```cmake
1  cmake_minimum_required(VERSION 3.17)
2  project(optics_experiment C)
3
4  set(CMAKE_C_STANDARD 99)
5
6  add_executable(optics_experiment main.c generate_table.c generate_table.h main.h
7      readcsv.c readcsv.h generate_document.c generate_document.h)
```

```c
1   //
2   // Created by hxp on 2020-11-10.
3   //
4   #include "main.h"
5   #include "generate_document.h"
6
7   void generate_header(char *filename) {
8       char *cmd = malloc(sizeof(char) * 256);
9       sprintf(cmd, "%s %s %s", "cp -f", "../tex-templates/new_document_head.tex", filename);
10      system(cmd);
11  }
12
13  void generate_footer(char *filename) {
14      char *cmd = malloc(sizeof(char) * 256);
15      sprintf(cmd, "cat %s >> %s",
16          "../tex-templates/new_document_tail.tex",
17          filename);
18      system(cmd);
19  }
20
21  void xelatex_compile(char *tex_filename, char *pdf_filename) {
22      char *cmd = malloc(sizeof(char) * 256);
23      sprintf(cmd, "xelatex %s",
24          tex_filename);
25      system(cmd);
26      sprintf(cmd, "cp *.pdf %s",
27          pdf_filename);
28      system(cmd);
```

```
29  }
```

```
 1  //
 2  // Created by hxp on 2020-11-10.
 3  //
 4
 5  #ifndef OPTICS_EXPERIMENT_GENERATE_DOCUMENT_H
 6  #define OPTICS_EXPERIMENT_GENERATE_DOCUMENT_H
 7
 8  void generate_header(char *filename);
 9
10  void generate_footer(char *filename);
11
12  void xelatex_compile(char *tex_filename, char* pdf_filename);
13
14  #endif //OPTICS_EXPERIMENT_GENERATE_DOCUMENT_H
15
```

```c
1   //
2   // Created by hxp on 2020-11-09.
3   //
4
5   #include "main.h"
6   #include "generate_table.h"
7   #include "readcsv.h"
8
9   void create_table_analyzer_angle_light_intensity(char *filename) {
10      char *cmd = malloc(sizeof(char) * 256);
11      sprintf(cmd, "cat %s >> %s",
12          "../tex-templates/analyzer_angle_light_intensity.tex",
13          filename);
14      system(cmd);
15  }
16
17  void fill_table_analyzer_angle_light_intensity(char *data_filename, char *tex_filename) {
18      char *cmd = malloc(sizeof(char) * 256);
19      double current = read_lines(data_filename, 2, 2, 2)[0];
20      const double *light_intensity = read_lines(data_filename, 2, 37, 3);
21      sprintf(cmd, "sed -i s/p00/%.2f/ %s", current, tex_filename);
22      system(cmd);
23      for (int i = 0; i < 36; i++) {
24          sprintf(cmd, "sed -i s/p%d/%.2f/ %s", i + 11, light_intensity[i], tex_filename);
25          system(cmd);
26      }
27  }
28
```

```c
29  void insert_plot(char* plot_script_path, char* plot_script_name, char* tex_filename) {
30      char *cmd = malloc(sizeof(char) * 256);
31      sprintf(cmd, "gnuplot -p %s/%s",
32          plot_script_path,
33          plot_script_name);
34      system(cmd);
35      sprintf(cmd, "cat %s >> %s",
36          "../tex-templates/figure.tex",
37          tex_filename);
38      system(cmd);
39      sprintf(cmd, "sed -i s/path.pdf/%s/ %s",
40          plot_script_name,
41          tex_filename);
42      system(cmd);
43  }
```

```
1  //
2  // Created by hxp on 2020-11-09.
3  //
4
5  #ifndef OPTICS_EXPERIMENT_GENERATE_TABLE_H
6  #define OPTICS_EXPERIMENT_GENERATE_TABLE_H
7
8  void create_table_analyzer_angle_light_intensity(char *filename);
9  void fill_table_analyzer_angle_light_intensity(char *data_filename, char* tex_filename);
10 void insert_plot(char* plot_script_path, char* plot_script_name, char* tex_filename);
11
12 #endif //OPTICS_EXPERIMENT_GENERATE_TABLE_H
13
```

```c
1   #include "main.h"
2   #include "generate_document.h"
3   #include "generate_table.h"
4
5   const char *WORKDIR = "../output/";
6   const char *TEX_FILE_NAME = "optics-experiment.tex";
7   const char *PDF_FILE_NAME = "optics-experiment.pdf";
8   const char *PLOT_SCRIPT_PATH = "../gnuplot_scripts/";
9
10
11  int main() {
12      char *tex_filename = malloc(sizeof(char) * 128);
13      char *pdf_filename = malloc(sizeof(char) * 128);
14      sprintf(tex_filename, "%s%s", WORKDIR, TEX_FILE_NAME);
15      sprintf(pdf_filename, "%s%s", WORKDIR, PDF_FILE_NAME);
16      generate_header(tex_filename);
17
18      create_table_analyzer_angle_light_intensity(tex_filename);
19      fill_table_analyzer_angle_light_intensity("../data/analyzer_angle_light_intensity_1.csv", tex_filename);
20      insert_plot(PLOT_SCRIPT_PATH, "analyzer-angle-light-intensity-1.gnuplot", tex_filename);
21
22      generate_footer(tex_filename);
23      xelatex_compile(tex_filename, pdf_filename);
24
25      return 0;
26  }
27
```

```
1    //
2    // Created by hxp on 2020-11-09.
3    //
4
5    #ifndef OPTICS_EXPERIMENT_MAIN_H
6    #define OPTICS_EXPERIMENT_MAIN_H
7
8    #include <stdio.h>
9    #include <stdlib.h>
10   #include <string.h>
11
12   #endif //OPTICS_EXPERIMENT_MAIN_H
13
```

```c
1   //
2   // Created by hxp on 2020-11-07.
3   // Read a csv file and extract data from given lines and a given column.
4
5   #include "readcsv.h"
6
7   const char *get_field(char *line, int num) {
8       const char *tok;
9       for (tok = strtok(line, ","); tok && *tok; tok = strtok(NULL, ",\n")) {
10          if (!--num)
11              return tok;
12      }
13      return NULL;
14  }
15
16  double *read_lines(char* filename, int line_start, int line_end, int column) {
17      FILE *data = fopen(filename, "r");
18      char line[1024];
19      double *result = malloc(sizeof(double) * (line_end - line_start + 1));
20      int current_line = 0;
21      while (fgets(line, 1024, data)) {
22          if (current_line < line_start - 1) {
23              current_line++;
24              continue;
25          }
26          if (current_line > line_end - 1) {
27              break;
28          }
```

```
29      char *tmp = strdup(line);
30      result[current_line + 1 - line_start] = strtod(get_field(tmp, column), NULL);
31      current_line++;
32    }
33    fclose(data);
34    return result;
35  }
```

```
 1  //
 2  // Created by hxp on 2020-11-07.
 3  //
 4
 5  #ifndef SPECTROMETER_READCSV_H
 6  #define SPECTROMETER_READCSV_H
 7
 8  #include <stdio.h>
 9  #include <stdlib.h>
10  #include <string.h>
11
12  const char *get_field(char *line, int num);
13
14  double *read_lines(char *filename, int line_start, int line_end, int column);
15
16  #endif //SPECTROMETER_READCSV_H
17
```

```latex
1   \begin{table}[H]
2   \centering
3   \begin{tabular}{|c|c|c|c|c|c|c|c|c|}
4   \hline
5   检偏镜角度($ {}^{\circ}$) & 0 & 10 & 20 & 30 & 40 & 50 & 60 & 70 & 80 \\\hline
6   光强($10^{-7} \si{A}$)  & p11 & p12 & p13 & p14 & p15 & p16 & p17 & p18 & p19 \\\hline
7   检偏镜角度($ {}^{\circ}$) & 90 & 100 & 110 & 120 & 130 & 140 & 150 & 160 & 170 \\\hline
8   光强($10^{-7} \si{A}$)  & p21 & p22 & p23 & p24 & p25 & p26 & p27 & p28 & p29 \\\hline
9   检偏镜角度($ {}^{\circ}$) & 180 & 190 & 200 & 210 & 220 & 230 & 240 & 250 & 260 \\\hline
10  光强($10^{-7} \si{A}$)  & p31 & p32 & p33 & p34 & p35 & p36 & p37 & p38 & p39 \\\hline
11  检偏镜角度($ {}^{\circ}$) & 270 & 280 & 290 & 300 & 310 & 320 & 330 & 340 & 350 \\\hline
12  光强($10^{-7} \si{A}$)  & p41 & p42 & 45 & p44 & p45 & p46 & p47 & p48 & p49 \\\hline
13  \end{tabular}
14  \caption{检偏器角度与光强关系，特定励磁电流$I=p00$}
15  \end{table}
16
```

```
1
2  \begin{figure}[H]
3    \centering
4    \includegraphics[width=\linewidth]{../output/path.pdf}
5    \caption{path.pdf}
6    \label{fig:path.pdf}
7  \end{figure}
8
```

```
1  %! Author = hxp
2  %! Date = 2020-11-09
3
4  \documentclass{ctexart}
5
6
7  \usepackage{ctex}
8  \usepackage{amsmath}
9  \usepackage{amsfonts}
10 \usepackage{amssymb}
11 \usepackage{wasysym}
12 \newcommand{\angstrom}{\text{\normalfont\AA}}  % 定义了原子物理的A
13 \usepackage{graphicx}
14 \usepackage{float}
15 \restylefloat{table}
16 \usepackage{geometry}
17 \geometry{a4paper,scale=0.8}  % 定义页面大小是A4，缩放是0.8
18 \usepackage{caption}
19 \usepackage{subcaption}
20 \usepackage{enumitem}
21
22 \newcommand*{\md}{\mathop{}\!\mathrm{d}}  % 定义微分算子，直立体的d
23 \newcommand*{\me}{\mathrm{e}}         % 定义自然对数e，同样应当是直立体
24
25 % 如果你想要每一段的开头不要空两格，注释掉下面这两行
26 \usepackage{parskip}
27 \setlength{\parindent}{0cm}
28
```

```
29  % 默认的\mathbf对希腊字母不生效, 这里改下
30  \usepackage{bm}
31  \let\Oldmathbf\mathbf
32  \renewcommand{\mathbf}[1]{\boldsymbol{\Oldmathbf{#1}}}
33
34  % 表格默认格内内容和边框没有留出距离, 显示分数的时候, 分数的上下会贴到边框上
35  % 因此我增加了表格内容和边框的最短距离是5像素
36  \usepackage{cellspace}
37  \setlength{\cellspacetoplimit}{5pt}
38  \setlength{\cellspacebottomlimit}{5pt}
39
40  % \si命令是用来写单位的, 单位需要和之前的数字有一个空格的距离, 而且应当直立体
41  % 用法: 5 \si{km/h}
42  \newcommand{\si}[1]{\ \mathrm{#1}}
43
44  % 日期不要显示
45  \date{}
46
47  \usepackage{fancyhdr}
48  \pagestyle{fancy}
49  \fancyhf{}
50  \lhead{本文档TeX源码地址:https://github.com/hxp-plus/Notes/tree/master/Physics-Experiment/实验报告}
51  \rfoot{第 \thepage 页}
52  \renewcommand{\headrulewidth}{1pt}
53  \renewcommand{\footrulewidth}{1pt}
54
55  %% 标题三号黑体, 作者信息为班级姓名学号
56  \newcommand{\generatetitle}[6]{\title{\zihao{3}\heiti#1} \author{#2 \quad
```

```
57  \quad #3 \quad\quad #4 \quad\quad #5 \quad\quad #6} \maketitle\thispagestyle{fancy}}
58
59  %% 所有的引言、实验内容与数据处理啥的，用section
60  \ctexset {
61  section = {
62  format = \raggedright\zihao{4}\heiti,    % 设置所有section的字号为四号黑体左对齐
63  name={,、},                              % 序号后跟顿号
64  aftername={\hspace{0pt}},                % 修改序号和标题直接的间距为零
65  number=\chinese{section},                % 设置序号为中文
66  },
67  subsection = {
68  format = \raggedright\zihao{5}\heiti,    % 设置所有subsection的字号为五号黑体左对齐
69  number={},                               % 设置序号为没有序号
70  },
71  subsubsection = {
72  format = \raggedright\zihao{5}\heiti,    % 设置所有subsection的字号为五号黑体左对齐
73  number={},                               % 设置序号为没有序号
74  }
75  }
76
77  %% 实验背景、实验目的啥的，用subsection
78  \ctexset {
79  subsection = {
80  format = \raggedright\zihao{5}\heiti,    % 所有subsection的字号为五号黑体左对齐
81  number={},                               % 设置序号为没有序号
82  }
83  }
84
```

```
85   %% 把\subsection之间加上中括号
86   \let\oldsubsection\subsection
87   \renewcommand{\subsection}[1]{\oldsubsection{\!\!\!\!\!\!\! 【#1】 }}
88   \let\oldsubsubsection\subsubsection
89   \renewcommand{\subsubsection}[1]{\oldsubsubsection{\!\!\!\!\!\!\!\! 【#1】 }}
90
91   %% 摘要和关键词用paragraph
92
93   \ctexset {
94   paragraph = {
95   format = \raggedright\zihao{5}\heiti,   % 所有paragraph的字号为五号黑体左对齐
96   number={},                              % 设置序号为没有序号
97   }
98   }
99
100  %% 把paragraph之间加上中括号
101  \let\oldparagraph\paragraph
102  \renewcommand{\paragraph}[1]{\oldparagraph{#1：  \!\!\!\!\!\!\!\!}}
103
104  %% 再把参考文献的序号去掉
105  \makeatletter
106  \renewcommand\@biblabel[1]{}
107  \makeatother
108
109  \begin{document}
110
111  \generatetitle{综合物理实验报告——
112  综合光学实验}{物理4+4}{胡喜平}{U201811966}{hxp201406@gmail.com}{https://hxp.plus/}
```

```
113
114   \paragraph{摘要}
115
116   \paragraph{关键词}
117
118   \section{引言}
119
120   \subsection{实验目的}
121
122   \section{实验内容与数据处理}
123
124   \subsection{实验原理}
125
126   \subsection{实验内容}
127
128   \subsection{实验结果的分析和结论}
129
130
```

```latex
1  \section{参考文献}
2  \begin{itemize}[leftmargin=0pt]
3    \item[] 综合物理实验讲义
4  \end{itemize}
5  \end{document}
```

1 线圈电流（安培）,检偏器角度（度）,光强（安培）
2 135,0,75
3 135,10,37
4 135,20,29
5 135,30,73
6 135,40,76
7 135,50,38
8 135,60,30
9 135,70,74
10 135,80,77
11 135,90,39
12 135,100,31
13 135,110,75
14 135,120,78
15 135,130,40
16 135,140,32
17 135,150,76
18 135,160,79
19 135,170,41
20 135,180,33
21 135,190,77
22 135,200,80
23 135,210,42
24 135,220,34
25 135,230,78
26 135,240,81
27 135,250,43
28 135,260,35

29 135,270,79
30 135,280,82
31 135,290,44
32 135,300,36
33 135,310,80
34 135,320,83
35 135,330,45
36 135,340,37
37 135,350,81
38

```
1  set datafile separator ','
2  set term eps
3  set output "../output/analyzer-angle-light-intensity-1.gnuplot.eps"
4  plot '../data/analyzer_angle_light_intensity_1.csv' using 2:3 with line notitle
5
6
7
```