航天器导航制导与控制

复习题解

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目录

天文学和地球物理学基本概念

空间飞行器轨道动力学基础

导航与制导部分习题解答

Definition 1
> 黄道面：地球绕太阳公转的轨道平面
> 赤道面：通过地心，与黄道面垂直的平面
> 二分点线：赤道面和黄道面的交线
> 春分点：太阳从南向北运动，与赤道面相交的点
> 秋分点：太阳从北向南运动，与赤道面相交的点

Example
1. 为什么恒星日小于太阳日？何谓平太阳日

SECTION 7

Required Packages

For *NotesTeX,* the following packages are required

marginnote, sidenotes, fancyhdr, titlesec, geometry, and tcolorbox.

The role of each packages is discussed in Part IV. Briefly, the marginnote, sidenote, titlesec, and tcolorbox packages are required to create the \part environment. geometry is used globally to set the page width, page height, and margin width. fancyhdr (overridden on the title, contents, and \part page) sets the header.

Modifications

PART

IV

SECTION 8

Features

NotesTeX inherits jhep formatting for sections, subsections, subsubsections, title page, contents page, and bibliography presets. Significant extensions include the following:

1. Several mathematics and physics packages.

2. Margins and margin environments for tables, figures, and asides.

3. TeX shortcuts for various math scripts namely vector bold math, mathbb, mathfrak, and mathcal.

4. amsthm integrations and special environments for theorems, lemmas, proofs, definitions, examples, and remarks.

表 **1**. Contents for PART II

5. Stylized support for the `part` environment.

6. A fullpage environment that spans across the text width and the margin for longer equations and horizontal figures.

Each of these will be discussed in the following subsections.

Included Packages

Additional package are listed right under the required packages in `NotesTeX.sty`. These are divided into font styling packages and mathematical and physics related packages. The list of packages are also reiterated here and their links are in the sidenotes.

```
\usepackage[T1]{fontenc}                        % Font Styling
\usepackage{lmodern,mathrsfs}


\usepackage[shortlabels]{enumitem}              % Enumitem Options
\usepackage{mathtools,amssymb,amsfonts,amsthm,bm}   % Math Presets
\usepackage{array,tabularx,booktabs}            % Table Presets
\usepackage{graphicx,wrapfig,float,caption}     % Figure Presets
\usepackage{setspace,multicol}                  % Text Presets
\usepackage{tikz,physics}               % Physics Presets
```

fontenc
mathrsfs
enumitem
mathtools
amsfonts
amsthm
bm
array
tabularx
booktabs
graphicx
float
caption
setspace
multicol
tikz
physics
cancel

表 **2**. Links

Margins

NotesTeX inherits all the margin commands that are used by `sidenote` and `marginnote`, and two additional pre-configured commands known as \mn and \sn. The relevant commands, and the packages they belong to, are

$$\text{\marginnote [marginnote]} \qquad \text{\lec [NotesTeX]}$$
$$\text{\mn [NotesTeX]} \qquad \text{\marginfigure [sidenote]}$$
$$\text{\sidenote [sidenote]} \qquad \text{\margintable [sidenote]}$$
$$\text{\sn [NotesTeX]}$$

The implementation of each of these is as follows.

1. `Marginnote:` This is how a \marginnote{...} behaves.

   Not numbered, 10pt.

2. `Mn:` This is how a \mn{...} behaves.[1]

   [1] *Numbered, footnotesize.*

3. `Sidenote:` This is how a \sidenote{...} behaves.[2]

   [2] Numbered, 10pt.

4. `Sn:` This is how a \sn{...} behaves.[3]

   [3] *Numbered, footnotesize.*

5. `Lec:` This environment appears in the left column and requires two inputs. The example here is \lec{Left Side}{Some text goes here.}.

Left Side
Some text
goes here.

6. `Marginfigure`: This environment requires the `\begin{marginfigure}` ⋯
   `\end{marginfigure}` enclosings. The `caption` package is needed to caption the
   figure.

7. `Margintable`: This environment requires the `\begin{margintable}` ⋯
   `\end{margintable}` enclosings. A table package, such as `tabular`, `tabulary`,
   `tabu`, or `tabularx` is required. The `caption` package is needed to caption the
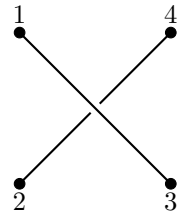   table.

Remark   **Why use both `marginnotes` and `sidenotes`?** Quite simply, `marginnotes` overlap
each other if they are too close whereas `sidenotes` both numbers and dynamically aligns
all side notes, figures, and tables. However `sidenotes` cannot be used in equations,
`multicols`, and with the `tcolorbox`[4] environment. As the majority of the special
environments from `amsthm` are modified to use `tcolorbox`, `marginnotes` becomes an
essential part of *NotesTeX*.

~~图 1. Marginfigure: Tikz~~

| *NotesTeX* | **rocks!** |

表 **3**. Margintable

[4] *See 11 and 12 for more details.*

`amsthm` Environments

`amsthm` environments are defined as usual being enclosed by `\begin{environment}`⋯
`\end{environment}`. Modifications include integration with the `tcolorbox` package.
Note that counting for `theorems` and `lemmas` is distinct from the counting for `definitions`. Also, the `breakable` option for `tcolorbox` allows these environments to span multiple pages.

If one wishes to change the color, simply modify the line which states `borderline west={1pt}{0pt}{blue}`. The first numeric value dictates the width of the line, the second dictates how close it is away from the *left* margin, while the last argument declares the color. This customization is independent of the `amsthm` environments.

There is one issue with this however. Since we are using a `tcolorbox`, this proof environment is incompatible with `\sn` and `\sidenote`, as it results in a **Float(s) Error**. However, this environment is compatible with `\mn` and `\marginnote`.

Definition 2   The `definition` environment and the associated `tcolorbox` are provided by the
following code in `NotesTeX.sty`:

```
\tcolorboxenvironment{definition}{
  boxrule=0pt,
  boxsep=0pt,
  colback={White!90!Cerulean},
  enhanced jigsaw,
  borderline west={2pt}{0pt}{Cerulean},
  sharp corners,
  before skip=10pt,
```

```
  after skip=10pt,
  breakable,
}
```

Theorem 1 The `theorem` environment and the associated `tcolorbox` are provided by the following code in NotesTeX.sty:

```
\tcolorboxenvironment{theorem}{
  boxrule=0pt,
  boxsep=0pt,
  colback={White!90!Dandelion},
  enhanced jigsaw,
  borderline west={2pt}{0pt}{Dandelion},
  sharp corners,
  before skip=10pt,
  after skip=10pt,
  breakable,
}
```

Lemma 1 The `lemma` environment and the associated `tcolorbox` are provided by the following code in NotesTeX.sty:

```
\tcolorboxenvironment{lemma}{
  boxrule=0pt,
  boxsep=0pt,
  blanker,
  borderline west={2pt}{0pt}{Red},
  before skip=10pt,
  after skip=10pt,
  sharp corners,
  left=12pt,
  right=12pt,
  breakable,
}
```

PROOF The `proof` environment and the associated `tcolorbox` are provided by the following code in NotesTeX.sty:

```
\tcolorboxenvironment{proof}{
  boxrule=0pt,
  boxsep=0pt,
  blanker,
  borderline west={2pt}{0pt}{NavyBlue!80!white},
  before skip=10pt,
```

```
    after skip=10pt,
    left=12pt,
    right=12pt,
    breakable,
}
```

□

Example The `example` environment and the associated `tcolorbox` are provided by the following code in `NotesTeX.sty`:

```
\tcolorboxenvironment{example}{
    boxrule=0pt,
    boxsep=0pt,
    blanker,
    borderline west={2pt}{0pt}{Black},
    sharp corners,
    before skip=10pt,
    after skip=10pt,
    left=12pt,
    right=12pt,
    breakable,
}
```

Remark The `remark` environment and the associated `tcolorbox` are provided by the following code in `NotesTeX.sty`:[5]

[5]*Coexistence of* `amsthm` *environment and* `mn`

```
\tcolorboxenvironment{remark}{
    boxrule=0pt,
    boxsep=0pt,
    blanker,
    borderline west={2pt}{0pt}{Green},
    before skip=10pt,
    after skip=10pt,
    left=12pt,
    right=12pt,
    breakable,
}
```

SECTION 12

Fullpage Environment

The `fullpage` environment is defined by

$$\texttt{\textbackslash begin\{fullpage\}}$$
$$\cdots$$
$$\texttt{\textbackslash end\{fullpage\}}$$

with the width of the `fullpage` environment given by \textwidth+\marginparsep+\marginparwidth.The code in
`NotesTeX.sty` that is responsible for the `fullpage` environment is given by

```
\newenvironment{fullpage}{
{\smallskip\noindent
\begin{minipage}{\textwidth+\marginparwidth+\marginparsep}\hrule\smallskip\smallskip}
{\smallskip\smallskip\hrule\end{minipage}\vspace{.1in}
}
```

Remark Eliminating the \hrule in the code will remove the lines surrounding the `fullpage`
environment. Similarly, it is possible to change the vertical spacing after the `fullpage`
is over, by modifying the \vspace{} argument.

lec `multicols` may be used in conjunction with `fullpage`. I   environment. The `lec` environment is compatible with
entry find it useful for formatting exercises in multiple columns   `multicols` but `sidenote`, `marginnote` are not.
       and it makes the text distinct from the rest of the `fullpage`

SUBSECTION 12.1
Known Issues with Fullpage

Remark Since the `fullpage` environment uses a `minipage`, and minipages do not work over
multiple pages, one will need a new `fullpage` per page.

Remark If the `twoside` option is enabled in the `documentclass` header, then the `fullpage` is
known to bleed out beyond the margin.

SECTION 13
The Part Environment

In the original Jhep format, the \part environment is not special and is set to the
default given by the article class. In *NotesTeX*, the `part` environment produces the

following image. Furthermore the code responsible is noted below.

PART

#

```
\titleformat{\part}[hang]{{\thispagestyle{plain}}\Huge\bfseries}{\marginnote{
\begin{tcolorbox}
[width=\marginparwidth,height=\marginparwidth/2,colback=black!75!white,
   colframe=black!75!white,center title,fonttitle=\bfseries\normalsize,title=PART,
   text fill]

  \begin{center}
   {\color{white}\thepart}
  \end{center}

\end{tcolorbox}
}[-1.25in]}{0pt}{\Huge\bfseries}
```

This combines the `titlesec` and the `tcolorbox` packages, placing the title of the \part on the left hand side, and the \part number in the margin.

Advanced

PART

V

For those wanting to adjust the margin sizes, or the `fancyhdr` layout, there are a few comments that could be made here.

SECTION 14

Page Dimensions

NotesTeX relies on the `geometry` package to set its dimensions. The associated code is the deceptively simple chunk of code given by

```
\geometry{paperheight=11in,paperwidth=8.5in,
        marginparsep=.02\paperwidth,marginparwidth=.2\paperwidth,
        inner=.11\paperwidth,voffset=-1in,headheight=.02\paperheight,
        headsep=.03\paperheight,footskip=20pt,
        textheight=.795\paperheight,textwidth=.62\paperwidth}
```

Ignoring most of the arguments, the \paperheight and \paperwidth are set to be the standard 8.5×11 inches. All other options, with the exception of \voffset, inherit fractions of \paperheight and \paperwidth, the most important being \marginparwidth. Increasing \marginparwidth causes the margin to bleed off of the right side of the page. In order to increase this value, \textwidth must be decreased accordingly.

SECTION 15

Fancyhdr Layout

As mentioned before, fancyhdr is overridden on the title page, the contents page, and the \part page, and sets the header for all other pages through the code

```
\pagestyle{fancy}%
\newlength{\offset}%
\setlength{\offset}{\marginparwidth + \marginparsep}%
\renewcommand{\sectionmark}[1]{\markboth{#1}{}}%
\renewcommand{\subsectionmark}[1]{\markright{#1}{}}%


\fancypagestyle{fancynotes}{%
  \fancyhf{}%
  \fancyheadoffset[rh]{\offset}%
  \renewcommand{\headrulewidth}{0pt}%
  \fancyhead[L]{\textsc{\leftmark}}%
  \fancyhead[R]{\footnotesize \textit{\rightmark}~~~~ \thepage}%
}%
```

The header style is set so that it spans the width of the entire page as opposed to just the \textwidth through the line \fancyheadoffset[rh]{\myoddoffset}. The \sectionmark and \subsectionmark are set up so that the section appears on the left and subsections appear on the right along with the page number, and this is given in the last two lines of code.

SECTION 16

Alternative Language Integration

For languages written right to left, such as Persian, it is possible to use *NotesTeX*. A complied example can be found in the legacy V1 version on Github. Suggestions are welcome for a more comprehensive language integration.

SECTION 17

License

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[1]Please contact me at my email if you have any questions or comments.