 & -   & 5.2903e-02 & -   & 4 &
8.0540e-02 & -   & 1.7316e-02 & -\\
16 & 2.1078e-01 & 1.59 & 1.0824e-02 & 2.29 & 8 &
7.7251e-03 & 3.38 & 1.1771e-03 & 3.89 \\
32 & 7.9903e-02 & 1.40 & 2.6661e-03 & 2.02 & 16 &
1.0326e-03 & 2.90 & 8.9444e-05 & 3.72 \\
\hline
\end{tabular}
\end{table}
```

Table 4: Example 4.

	N_t	L_∞ Error	CR	L_∞ Error	CR
1	8	6.3603e-01	-	5.2903e-02	-
2	16	2.1078e-01	1.59	1.0824e-02	2.29
3	32	7.9903e-02	1.40	2.6661e-03	2.02
4	64	3.5422e-02	1.17	6.7627e-04	1.98

```
\begin{table}[!tbh]
\caption{Example 4.}
\label{t4}
\centering
\medskip\small\renewcommand{\arraystretch}{1.15}
\begin{tabular}{||l|ccccc||}
\hline
&$N_t$  & $L_\infty$ Error & CR  &$L_\infty$ Error & CR  \\
\cline{3-5}
1 & 8   & 6.3603e-01  & -    & 5.2903e-02 & -\\
2 & 16  & 2.1078e-01  & 1.59 & 1.0824e-02 & 2.29  \\
3 & 32  & 7.9903e-02  & 1.40 & 2.6661e-03 & 2.02  \\
4 & 64  & 3.5422e-02  & 1.17 & 6.7627e-04 & 1.98  \\
\hline
\end{tabular}
\end{table}
```

For big tables you can change font size

```
\medskip\small\renewcommand{\arraystretch}{1.15}
```

to

```
\medskip\footnotesize\renewcommand{\arraystretch}{1.15}
```

and/or reduce space between columns

```
\setlength\tabcolsep{-0.9mm}
```

and/or reduce space between rows

```
\medskip\small\renewcommand{\arraystretch}{1.02}
```

Acknowledgments

At the end of paper but preceding the References.
The author would like to thank ....

2.8. References

References should be listed at the end of the paper in alphabetical order according to the surnames of the first author, and should be cited in the text using `\cite` command as `\cite{Yin,Kopka,Goossens,Other}`. In the text the citations will appear as [1, 2, 4, 5].

Abbreviations of titles of periodicals/books should be given by using Math. Reviews, see e.g. `https://mathscinet.ams.org/msnhtml/serials.pdf`

For unpublished lectures of symposia, include title of paper, name of sponsoring society in full, and date. Give titles of unpublished reports with "(unpublished)" fol-

lowing the reference. Only articles that have been published or are in press should be included in the references. Unpublished results or personal communications should be cited as such in the text.

```
\begin{thebibliography}{99}
\bibitem{Goossens}
{\sc M. Goossens, F. Mittelbach, and A. Samarin},
{\em The LaTeX Companion}, Addison-Wesley, 1994.

\bibitem{Kopka}
{\sc H. Kopka and P. W. Daly}, {\em A Guide to LaTeX},
Addison-Wesley, 1999.

\bibitem{Knuth}
{\sc D. E. Knuth}, {\em The TeXbook},
Addison-Wesley, 1992.

\bibitem{Other}
{\sc A. N. Other}, {\em A demonstration of the LaTeX2e class file for
the International Journal for Numerical Methods in Engineering},
Int. J. Numer. Meth. Engng  00 (2000), 1--6.

\bibitem{Yin}
{\sc Z. Yin, H. J. H. Clercx, and D. C. Montgomery},
{\em An easily implemented task-based parallel scheme for the
Fourier pseudospectral solver applied to 2D Navier-Stokes
turbulence}, Comput. Fluids  33 (2000),   509--520.
\end{thebibliography}
```

References

[1] M. GOOSSENS, F. MITTELBACH AND A. SAMARIN, *The LaTeX Companion*, Addison-Wesley, 1994.

[2] H. KOPKA AND P. W. DALY, *A Guide to LaTeX*, Addison-Wesley, 1999.

[3] D. E. KNUTH, *The TeXbook*, Addison-Wesley, 1992.

[4] A. N. OTHER, *A demonstration of the LaTeX2e class file for the International Journal for Numerical Methods in Engineering,* Int. J. Numer. Meth. Engng, 00 (2000), 1–6.

[5] Z. YIN, H. J. H. CLERCX, AND D. C. MONTGOMERY, *An easily implemented task-based parallel scheme for the Fourier pseudospectral solver applied to 2D Navier-Stokes turbulence,* Comput. Fluids 33 (2000), 509–520.