mathjax2mobi：将 MathJax HTML 转换为电子书

项目简介

先大致讲讲项目情况。

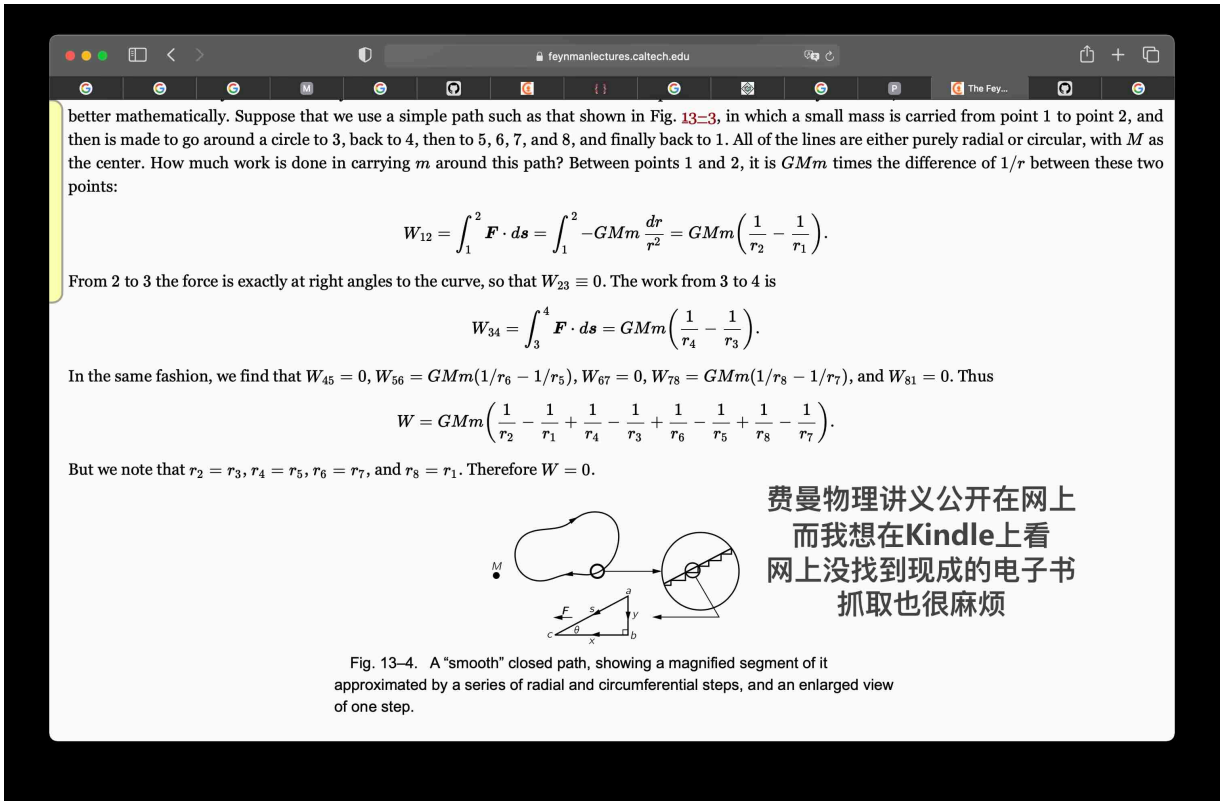


Figure 1: feynman_online

做完项目后，有点开心。写下了这样一段话。

写了一天代码，终于得到了漂亮的费曼物理讲义电子书！费曼物理讲义公开在网上，是用 latex 渲染的。人们常用 latex 来写论文，它对数学公式的渲染很棒。而公开在网上，用到了 mathjax 这个库。它把 latex 源码变成了 html 代码，生成了很多的 div 和 span 标签。电子书却不支持这种方式。这时，想法是抓取网页，逆向 mathjax 渲染，接着替换成 svg 图片。出现了挺多问题，一个是源码有很多的 latex 自定义宏，需要加上；第二个是内嵌很多 svg 会有问题。如果是单个 svg 倒没问题，很多的时候会出现问题。大概是浏览器和 svg 的诡异 Bug。这时只要把 svg 保存为文件，用 img 标签引入进来即可。公式也分为两种，一种是文本中间的公式，一种是单行的公式。所以，最后就得到了漂亮的电子书！

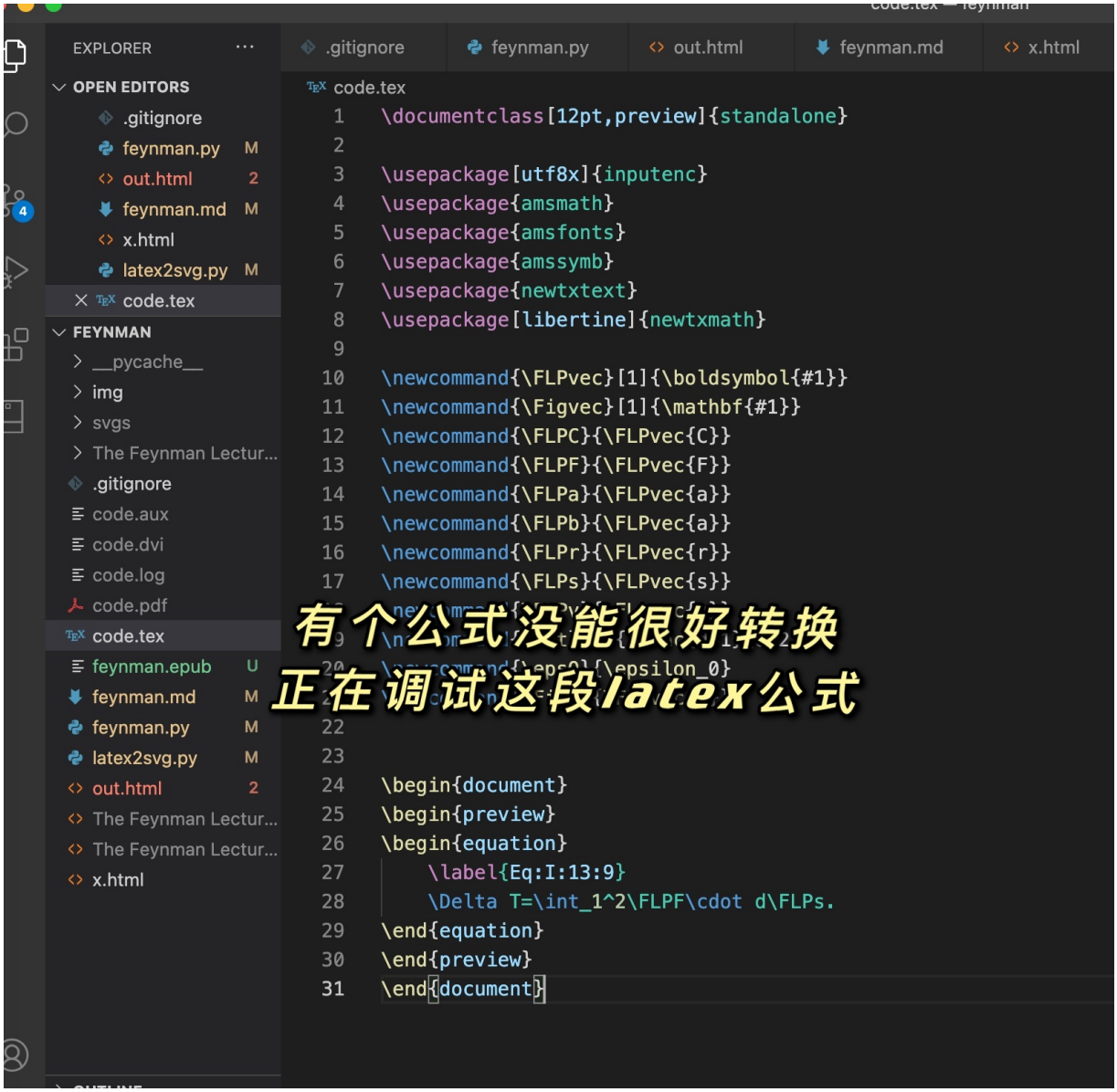


Figure 2: latex

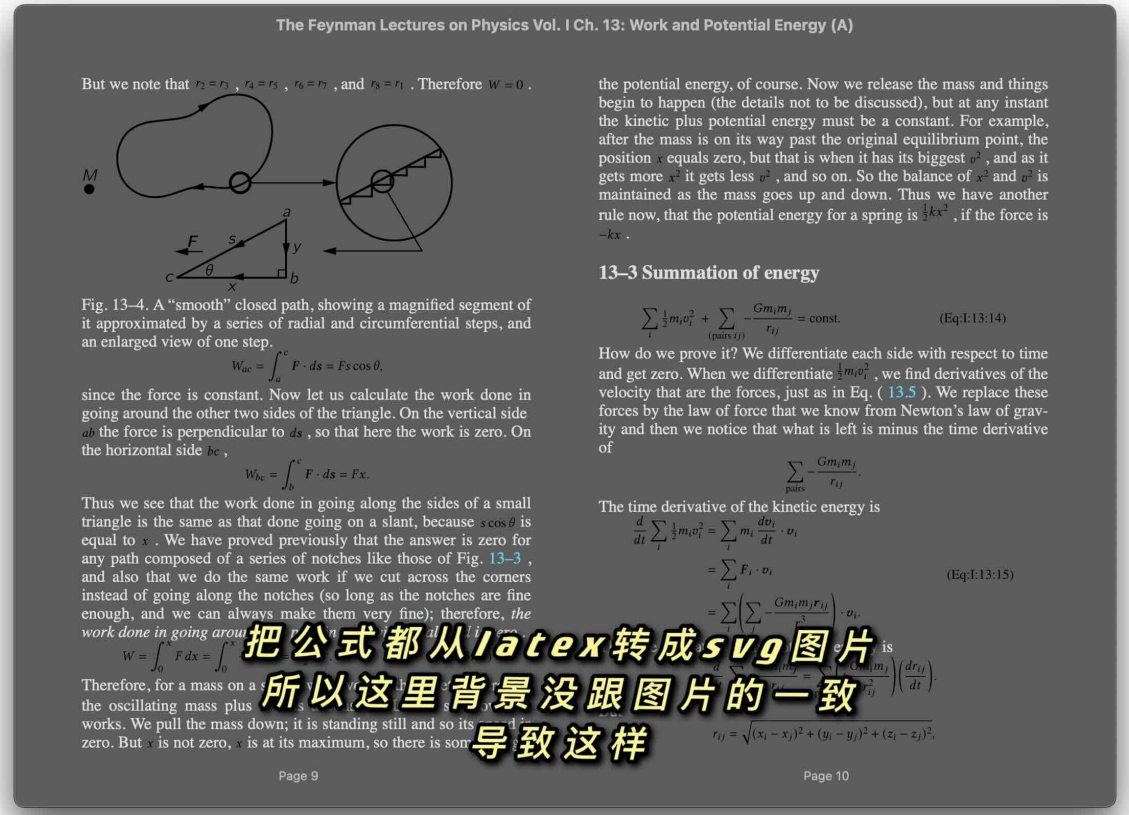


Figure 3: epub_black

From 2 to 3 the force is exactly at right angles to the curve, so that $W_{23} \equiv 0$. The work from 3 to 4 is

$$W_{34} = \int_3^4 \boldsymbol{F} \cdot d\boldsymbol{s} = GMm\left(\frac{1}{r_4} - \frac{1}{r_3}\right).$$

In the same fashion, we find that $W_{45} = 0$, $W_{56} = GMm(1/r_6 - 1/r_5)$, $W_{67} = 0$, $W_{78} = GMm(1/r_8 - 1/r_7)$, and $W_{81} = 0$. Thus

$$W = GMm\left(\frac{1}{r_2} - \frac{1}{r_1} + \frac{1}{r_4} - \frac{1}{r_3} + \frac{1}{r_6} - \frac{1}{r_5} + \frac{1}{r_8} - \frac{1}{r_7}\right).$$

But we note that $r_2 = r_3$, $r_4 = r_5$, $r_6 = r_7$, and $r_8 = r_1$. Therefore $W = 0$.

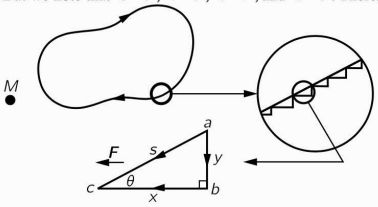


Fig. 13–4. A "smooth" closed path, showing a magnified segment of it approximated by a series of radial and circumferential steps, and an enlarged view of one step.

$$W_{ac} = \int_a^c \boldsymbol{F} \cdot d\boldsymbol{s} = Fs\cos\theta,$$

since the force is constant. Now let us calculate the work done in going around the other two sides of the triangle. On the vertical side ab the force is perpendicular to ds, so that here the work is zero. On the horizontal side bc,

$$W_{bc} = \int_b^c \boldsymbol{F} \cdot d\boldsymbol{s} = Fx.$$

Thus we see that the work done in going along the sides of a small triangle is the same as that done going on a slant, because $s\cos\theta$ is equal [illegible] We've proved previously that [illegible] any [illegible] notches like [illegible]

and also that we do the same work if we cut across the corners instead of going along the notches (so long as the notches are fine enough, and we can always make them very fine); therefore, *the work done in going around any path in a gravitational field is zero*.

$$W = \int_0^x F\,dx = \int_0^x -kx\,dx = -\tfrac{1}{2}kx^2. \qquad \text{(Eq:I:13:13)}$$

Therefore, for a mass on a spring we have that the kinetic energy of the oscillating mass plus $\frac{1}{2}kx^2$ is a constant. Let us see how this works. We pull the mass down; it is standing still and so its speed is zero. But x is not zero, x is at its maximum, so there is some energy, the potential energy, of course. Now we release the mass and things begin to happen (the details not to be discussed), but at any instant the kinetic plus potential energy must be a constant. For example, after the mass is on its way past the original equilibrium point, the position x equals zero, but that is when it has its biggest v^2, and as it gets more x^2 it gets less v^2, and so on. So the balance of x^2 and v^2 is maintained as the mass goes up and down. Thus we have another rule now, that the potential energy for a spring is $\frac{1}{2}kx^2$, if the force is $-kx$.

13–3 Summation of energy

$$\sum_i \tfrac{1}{2}m_i v_i^2 + \sum_{\text{(pairs } ij)} -\frac{Gm_i m_j}{r_{ij}} = \text{const.} \qquad \text{(Eq:I:13:14)}$$

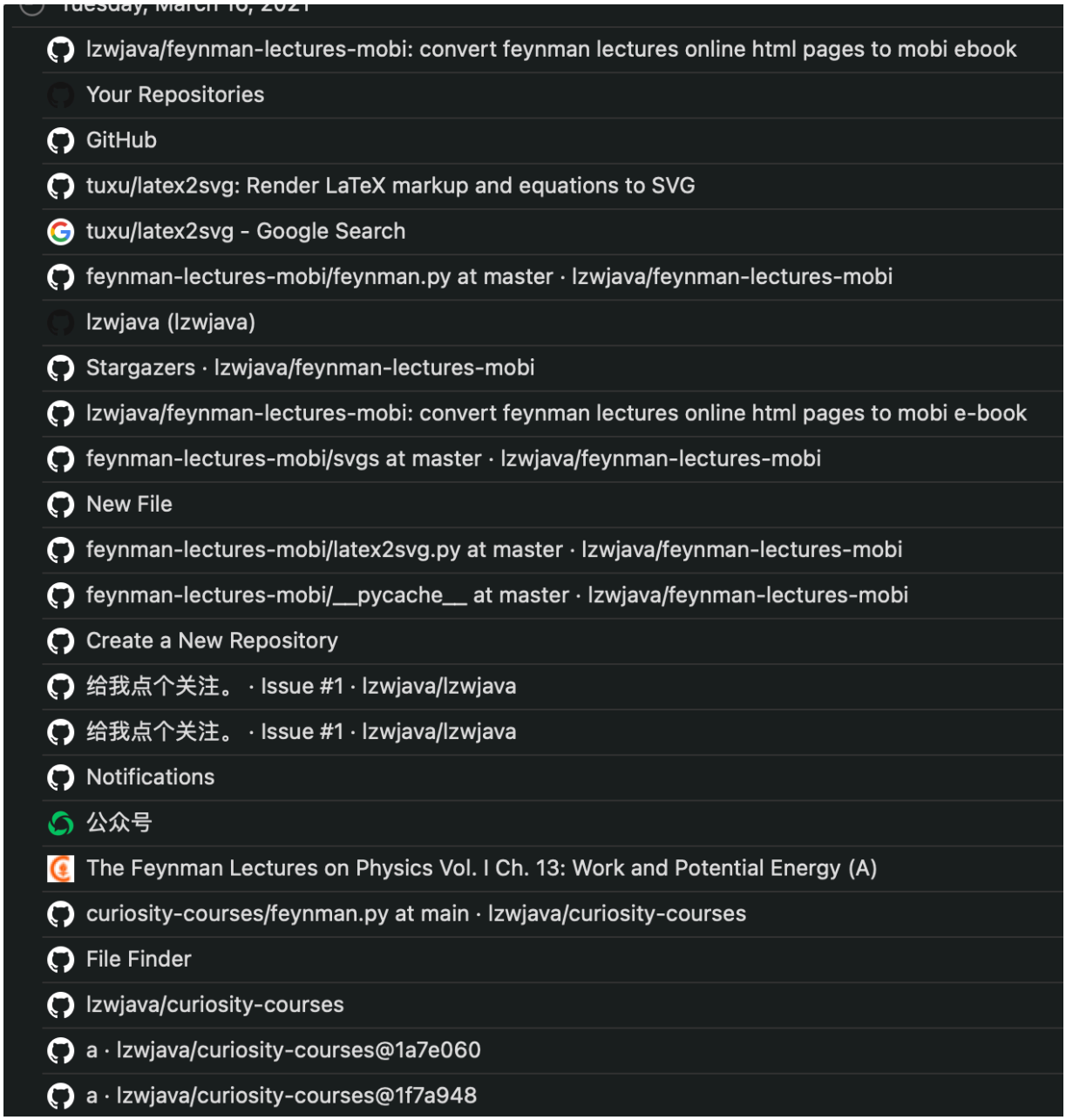
How do we prove it? We differentiate each side with respect to time and get zero. When we differentiate $\frac{1}{2}m_i v_i^2$, we find derivatives of the velocity that are the forces, just as in Eq. (13.5). We replace these forces by the law of force that we know from Newton's law of gravity and then we notice that what is left is minus the time derivative of

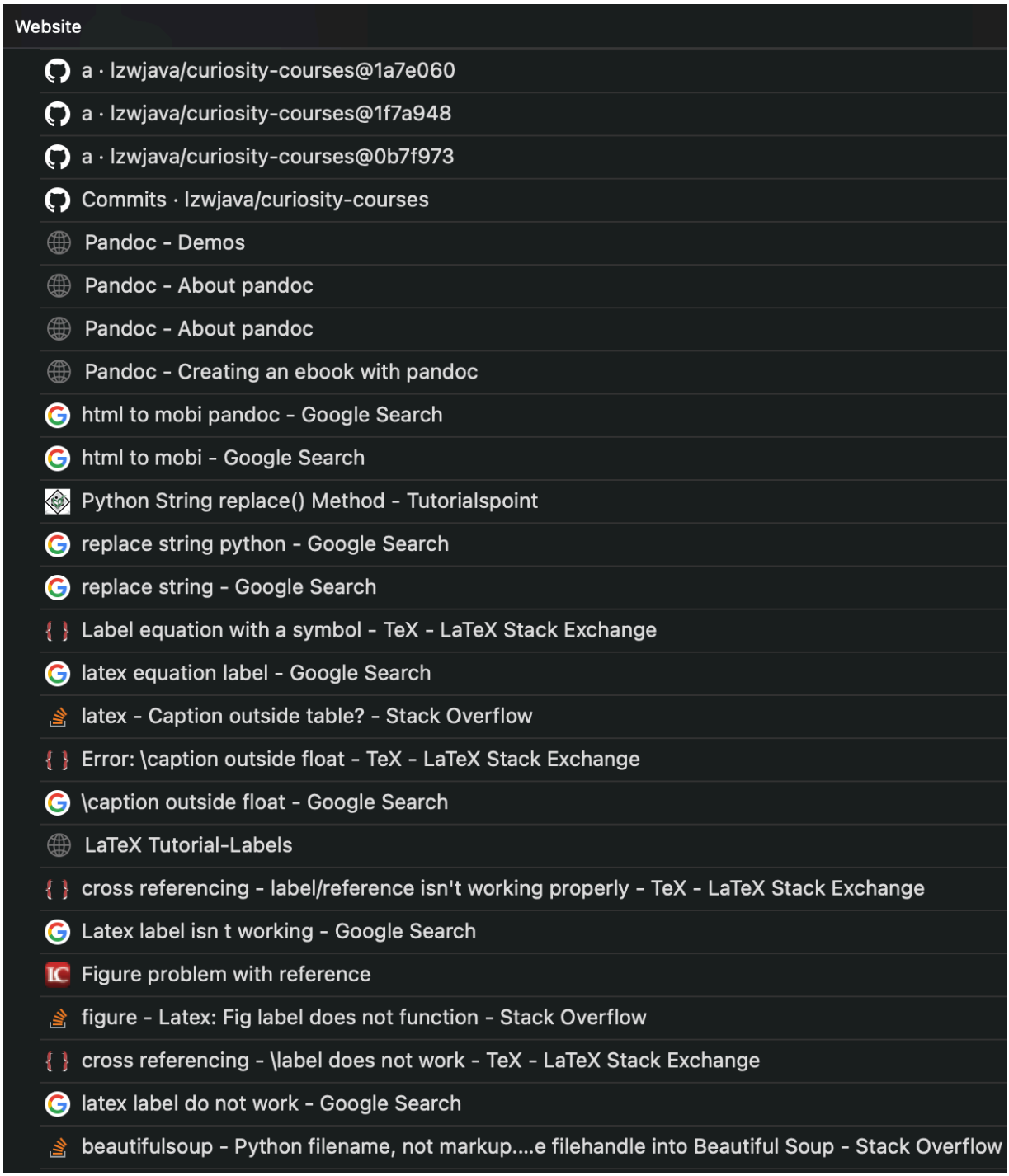
$$\sum_{\text{pairs}} -\frac{Gm_i m_j}{r_{ij}}.$$

Figure 4: epub_beautiful

查询的资料

这里记录了解决项目过程中访问的资料。因为这是一个教程，所以向学生展示一下大概做一个项目是怎么样的体验。




Website
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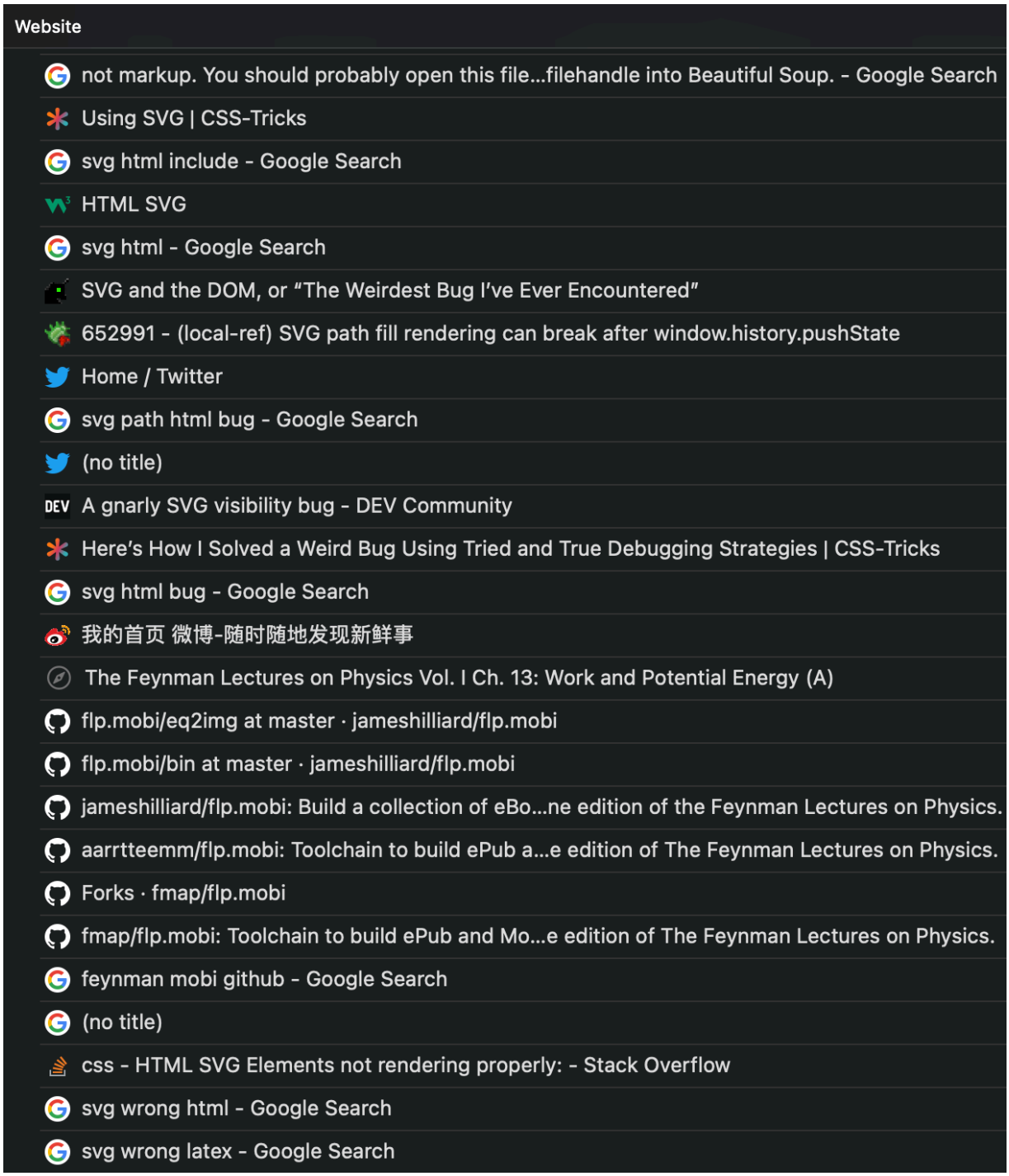
a · lzwjava/curiosity-courses@0b7f973
Commits · lzwjava/curiosity-courses
Pandoc - Demos
Pandoc - About pandoc
Pandoc - About pandoc
Pandoc - Creating an ebook with pandoc
html to mobi pandoc - Google Search
html to mobi - Google Search
Python String replace() Method - Tutorialspoint
replace string python - Google Search
replace string - Google Search
Label equation with a symbol - TeX - LaTeX Stack Exchange
latex equation label - Google Search
latex - Caption outside table? - Stack Overflow
Error: \caption outside float - TeX - LaTeX Stack Exchange
\caption outside float - Google Search
LaTeX Tutorial-Labels
cross referencing - label/reference isn't working properly - TeX - LaTeX Stack Exchange
Latex label isn t working - Google Search
Figure problem with reference
figure - Latex: Fig label does not function - Stack Overflow
cross referencing - \label does not work - TeX - LaTeX Stack Exchange
latex label do not work - Google Search
beautifulsoup - Python filename, not markup....e filehandle into Beautiful Soup - Stack Overflow


Website
not markup. You should probably open this file...filehandle into Beautiful Soup. - Google Search
Using SVG | CSS-Tricks
svg html include - Google Search
HTML SVG
svg html - Google Search
SVG and the DOM, or "The Weirdest Bug I've Ever Encountered"
652991 - (local-ref) SVG path fill rendering can break after window.history.pushState
Home / Twitter
svg path html bug - Google Search
(no title)
A gnarly SVG visibility bug - DEV Community
Here's How I Solved a Weird Bug Using Tried and True Debugging Strategies | CSS-Tricks
svg html bug - Google Search
我的首页 微博-随时随地发现新鲜事
The Feynman Lectures on Physics Vol. I Ch. 13: Work and Potential Energy (A)
flp.mobi/eq2img at master · jameshilliard/flp.mobi
flp.mobi/bin at master · jameshilliard/flp.mobi
jameshilliard/flp.mobi: Build a collection of eBo...ne edition of the Feynman Lectures on Physics.
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Forks · fmap/flp.mobi
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feynman mobi github - Google Search
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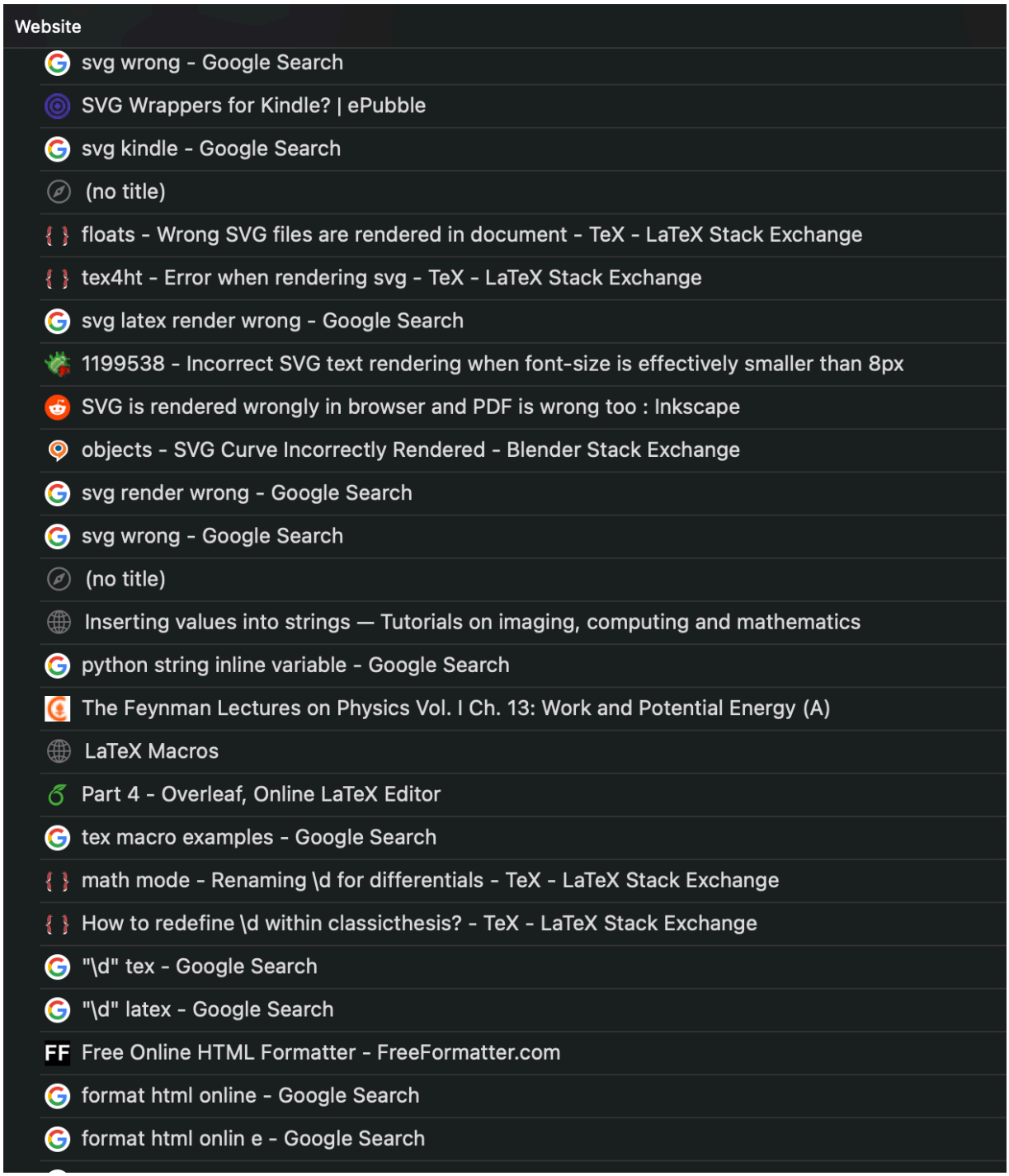
css - HTML SVG Elements not rendering properly: - Stack Overflow
svg wrong html - Google Search
svg wrong latex - Google Search


Website
svg wrong - Google Search
SVG Wrappers for Kindle? | ePubble
svg kindle - Google Search
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floats - Wrong SVG files are rendered in document - TeX - LaTeX Stack Exchange
tex4ht - Error when rendering svg - TeX - LaTeX Stack Exchange
svg latex render wrong - Google Search
1199538 - Incorrect SVG text rendering when font-size is effectively smaller than 8px
SVG is rendered wrongly in browser and PDF is wrong too : Inkscape
objects - SVG Curve Incorrectly Rendered - Blender Stack Exchange
svg render wrong - Google Search
svg wrong - Google Search
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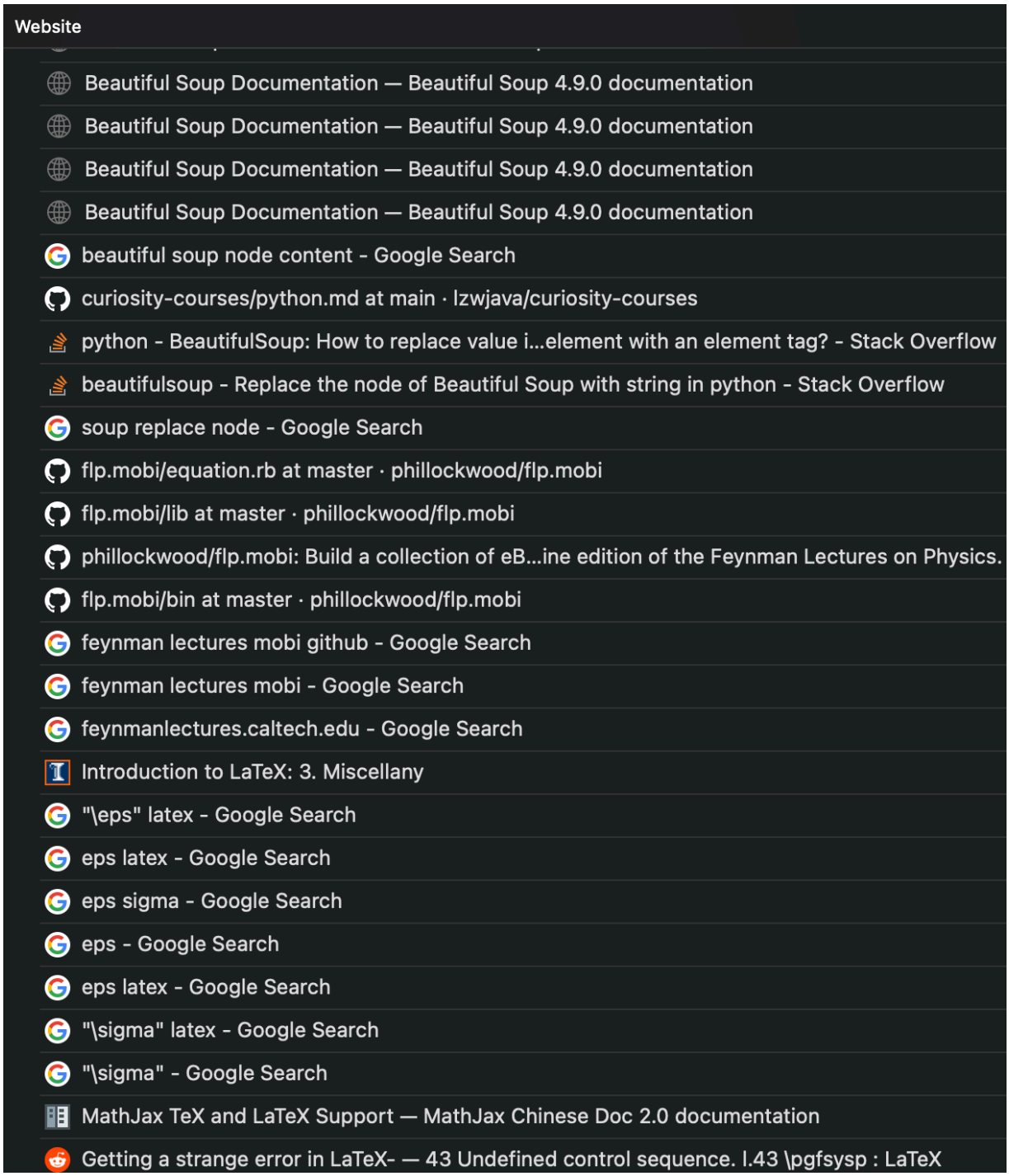
Inserting values into strings — Tutorials on imaging, computing and mathematics
python string inline variable - Google Search
The Feynman Lectures on Physics Vol. I Ch. 13: Work and Potential Energy (A)
LaTeX Macros
Part 4 - Overleaf, Online LaTeX Editor
tex macro examples - Google Search
math mode - Renaming \d for differentials - TeX - LaTeX Stack Exchange
How to redefine \d within classicthesis? - TeX - LaTeX Stack Exchange
"\d" tex - Google Search
"\d" latex - Google Search
Free Online HTML Formatter - FreeFormatter.com
format html online - Google Search
format html onlin e - Google Search

Website

cpython/Lib at master · python/cpython
python/cpython: The Python programming language
Python
python github - Google Search
Welcome to Python.org
Beautiful Soup Documentation — Beautiful Soup 4.9.0 documentation
Beautiful Soup Documentation — Beautiful Soup 4.9.0 documentation
beautiful soup insert - Google Search
8. Errors and Exceptions — Python 3.9.2 documentation
python try catch - Google Search
LaTeX to Image converter
latex2png - convert latex equations to images
latex equation to image - Google Search
Python bs4 - find_all multiple tags and classes - DebugCN
How to get two tags in findall using BeautifulSoup | Edureka Community
Python BeautifulSoup give multiple tags to findAll - Stack Overflow
beautifulsoup find_all multiple tags - Google Search
Beautiful Soup documentation
Beautiful Soup documentation
findall beautifulsoup - Google Search
findAll - Google Search
Python Random randint() Method
python rand int - Google Search
python - How do I insert an attribute using BeautifulSoup? - Stack Overflow
python - BeautifulSoup - adding attribute to tag - Stack Overflow
beautifulsoup add attribute - Google Search


Website
Beautiful Soup Documentation — Beautiful Soup 4.9.0 documentation
Beautiful Soup Documentation — Beautiful Soup 4.9.0 documentation
Beautiful Soup Documentation — Beautiful Soup 4.9.0 documentation
Beautiful Soup Documentation — Beautiful Soup 4.9.0 documentation
beautiful soup node content - Google Search
curiosity-courses/python.md at main · lzwjava/curiosity-courses
python - BeautifulSoup: How to replace value i...element with an element tag? - Stack Overflow
beautifulsoup - Replace the node of Beautiful Soup with string in python - Stack Overflow
soup replace node - Google Search
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phillockwood/flp.mobi: Build a collection of eB...ine edition of the Feynman Lectures on Physics.
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feynmanlectures.caltech.edu - Google Search
Introduction to LaTeX: 3. Miscellany
"\eps" latex - Google Search
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eps sigma - Google Search
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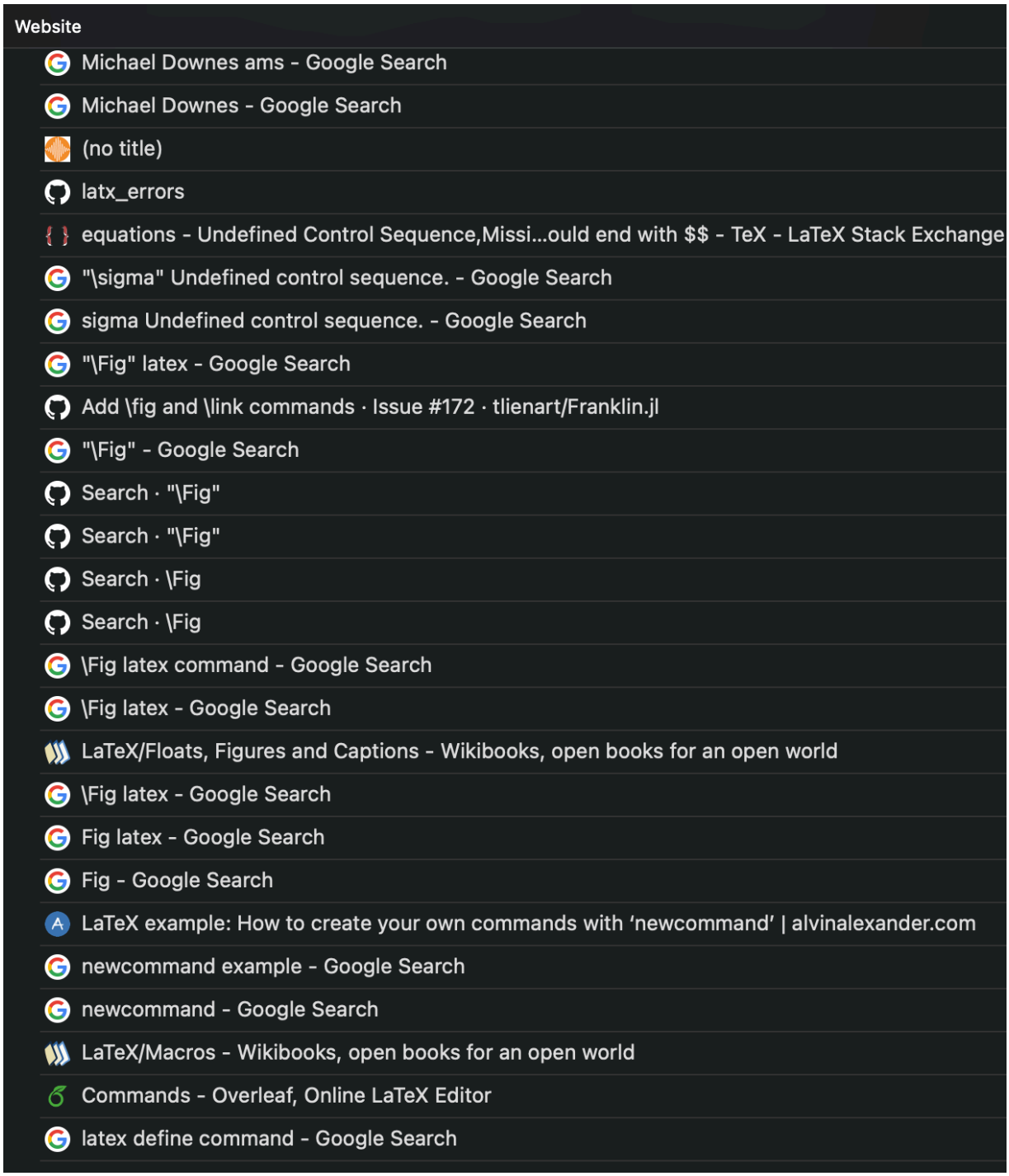
MathJax TeX and LaTeX Support — MathJax Chinese Doc 2.0 documentation
Getting a strange error in LaTeX- — 43 Undefined control sequence. l.43 \pgfsysp : LaTeX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equations - Undefined Control Sequence,Missi...ould end with $$ - TeX - LaTeX Stack Exchange
"\sigma" Undefined control sequence. - Google Search
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"\Fig" latex - Google Search
Add \fig and \link commands · Issue #172 · tlienart/Franklin.jl
"\Fig" - Google Search
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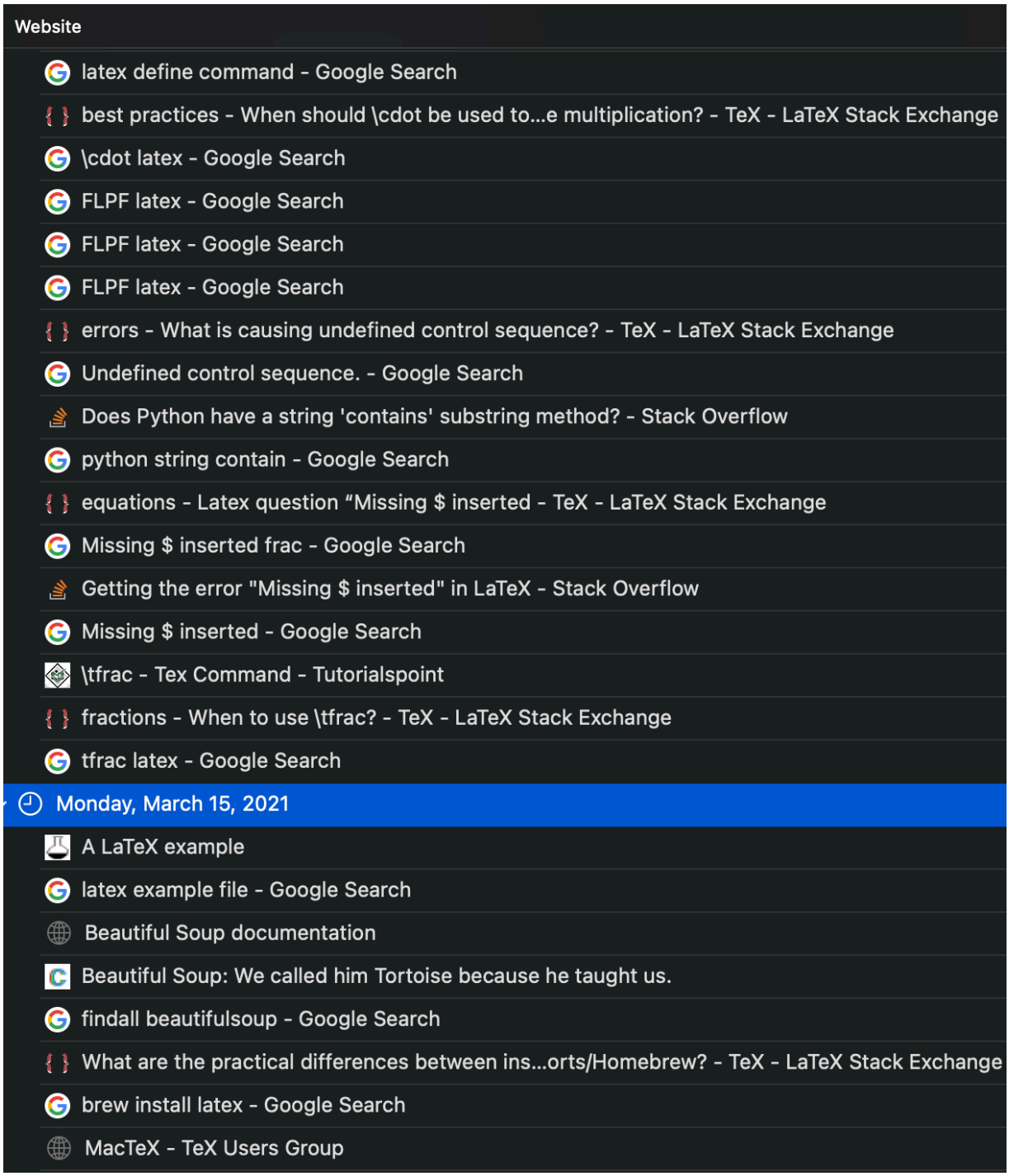
\Fig latex command - Google Search
\Fig latex - Google Search
LaTeX/Floats, Figures and Captions - Wikibooks, open books for an open world
\Fig latex - Google Search
Fig latex - Google Search
Fig - Google Search
LaTeX example: How to create your own commands with 'newcommand' | alvinalexander.com
newcommand example - Google Search
newcommand - Google Search
LaTeX/Macros - Wikibooks, open books for an open world
Commands - Overleaf, Online LaTeX Editor
latex define command - Google Search



开始项目

费曼物理讲义已经在公开在网上可以阅读。我想在 `Kindle` 上看它。然而因为它有挺多的数学公式。它最初的稿子应该是用 `latex` 做的。它用 `mathjax` 这个库来把 `latex` 格式的内容显示在网页上。

举个例子。

```
<span class="MathJax_Preview" style="color: inherit; display: none;">
</span>
<div class="MathJax_Display">
    <span class="MathJax MathJax_FullWidth" id="MathJax-Element-10-Frame" tabindex="0" style="">
              <span class="mi" id="MathJax-Span-159" style="font-family: MathJax_Math-italic;">d<span s
                </span>
    </span>
</div>
<script type="math/tex; mode=display" id="MathJax-Element-10">\begin{equation}
\label{Eq:I:13:3}
dT/dt = Fv.
\end{equation}
</script>
```

上面是截取的一段 html 代码。这一块 html 代码中。script 标签下是 latex 的原样文本。mathjax 把它变成很多的 span。来显示它。

我们现在有个思路。就是把 mathjax 的显示方法改成 svg 图片。

从 GitHub 上找到一个项目 tuxu/latex2svg。

```
from latex2svg import latex2svg
out = latex2svg(r'\( e^{i \pi} + 1 = 0 \)')
print(out['depth'])
print(out['svg'])
```

试着运行，但出错了。

```
    raise RuntimeError('latex not found')
RuntimeError: latex not found
```

看看代码。

```
    # Run LaTeX and create DVI file
    try:
        ret = subprocess.run(shlex.split(params['latex_cmd']+' code.tex'),
                             stdout=subprocess.PIPE, stderr=subprocess.PIPE,
                             cwd=working_directory)
        ret.check_returncode()
    except FileNotFoundError:
        raise RuntimeError('latex not found')
```

原来这也依赖于 latex 命令。

安装一下。

```
brew install --cask mactex
==> Caveats
You must restart your terminal window for the installation of MacTex CLI tools to take effect.
Alternatively, Bash and Zsh users can run the command:
  eval "$(/usr/libexec/path_helper)"
==> Downloading http://mirror.ctan.org/systems/mac/mactex/mactex-20200407.pkg
==> Downloading from https://mirrors.aliyun.com/CTAN/systems/mac/mactex/mactex-20200407.pkg
######################################################################## 100.0%
All formula dependencies satisfied.
==> Installing Cask mactex
==> Running installer for mactex; your password may be necessary.
installer: Package name is MacTeX
installer: choices changes file '/private/tmp/choices20210315-4643-5884ro.xml' applied
installer: Installing at base path /
installer: The install was successful.
   mactex was successfully installed!
```

安装成功。

```
% latex
This is pdfTeX, Version 3.14159265-2.6-1.40.21 (TeX Live 2020) (preloaded format=latex)
 restricted \write18 enabled.
**
```

```
out = latex2svg(r'\( e^{i \pi} + 1 = 0 \)')
print(out['depth'])
print(out['svg'])


svg = open('1.svg', 'w')
svg.write(out['svg'])
svg.close()
```

可以生成 svg 了。

所以试试把 mathjax 中得到的 latex 文本都生成一下。

```
from bs4 import BeautifulSoup
```

```
from latex2svg import latex2svg

file = open('The Feynman Lectures on Physics Vol. I Ch. 13_ Work and Potential Energy (A).html')
content = file.read()

soup = BeautifulSoup(content)

mathjaxs = soup.findAll('script', {'type': 'math/tex'})
for mathjax in mathjaxs:
    print(mathjax.string)
    out = latex2svg(mathjax.string)
    print(out['svg'])
```

可惜出错了。

```
    raise CalledProcessError(self.returncode, self.args, self.stdout,
subprocess.CalledProcessError: Command '['latex', '-interaction', 'nonstopmode', '-halt-on-error', 'cod
```

具体哪个公式错了呢。

```
\tfrac{1}{2}mv^2
```

latex

来学习一下 latex。

```
\documentclass[12pt]{article}
\usepackage{lingmacros}
\usepackage{tree-dvips}
\begin{document}

\section*{Notes for My Paper}

Don't forget to include examples of topicalization.
They look like this:

{\small
\enumsentence{Topicalization from sentential subject:\\
\shortex{7}{a John$_i$ [a & kltukl & [el &
  {\bf l-}oltoir & er & ngii$_i$ & a Mary]]}
```

```
{ & {\bf R-}clear & {\sc comp} &
  {\bf IR}.{\sc 3s}-love   & P & him & }
{John, (it's) clear that Mary loves (him).}}
}

\subsection*{How to handle topicalization}

I'll just assume a tree structure like (\ex{1}).

{\small
\enumsentence{Structure of A$'$ Projections:\\ [2ex]
\begin{tabular}[t]{cccc}
    & \node{i}{CP}\\ [2ex]
    \node{ii}{Spec} &   &\node{iii}{C$'$}\\ [2ex]
        &\node{iv}{C} & & \node{v}{SAgrP}
\end{tabular}
\nodeconnect{i}{ii}
\nodeconnect{i}{iii}
\nodeconnect{iii}{iv}
\nodeconnect{iii}{v}
}
}

\subsection*{Mood}

Mood changes when there is a topic, as well as when
there is WH-movement.  \emph{Irrealis} is the mood when
there is a non-subject topic or WH-phrase in Comp.
\emph{Realis} is the mood when there is a subject topic
or WH-phrase.

\end{document}
```

网上找到一段样例的 latex 源码。

```
% latex code.tex
This is pdfTeX, Version 3.14159265-2.6-1.40.21 (TeX Live 2020) (preloaded format=latex)
```

```
 restricted \write18 enabled.
entering extended mode
(./code.tex
LaTeX2e <2020-02-02> patch level 5
L3 programming layer <2020-03-06>
(/usr/local/texlive/2020/texmf-dist/tex/latex/base/article.cls
Document Class: article 2019/12/20 v1.4l Standard LaTeX document class
(/usr/local/texlive/2020/texmf-dist/tex/latex/base/size12.clo))
(/usr/local/texlive/2020/texmf-dist/tex/latex/tree-dvips/lingmacros.sty)
(/usr/local/texlive/2020/texmf-dist/tex/latex/tree-dvips/tree-dvips.sty
tree-dvips version .91 of May 16, 1995
) (/usr/local/texlive/2020/texmf-dist/tex/latex/l3backend/l3backend-dvips.def)
(./code.aux) [1] (./code.aux) )
Output written on code.dvi (1 page, 3416 bytes).
Transcript written on code.log.
```

来对着源码和渲染后的效果，看看能学到什么。

```
\begin{document}
\end{document}
```

这样来把文档裹起来。

```
\section*{Notes for My Paper}
```

这表示 `section` 标题开头。

```
\subsection*{How to handle topicalization}
```

这表示子标题。

```
\shortex{7}{a John$_i$ [a & kltukl & [el &
  {\bf l-}oltoir & er & ngii$_i$ & a Mary]]}
```

可见 `$_i$` 来表示下标。`{\bf l-}` 来表示加粗。

```
\enumsentence{Structure of A$'$ Projections:\\ [2ex]
\begin{tabular}[t]{cccc}
    & \node{i}{CP}\\ [2ex]
    \node{ii}{Spec} &   &\node{iii}{C$'$}\\ [2ex]
        &\node{iv}{C} & & \node{v}{SAgrP}
\end{tabular}
\nodeconnect{i}{ii}
```

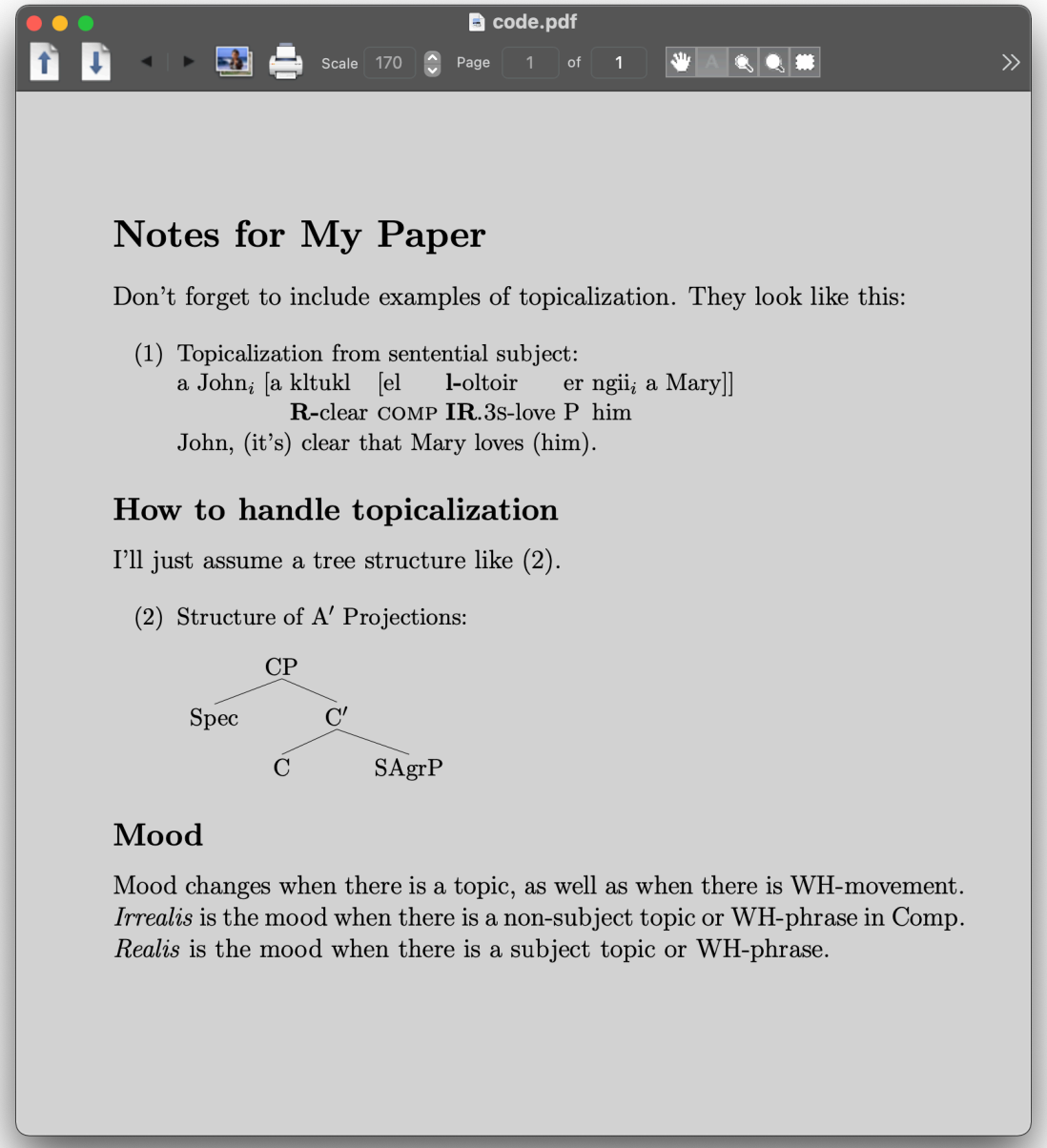


Figure 5: latex

a John$_i$ [a kltukl [el l-oltoir er ngii$_i$ a Mary]]

Figure 6: shortex

```
\nodeconnect{i}{iii}
\nodeconnect{iii}{iv}
\nodeconnect{iii}{v}
}
```

注意到 nodeconnect 来表示连线。

latex 转换成 svg

继续项目。

```
\documentclass[16pt]{article}
\usepackage{amsmath}
\begin{document}

\[\tfrac{1}{2}mv^2\]

\end{document}
```

这样可以正确地被渲染。在代码里无法被渲染，可能是因为没有加上\usepackage{amsmath}。

```
\documentclass[12pt,preview]{standalone}

\usepackage[utf8x]{inputenc}
\usepackage{amsmath}
\usepackage{amsfonts}
\usepackage{amssymb}
\usepackage{newtxtext}
\usepackage[libertine]{newtxmath}

\begin{document}
\begin{preview}
\tfrac{1}{2}mv^2
\end{preview}
\end{document}
```

```
! Missing $ inserted.
<inserted text>
                $
l.12 \tfrac{1}{2}
```

```
                mv^2
```

这样出错了。而改成一下这样就可以。

```
\[\tfrac{1}{2}mv^2\]
```

进行各种试探。

```
from bs4 import BeautifulSoup
from latex2svg import latex2svg

file = open('The Feynman Lectures on Physics Vol. I Ch. 13_ Work and Potential Energy (A).html')
content = file.read()

soup = BeautifulSoup(content, features="lxml")

mathjaxs = soup.findAll('script', {'type': 'math/tex'})
for mathjax in mathjaxs:
    print(mathjax.string)
    wrap = '$' + mathjax.string + '$'
    # if 'frac' in mathjax.string:
    #     wrap = '$' + mathjax.string + '$'
    if 'FLP' in mathjax.string:
        continue
    elif 'Fig' in mathjax.string:
        continue
    elif 'eps' in mathjax.string:
        continue
    out = latex2svg(wrap)
    # print(out)
    node = BeautifulSoup(out['svg'], features="lxml")
    svg = node.find('svg')
    mathjax.insert_after(svg)
    # print(out['svg'])
    # break
    # mathjax.replaceWith(out['svg'])

    # print(dir(mathjax))
    # break
```

```
    # out = latex2svg(wrap)
    # print(out['svg'])

# print(len(soup.contents))

output_file = open('out.html', 'w')
output_file.write(soup.prettify())
output_file.close()
# print(soup.contents)

# out = latex2svg(r'\( e^{i \pi} + 1 = 0 \)')
# print(out['depth'])
# print(out['svg'])

# svg = open('1.svg', 'w')
# svg.write(out['svg'])
# svg.close()
```

这些我都在试探什么呢。

```
    if 'FLP' in mathjax.string:
        continue
    elif 'Fig' in mathjax.string:
        continue
    elif 'eps' in mathjax.string:
        continue
```

这里当解析到有 FLP、Fig、eps 在 latex 源码的时候，转换的过程出错了。

例如，在 HTML 中，有这样的脚本：

```
<script type="math/tex" id="MathJax-Element-11">\FLPF\cdot\FLPv</script>
```

解析拿到：

```
\FLPF\cdot\FLPv
```

当在代码里转换的时候出错了。也即，latex2svg.py 出错了。这里就是用 latex 程序来转换。

code.tex:

```
\documentclass[12pt,preview]{standalone}
```

```
\usepackage[utf8x]{inputenc}
\usepackage{amsmath}
\usepackage{amsfonts}
\usepackage{amssymb}
\usepackage{newtxtext}
\usepackage[libertine]{newtxmath}

\begin{document}
\begin{preview}
\begin{equation}
    \FLPF\cdot\FLPv
\end{equation}
\end{preview}
\end{document}
```

```
$latex code.tex
! Undefined control sequence.
l.13     \FLPF
              \cdot\FLPv
?
```

这到底是什么问题。我后来才注意到在 `html` 中的这段代码。

```
<script type="text/x-mathjax-config;executed=true">
      MathJax.Hub.Config({
        TeX: {
          Macros: {
            FLPvec: ["\\boldsymbol{#1}", 1], Figvec: ["\\mathbf{#1}", 1], FLPC: ["\\FLPvec{C}", 0], FLP
          }
        }
      });
</script>
```

这表示网页在渲染的时候，给 `MathJax` 设置上了宏。所以我们的 `latex` 转换源码里也应该加上。来加上它们。

```
\documentclass[12pt,preview]{standalone}
```

```
\usepackage[utf8x]{inputenc}
\usepackage{amsmath}
\usepackage{amsfonts}
\usepackage{amssymb}
\usepackage{newtxtext}
\usepackage[libertine]{newtxmath}

\newcommand{\FLPvec}[1]{\boldsymbol{#1}}
\newcommand{\Figvec}[1]{\mathbf{#1}}
\newcommand{\FLPC}{\FLPvec{C}}
\newcommand{\FLPF}{\FLPvec{F}}
\newcommand{\FLPa}{\FLPvec{a}}
\newcommand{\FLPb}{\FLPvec{a}}
\newcommand{\FLPr}{\FLPvec{r}}
\newcommand{\FLPs}{\FLPvec{s}}
\newcommand{\FLPv}{\FLPvec{v}}
\newcommand{\ddt}[2]{\frac{d#1}{d#2}}
\newcommand{\eps0}{\epsilon_0}
\newcommand{\FigC}{\Figvec{C}}
\begin{document}
\begin{preview}
\begin{equation}
    \FLPF\cdot\FLPv
\end{equation}
\end{preview}
\end{document}
```

这样就对了。

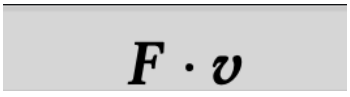


Figure 7: fv1

分析代码

来看看最后的代码。

```
import subprocess
from bs4 import BeautifulSoup
from latex2svg import latex2svg

def clean_mathjax(soup, name, cls):
    previews = soup.findAll(name, {'class': cls})
    for preview in previews:
        preview.decompose()

def clean_script(soup):
    scripts = soup.findAll('script')
    for s in scripts:
        s.decompose()

def wrap_latex(mathjax, equation = False):
    wrap = ''
    if equation:
        wrap = mathjax.string
    else:
        wrap = '$' + mathjax.string + '$'
    wrap = wrap.replace('label', 'tag')
    return wrap

def wrap_svg(svg, equation):
    if equation:
        p = BeautifulSoup(f'<div style="text-align:center;"></div>', features="lxml")
        p.div.append(svg)
        return p.div
    else:
        return svg

def to_svg(mathjaxs, equation=False):
    if equation:
        svg_prefix = 'eq_'
    else:
        svg_prefix = 'in_'
```

```
    i = 0
    for mathjax in mathjaxs:
        print(mathjax.string)
        wrap = wrap_latex(mathjax, equation=equation)
        out = {}
        try:
            out = latex2svg(wrap)
        except subprocess.CalledProcessError as err:
            raise err

        f = open(f'svgs/{svg_prefix}{i}.svg', 'w')
        f.write(out['svg'])
        f.close()

        node = BeautifulSoup('<img>', features="lxml")
        img = node.find('img')
        img.attrs['src'] = f'./svgs/{svg_prefix}{i}.svg'
        img.attrs['style'] = 'vertical-align: middle; margin: 0.5em 0;'

        p = wrap_svg(img, equation)
        mathjax.insert_after(p)
        i +=1

def main():
    file = open('The Feynman Lectures on Physics Vol. I Ch. 13_ Work and Potential Energy (A).html')
    content = file.read()

    soup = BeautifulSoup(content, features="lxml")
    clean_mathjax(soup, 'span', 'MathJax')
    clean_mathjax(soup, 'div', 'MathJax_Display')
    clean_mathjax(soup, 'span', 'MathJax_Preview')

    mathjaxs = soup.findAll('script', {'type': 'math/tex'})
    to_svg(mathjaxs, equation=False)

    mathjaxs = soup.findAll('script', {'type': 'math/tex; mode=display'})
```

```
    to_svg(mathjaxs, equation=True)

    clean_script(soup)

    output_file = open('out.html', 'w')
    output_file.write(soup.prettify())
    output_file.close()

main()
```

当我们想转换整个电子书时，可以先用一个页面来试试。

```
    file = open('The Feynman Lectures on Physics Vol. I Ch. 13_ Work and Potential Energy (A).html')
    content = file.read()
```

这里便是下载了一个页面。

MathJax 生成了很多的 div 和 span。意思是比如 T+U=const。MathJax 这样来生成。

```
<span class="MathJax">T</span>
<span class="MathJax">+</span>
<span class="MathJax">U</span>
<span class="MathJax">=</span>
<span class="MathJax">const</span>
```

这些很讨厌，也会影响我们的文本。因为已经有 svg 了，不需要这些了。

```
def clean_mathjax(soup, name, cls):
    previews = soup.findAll(name, {'class': cls})
    for preview in previews:
        preview.decompose()

    clean_mathjax(soup, 'span', 'MathJax')
    clean_mathjax(soup, 'div', 'MathJax_Display')
    clean_mathjax(soup, 'span', 'MathJax_Preview')
```

把它们都去掉。

```
    mathjaxs = soup.findAll('script', {'type': 'math/tex'})
    to_svg(mathjaxs, equation=False)

    mathjaxs = soup.findAll('script', {'type': 'math/tex; mode=display'})
```

```
    to_svg(mathjaxs, equation=True)
```

注意到这里分成两种的 script。

```
m(dv/dt)=F
```

这是内嵌形式的。

```
\begin{equation}
\underset{\text{K.E.}}{\tfrac{1}{2}mv^2}+
\underset{\text{P.E.}}{\vphantom{\tfrac{1}{2}}mgh}=\text{const},\notag
```

这是成段形式的。

当时内嵌形式时，转换要在表达式左右加上 $ 或 []。否则就有可能出错。

```
\begin{document}
\begin{preview}
\tfrac{1}{2}mv^2
\end{preview}
\end{document}
```

```
! Missing $ inserted.
<inserted text>
                $
l.26 \tfrac{1}{2}
                 mv^2
```

得改成这样:

```
\begin{document}
\begin{preview}
$\tfrac{1}{2}mv^2$
\end{preview}
\end{document}
```

接下来看看如何转换 latex 成 svg。

```
    if equation:
        svg_prefix = 'eq_'
    else:
        svg_prefix = 'in_'
```

```
% tree svgs
svgs
```

```
eq_0.svg
eq_1.svg
in_0.svg
```

这样来保存 svg。

```
def wrap_latex(mathjax, equation = False):
    wrap = ''
    if equation:
        wrap = mathjax.string
    else:
        wrap = '$' + mathjax.string + '$'
    wrap = wrap.replace('label', 'tag')
    return wrap
```

这里来对 latex 源码进行一些调整。注意到 label 变成了 tag。

$$\sum_i \tfrac{1}{2} m_i v_i^2 + \sum_{(\text{pairs } ij)} -\frac{G m_i m_j}{r_{ij}} = \text{const.} \qquad \text{(Eq:I:13:14)}$$

Figure 8: tag

注意右边的 (Eq:I:13:14)。如果是 label 的话，则没解析成功。这会显示的是 (1)。这里将就用 tag 表示一下，暂时没有深究。

接着就进行调用 latex2svg.py。

```
        out = {}
        try:
            out = latex2svg(wrap)
        except subprocess.CalledProcessError as err:
            raise err
```

看看 latex2svg.py。

```
    # Run LaTeX and create DVI file
    try:
        ret = subprocess.run(shlex.split(params['latex_cmd']+' code.tex'),
                             stdout=subprocess.PIPE, stderr=subprocess.PIPE,
                             cwd=working_directory)
        ret.check_returncode()
```

```
    except FileNotFoundError:
        raise RuntimeError('latex not found')
```

这里是在调用 latex 命令。

```
 % latex --help
Usage: pdftex [OPTION]... [TEXNAME[.tex]] [COMMANDS]
   or: pdftex [OPTION]... \FIRST-LINE
   or: pdftex [OPTION]... &FMT ARGS
  Run pdfTeX on TEXNAME, usually creating TEXNAME.pdf.
```

```
    try:
        ret = subprocess.run(shlex.split(params['dvisvgm_cmd']+' code.dvi'),
                             stdout=subprocess.PIPE, stderr=subprocess.PIPE,
                             cwd=working_directory, env=env)
        ret.check_returncode()
    except FileNotFoundError:
        raise RuntimeError('dvisvgm not found')
```

这里是在调用 dvisvgm 命令。

```
% dvisvgm
dvisvgm 2.9.1

This program converts DVI files, as created by TeX/LaTeX, as well as
EPS and PDF files to the XML-based scalable vector graphics format SVG.

Usage: dvisvgm [options] dvifile
       dvisvgm --eps [options] epsfile
       dvisvgm --pdf [options] pdffile
```

上面说的 latex 自定义宏写在哪儿呢。这里要改一下 latex2svg.py。改改 default_preamble。

```
default_preamble = r"""
\usepackage[utf8x]{inputenc}
\usepackage{amsmath}
\usepackage{amsfonts}
\usepackage{amssymb}
\usepackage{newtxtext}
\usepackage[libertine]{newtxmath}
```

```
\newcommand{\FLPvec}[1]{\boldsymbol{#1}}
\newcommand{\Figvec}[1]{\mathbf{#1}}
\newcommand{\FLPC}{\FLPvec{C}}
\newcommand{\FLPF}{\FLPvec{F}}
\newcommand{\FLPa}{\FLPvec{a}}
\newcommand{\FLPb}{\FLPvec{a}}
\newcommand{\FLPr}{\FLPvec{r}}
\newcommand{\FLPs}{\FLPvec{s}}
\newcommand{\FLPv}{\FLPvec{v}}
\newcommand{\ddt}[2]{\frac{d#1}{d#2}}
\newcommand{\epsO}{\epsilon_0}
\newcommand{\FigC}{\Figvec{C}}
"""
```

转换成功后，写入到文件。

```
        f = open(f'svgs/{svg_prefix}{i}.svg', 'w')
        f.write(out['svg'])
        f.close()
```

继续。

```
        node = BeautifulSoup('<img>', features="lxml")
        img = node.find('img')
        img.attrs['src'] = f'./svgs/{svg_prefix}{i}.svg'
        img.attrs['style'] = 'vertical-align: middle; margin: 0.5em 0;'
```

这里构造一个 `img` 标签。

```
def wrap_svg(svg, equation):
    if equation:
        p = BeautifulSoup(f'<div style="text-align:center;"></div>', features="lxml")
        p.div.append(svg)
        return p.div
    else:
        return svg

p = wrap_svg(img, equation)
```

如果是独段的 `latex`，那么用 `div` 包起来，并且居中。

```
mathjax.insert_after(p)
```

这里把 div 标签或 img 标签加在原来的 script 后面。

```
def clean_script(soup):
    scripts = soup.findAll('script')
    for s in scripts:
        s.decompose()


clean_script(soup)
```

把所有的 latex 替换完 svg 后，就不需要 script 了。把它们删掉，这样整洁一点。

最后，再写入把修改后的整个 html 写入到一个文件里。

```
    output_file = open('out.html', 'w')
    output_file.write(soup.prettify())
    output_file.close()
```

接着用 pandoc 工具，转换成 epub。

```
pandoc -s -r html out.html -o feynman.epub
```

这会打开，就是漂亮的电子书了。

为什么不直接嵌入 svg 标签，而是用 img 来引入呢。即是说这样写：

```
<p></p>
<svg></svg>
<p></p>
```

有个很奇怪的 bug。当有很多的 svg 的时候，会出现这样的情况。

后来发现用 img 引入就行。至于为什么这样，没搞明白。当我把这单个的 svg 拿出来的时候，用浏览器看就没有问题。看来是在浏览器渲染非常多个 svg 时，就会出错。

最后

至于 epub 如何转成 mobi，可以用 Kindle 的官方工具 Kindle Previewer 3。注意这里只是一章。

该项目代码在feynman-lectures-mobi@lzwjava。

如何把所有的页面都抓取整理成电子书呢。后续再讲。但这费曼物理讲义一章也够看的了。好了，让我们拿起 Kindle 开始看吧。