Department of Electronic Engineering

FINAL YEAR PROJECT REPORT

BEngIE-2008/09-LMP-01

G6 Chinese Input System and User Interface Design on MS-Windows Vista Platform

Student Name: MA Ka Hang
Student ID:
Supervisor: LMP (Dr PO, L M)
Assessor: DP (Dr PAO, Derek C W)

Bachelor of Engineering (Honours) in Information Engineering
Student Final Year Project Declaration

I have read the student handbook and I understand the meaning of academic dishonesty, in particular plagiarism and collusion. I declare that the work submitted for the final year project does not involve academic dishonesty. I give permission for my final year project work to be electronically scanned and if found to involve academic dishonesty, I am aware of the consequences as stated in the Student Handbook.

Project Title:  
G6 Chinese Input System and User Interface Design on MS-Windows Vista Platform

Student Name: MA Ka Hang               Student ID: _______________________

Signature ___________________________ Date: _______________________

ii
No part of this report may be reproduced, stored in a retrieval system, or transcribed in any form or by any means – electronic, mechanical, photocopying, recording or otherwise – without the prior written permission of City University of Hong Kong.
Acknowledgement

I would like to thank to my FYP supervisor, Dr. Lai-Man PO, for providing constructive and creative opinions which can greatly increase the degree of user-friendly in G6 so that the objective of this project can be achieved. Also, Dr. Po has pointed out some issues for the G6 group continuously in the meeting so we can figure out these issues. Moreover, I am pleased at his bug testing for my G6 application continuously which can help me to debug the application rapidly.

I also thank to Mr. Chi-Kwan WONG since he has provided many helpful suggestions in the project. Same as Dr. Po, he has provided a bug list to me regularly so the progress in this project can be run smoothly.

Last but not least, I would like to thank to my group member in G6 since their projects also can inspire me to improve the project.
# Table of Contents

Acknowledgement ......................................................................................................................... iv  
List of Figures ................................................................................................................................. vi 
List of Tables .................................................................................................................................. viii  
Abstract ........................................................................................................................................ ix  

Chapter 1: Introduction  ................................................................................................................... 1  
1.1. Overview ................................................................................................................................. 1  
1.2. Statement of the problem ......................................................................................................... 1  
1.3. Objectives .............................................................................................................................. 1  

Chapter 2: Background  .................................................................................................................. 3  
2.1. G6 Bihua Chinese Input Method .......................................................................................... 3  

Chapter 3: Specification  ................................................................................................................ 8  
3.1. Overview ............................................................................................................................... 8  
3.2. Beginner User Interface ......................................................................................................... 9  
3.3. Numeric Keys and Roman Keys Modes ................................................................................. 12  
3.4. Simplified Chinese to Traditional Chinese conversation (Not implemented) ................. 16  
3.5. Associate characters ............................................................................................................ 16  
3.6. Phrasal Mode ....................................................................................................................... 17  
3.7. Punctuation .......................................................................................................................... 18  
3.8. User defined phrase ............................................................................................................. 19  
3.9. Dictionary ............................................................................................................................. 20  
3.10. Advance User Interface ....................................................................................................... 21  
3.11. Traditional/Simplified Chinese Mode ............................................................................... 24  
3.12. Chinese/English mode ......................................................................................................... 25  
3.13. Half Width/Full Width mode ............................................................................................ 26  
3.14. On-screen Keyboard ........................................................................................................... 28  
3.15. G6 Setting .......................................................................................................................... 27  
3.16. About G6 ........................................................................................................................... 29  
3.17. T9 Chinese Input Method ................................................................................................. 29  

Chapter 4: Methodology  ................................................................................................................. 31  
4.1. Implementation G6 in MS-Windows ..................................................................................... 31  
4.2. Database structure ............................................................................................................... 32  
4.3. Function Description for G6 Input Method ......................................................................... 34  
4.4. Graphical User Interface Description and Effects ............................................................... 48  
4.5. Key Assignment .................................................................................................................. 54  
4.6. Installation Guide ................................................................................................................ 65  

Chapter 5: Performance Evaluation ............................................................................................ 68  

Chapter 6: Time chart of the progress ......................................................................................... 69  

Chapter 7: Conclusion .................................................................................................................. 71  

References ..................................................................................................................................... 72
List of Figures

Figure 1.3.1: Statistic of market share of MS-Windows ................................................................. 2
Figure 3.2.1: A sample virtual keyboard for beginners ................................................................. 10
Figure 3.2.2: Example of typing without full codes ................................................................. 11
Figure 3.2.3: Example for roll back the codes ............................................................................ 11
Figure 3.2.4: Example for typing character with wildcards ....................................................... 12
Figure 3.3.1: Numeric keyboard ................................................................................................. 13
Figure 3.3.2: Roman keyboard ..................................................................................................... 13
Figure 3.4.1: Examples with using Simplified mode ................................................................. 16
Figure 3.5.1: Examples for Associate Characters ........................................................................ 17
Figure 3.6.1: Some examples for typing phrases .......................................................................... 18
Figure 3.7.1: Example for typing Punctuation(s) ......................................................................... 19
Figure 3.8.1: Example for user defined phrase ............................................................................ 19
Figure 3.9.1: G6 dictionary example ............................................................................................ 20
Figure 3.9.2: Example for inserting user defined phrase ............................................................. 21
Figure 3.10.1: Auto shift for input mode ....................................................................................... 22
Figure 3.10.2: Auto text output .................................................................................................... 23
Figure 3.10.3: Example for Static mode ....................................................................................... 24
Figure 3.11.1: Presentation of using Traditional/Simplified Chinese Mode ................................ 25
Figure 3.12.1: Example of using Chinese/English Mode .............................................................. 26
Figure 3.13.1: Example of using Half Width/Full Width Mode .................................................... 26
Figure 3.14.1: Main On-screen Keyboard for G6 ....................................................................... 27
Figure 3.15.1: Setting dialog for G6 ............................................................................................ 28
Figure 3.16.1: About G6 Dialog .................................................................................................. 29
Figure 3.17.1: Single character by T9 .......................................................................................... 30
Figure 4.2.1: Examples of G6 Input Method Database ................................................................. 33
Figure 4.3.1: The life cycle of G6 Input Method .......................................................................... 35
Figure 4.3.2: Invoke G6 Input method .......................................................................................... 35
Figure 4.3.3: Flowchart of Query in Database ............................................................................ 36
Figure 4.3.4: Priority for exact-match code .................................................................................. 37
Figure 4.3.5: Example of typing single character in Dynamic Mode ......................................... 38
Figure 4.3.6: Examples of typing phrase in Dynamic Mode ....................................................... 39
Figure 4.3.7: Demonstration of rollback codes and input mode in Dynamic Mode .................... 41
Figure 4.3.8: Example of typing single character in Static Mode .............................................. 42
Figure 4.3.9: Example of typing phrase in Static Mode .............................................................. 43
Figure 4.3.10: Example of typing associate characters .............................................................. 44
Figure 4.3.11: Example of typing Punctuation in Punctuation mode .......................................... 45
Figure 4.4.1: Candidate Window in G6 ...................................................................................... 49
Figure 4.4.2: Code Window in G6 .............................................................................................. 50
Figure 4.4.3: Position of Components in different scenarios ....................................................... 52
Figure 4.4.4: Language Bar with G6 Input Method ...................................................................... 52
Figure 4.4.5: Function description of self-defined buttons in Language Bar ................................. 53
Figure 4.4.6: On-screen Keyboard designed for G6 ................................................................. 53
Figure 4.5.1: Key assignment in QWERTY area ......................................................................... 54
Figure 4.5.2: Key assignment in numeric area ............................................................................ 56
Figure 4.5.3: Input sequence of typing single character .............................................................. 59
Figure 4.5.4: Cases for typing phrase in Type I............................................................................ 60
Figure 4.5.5: Demonstration of input sequence in Type I ............................................................ 60
Figure 4.5.6: Cases for typing single character in Type II ........................................................... 61
List of Tables

Table 2.2.1: Examples of G6 codes of some simple characters ................................. 6
Table 2.2.2: Examples of G6 codes of some characters .............................. 6
Table 2.2.3: Information about G6 Database ....................................................... 7
Table 2.2.4: Examples of G6 codes of some phrases ................................. 7
Table 3.3.1: Further Function Description of Numeric keyboard .................. 14
Table 3.3.2: Further Function Description of Roman keyboard ................. 15
Table 3.10.1: Functions for advance users ......................................................... 21
Table 3.15.1: Functions/Options in Setting ......................................................... 28
Table 4.2.1: Types of Database in G6 ............................................................... 32
Table 4.2.2: The alias/actual codes conversion in G6 ................................... 33
Table 4.3.1: Rollback events in Dynamic Mode .............................................. 40
Table 4.3.2: Effects of the components in Chinese/English conversion ...... 46
Table 4.4.1: Colour Presentation for the codes in Code Bar ......................... 50
Table 4.5.1: Functions Description in Areas .................................................... 54
Table 4.5.2: Code frequency in G6 ................................................................. 55
Table 4.5.3: Special key events ...................................................................... 58
Table 4.5.4: Text Input Sequence ................................................................. 59
Abstract

In these years, text input in computer becomes a very important part to store texts instead of handwriting because of its efficiency, quality, etc. For typing English character, QWERTY keyboard, which is very user-friendly design for typing English character, is invented. It is successful because there are only 26 characters in English. As a result, users can type every character directly from the keyboard so both the degree of user-friendly and input speed. For typing Chinese character, however, it is very difficult to provide a good solution since there are over ten thousand Chinese characters. For achieving the goal, many Chinese Input Methods has been released and each of them has their own advantages in terms of learning difficulty, input speed and mobile phone applications. In 2007, a new Chinese character and phrase input method has been invented by Dr. Lai-Man Po, which is called G6 Bihua (六碼筆劃輸入法) as five basic stroke types are used to define at most six digits and base-5 numbers for encoding both Chinese characters and phrases. In this project, G6 Bihua Chinese Input Method is implemented into Microsoft Windows Vista Platform, which has very user-friendly layout and design for archiving the main purposes of G6: easy to learn and easy to use and providing a solution to users for typing Chinese Character conveniently.
Chapter 1: Introduction

1.1. Overview

In these years, text input in computer is very important to store texts instead of handwriting since the efficiency and quality for text input is much higher than handwriting. Therefore, it is necessary to provide solutions for typing characters. For typing English character, QWERTY keyboard, which is very user-friendly design for typing English character, is invented. It is successful because there are only 26 characters in English.

1.2. Statement of the problem

For typing Chinese character, however, it is difficult to provide a good solution since there are over ten thousand Chinese characters. As a result, many Chinese Input Methods has released and each of them has their own advantages in terms of learning difficulty, input speed and mobile phone applications. For example, Cangjie Chinese Input Method (倉頡輸入法) provides high input rate but difficult to learn.

Q9 (九方輸入法) is easy to learn but the input speed is not fast. In 2007, a new Chinese character and phrase input method is invented by Dr. Lai-Man Po, which is called G6 (六碼簡易中文輸入法) as five basic stroke types are used to define at most six digits and base-5 numbers for encoding both Chinese characters and phrases. In this project, G6 Chinese Input Method is implemented into Microsoft Windows Vista Platform, which has user-friendly layout and design for archiving the main purposes of G6: easy to learn and easy to use.

1.3. Objectives

The first objective of implementing G6 is to provide an input method which is based on Chinese Character’s stroke, which has a satisfactory typing speed and is easy to learn.
The second objective of implementing G6 in MS-Windows is to provide a platform for users to use G6 in every Operating System so that users can only learn one Chinese Input Method because G6 has its great potential to one of famous Chinese Input Method by its 2Es advantages which is easy to learn and easy to use.

In the Figure 1.3.1, the statistic of market share of MS-Windows is shown. [1]

![Market Share of MS-Windows](image)

Figure 1.3.1: Statistic of market share of MS-Windows

From the chart, even though the market share of MS-Windows declines in these two years, the market share still have a round 90% which is very high market share. Also, the market share of Windows XP is declining quite fast since the life cycle of Windows XP entered decline stage. However, the performance of Windows Vista is not so good and some users choose to use other Operating Systems instead. However, the market share of Windows Vista keeps rising.

In conclusion, there is no doubt for implementing G6 Input Method to MS-Windows since the market share of MS-Windows is very high. Also, Microsoft will release a new version of Windows, Windows 7 and its performance is better than Windows Vista. Therefore, the market share of MS-Windows will probably not decline after Windows 7 released.
Chapter 2: Background

2.1. G6 Bihua Chinese Input Method

G6 Bihua Chinese Input Method (六碼筆劃輸入法) is a stroke-based Chinese character input method. G6 stands for six-diGit base-6 which is meant that maximum number of codes is six for typing a single character or phrase. For each stroke in a Chinese character can be converted into 1 code in G6 and there are 5 basic stroke types to represent all the stroke type in Chinese characters. These 5 basic stroke types are horizontal (横 or 一), vertical (豎 or 丨), left-falling (撇 or 丿), right-falling or dot (點捺 or 丶) and turning (折 or フ). For the coding rule in G6, it is based on 3+3 rule. For single character, the codes in G6 are first 3 strokes and last 3 strokes in a character. For phrase, the codes are first 3 strokes in the first and last character in the phrase. [2]

G6 is easy to learn, easy to use, easy to remember and fast in input speed. The only thing users need to know is the stroke order of the Chinese Character and 3+3 rule for typing all Chinese characters and phrases. For faster input speed, phrases are divided into 2-character, 3-character and multi-character phrases in G6.
2.1.1. Basic Stroke Types of G6

The G6's six basic stroke types are:

1. Horizontal strokes [ 一 ]:

2. Vertical strokes [ 丨 ]:

3. Left-falling strokes [ 丿 ]:

4. Right-falling or Dot strokes [ 、 ]:

5. Turning strokes [ フ ]:

1. Horizontal strokes [ 一 ]: A horizontal stroke is a stroke which is writing from left to right horizontally or a little bit upward. Some examples of horizontal strokes ( 一 / ) are shown as follow:

2. Vertical strokes [ 丨 ]: A vertical stroke is a stroke which is writing from top to bottom with or without a hook. Some examples of vertical strokes ( 丨 / ) are shown as follow:
3. Left-falling strokes [丿]: A left-falling stroke is a stroke which is writing from top right to bottom left. Some examples of left-falling strokes (丿) are shown as follow:

![Image](image1)

4. Right-falling or Dot strokes [・]: A Right-falling or Dot stroke is a stroke which is writing from top left to bottom right. Some examples of right-falling or dot strokes (・) are shown as follow:

![Image](image2)

5. Turning strokes [フ]: A turning stroke is a stroke which has at least one turn in the stroke. Some examples of turning strokes (フ) are shown as follow:

![Image](image3)

2.1.2. G6 Encoding Method

In G6, both characters and phrases are encoded by 3+3 rule. 3+3 refers to the first 3 and last 3 stroke (頭三尾三) of a character or a phrase. For single character, the codes in G6 are first 3 strokes and last 3 strokes in a character. For phrase, the codes are first 3 strokes in the first and last character in the phrase. The details of the G6 character and phrase encoding are introduced below.
For single characters, if the number of strokes of a Chinese character is less than 6, the G6 codes will be all strokes of that character. In Table 2.2.1, there are the G6 codes of some Chinese characters with the stroke number less than 6:

<table>
<thead>
<tr>
<th>Character</th>
<th>Codes</th>
<th>Character</th>
<th>Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>大</td>
<td>一丿丶</td>
<td>人</td>
<td>丿丶</td>
</tr>
<tr>
<td>小</td>
<td>丶丿丶</td>
<td>才</td>
<td>一丿丶</td>
</tr>
<tr>
<td>日</td>
<td>丨フ一一</td>
<td>水</td>
<td>丿フ丿丶</td>
</tr>
<tr>
<td>月</td>
<td>丿フ一一</td>
<td>火</td>
<td>丿丿丿丶</td>
</tr>
</tbody>
</table>

Table 2.2.1: Examples of G6 codes of some simple characters

If the number of strokes of a Chinese character is more than 6, then 3+3 rule is applied. This means to enter the first 3 and last 3 strokes of the characters. In Table 2.2.2, there are the examples of the G6 codes of some characters with the number of strokes more than 6:

<table>
<thead>
<tr>
<th>Character</th>
<th>Codes</th>
<th>Character</th>
<th>Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>香</td>
<td>ヽー丨フーー</td>
<td>容</td>
<td>ぃフ丨フー</td>
</tr>
<tr>
<td>港</td>
<td>ぃーフーー</td>
<td>易</td>
<td>ーフフノノ</td>
</tr>
<tr>
<td>學</td>
<td>ヽーフーー</td>
<td>非</td>
<td>ーーーーーー</td>
</tr>
<tr>
<td>習</td>
<td>フーフーー</td>
<td>常</td>
<td>ぃノフフ</td>
</tr>
</tbody>
</table>

Table 2.2.2: Examples of G6 codes of some characters
For every stroke number of characters, the maximum code number is 6 therefore the single character can be typed more efficient.

For phrases, since the database of phrases is very large that is more than 100,000 phrases and the information about G6 Database is shown in Table 2.2.3. For typing the phrases more efficient, G6 divides the Chinese phrases into 2-character, 3-character and multi-character phrases. The encoding method of G6 phrase is also very easy, which uses the 3+3 rule again. For the first 3 strokes, they refer to the first 3 strokes in the first character in the phrase. For the last 3 strokes, they refer to the first 3 strokes in the last character in the phrase. In Table 2.2.4, there are some phrases encoded by using the (3+3) rule:

<table>
<thead>
<tr>
<th>No. of elements in Traditional Chinese</th>
<th>Single character</th>
<th>2-character phrase</th>
<th>3-character phrase</th>
<th>multi-character phrase</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of elements in Simplified Chinese</td>
<td>13117</td>
<td>66914</td>
<td>37675</td>
<td>52566</td>
</tr>
<tr>
<td>No. of elements in Simplified Chinese</td>
<td>20901</td>
<td>66936</td>
<td>37677</td>
<td>52501</td>
</tr>
</tbody>
</table>

Table 2.2.3: Information about G6 Database

<table>
<thead>
<tr>
<th>Character</th>
<th>Codes</th>
<th>Character</th>
<th>Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>香港</td>
<td>丿一丷丶一</td>
<td>六碼</td>
<td>丿一丷丶一</td>
</tr>
<tr>
<td>城市</td>
<td>丿一丷丶一</td>
<td>筆劃</td>
<td>丿一丷丶一</td>
</tr>
<tr>
<td>大學</td>
<td>丿一丷丶一</td>
<td>輸入法</td>
<td>丿一丷丶一</td>
</tr>
<tr>
<td>香港城市大學</td>
<td>丿一丷丶一</td>
<td>六碼筆劃輸入法</td>
<td>丿一丷丶一</td>
</tr>
</tbody>
</table>

Table 2.2.4: Examples of G6 codes of some phrases

In G6, only 6 codes are needed for typing every phrase. Therefore, the input speed can be fast by using G6.
Chapter 3: Specification

3.1. Overview

In May of 2008, the first version of G6 MS-Windows XP/Vista version is released. However, this is only the beginning because the first version only provides a platform to users to type Chinese characters, with some bugs, not user friendly interface, etc. As a result, in this project, the main propose is to provide a no bugs, very user-friendly’s user interface for both beginners and advanced users. In the following paragraph, the specification of the newer version of G6 MS-Windows XP/Vista version will be stated and explain in detail.

The specification of the newer version of G6 MS-Windows XP/Vista version will be included:

1. Beginner User Interface (初學用家介面)
2. Numeric Keys and Roman Keys Modes
3. Simplified Chinese to Traditional Chinese conversation (繁體/簡體中文轉換) (Not implemented)
4. Associate characters (關聯字詞)
5. Phrasal Mode (詞組模式)
6. Punctuation
7. User defined phrase
8. Dictionary
9. Advance User Interface (進階用家介面)
10. Traditional/Simplified Chinese mode (繁體/簡體中文模式)
11. Chinese/English mode (中/英文模式)
12. Half/Full width mode (半形/全形模式)
13. On-screen Keyboard (螢幕鍵盤)
3.2. Beginner User Interface

The main propose of making beginner user interface is to let all users can be able to use G6 in the very beginning. As a result, the user interface will be focus on letting users know how to type the characters but not letting users type faster. To achieve this propose, there are several functions designed for beginners in G6:

1. On-screen keyboard (螢幕鍵盤)

2. Dynamic mode for typing (動態模式)

3. Wildcard for codes (萬用碼)

3.2.1. On-screen keyboard

Some beginners may not familiar with the key assignment in G6. For example, the beginners may be confused which button stands for vertical stroke. To let them feel comfortable with the key assignment in G6, an On-screen keyboard can be displayed which can remind the users about the locations of the buttons. A sample virtual keyboard is shown in Figure 3.2.1. For further explanation for On-screen keyboard, see 3.14.
3.2.2. Dynamic mode for typing

For beginners, it is difficult to remember how to type every character/phrase. Fortunately, they usually can remember part of codes for a character. One of solutions is using dynamic mode for typing, i.e. to show the character lists (候選字詞) before typing the complete codes for the characters, and the full codes will also be shown after the user selected the character(s) in the purpose for helping them remember the codes of the character(s). An example which is typing the character without full codes is shown in figure 3.2.2. The second advantage of this function is that the users can roll back their codes rather than retype the codes again so that the typing speed will be much faster. In figure 3.2.3, there is a demonstration how the users can find their prefer characters. Moreover, the users can selects the character(s) before typing the full codes because the character(s) they want to type can be appeared even the users only enter one code. There are examples provided in figure 3.2.2 and 3.2.3.
3.2.3. Wildcard for codes

By the dynamic mode for typing, the users can enter the characters easily even they forgot the second half of the codes. However, if the users forgot the first half of the codes, it is difficult for them to find out the characters just using dynamic mode. As a result, a wildcard will be provided for users to use. A wildcard can be presented all 6 codes in G6 Input Method. If the users are not sure some of the codes, they can just type wildcards instead to find out their preferred character(s). An Example demonstrated wildcard is shown in Figure 3.2.4.
3.3. Numeric Keys and Roman Keys Modes

G6 Input Method has only 15 essential buttons so the users can surely enter Chinese character(s) using one hand by G6. However, there are some optional hot keys which can help the users typing faster. Therefore, even though a QWERTY has far more buttons available than that G6 needs, the design of the input area is suitable for one hand input or both hand input for the main advantages for G6: easy to learn, since less buttons is easier and less complicate for different users’ needs. The input location is separated into two parts: numeric keys and roman keys modes. Even though both the numeric and roman keys mode adopted the same method for typing character(s), some of the buttons in these two modes are not equivalent for being more user friendly in both modes. For example, in the numeric keys mode, there are no hot keys for fast input. While in roman keys mode, there are some hotkeys for fast input.
3.3.1. Numeric Keys Mode

The Numeric keyboard is shown in Figure 3.3.1:

![Figure 3.3.1: Numeric keyboard](image)

In numeric keyboard, the num lock has to be on for typing in G6. The basic information of the buttons’ function for the Numeric keyboard is shown in the table 3.3.1:

3.3.2. Roman Keys Mode

The Numeric keyboard is shown in Figure 3.3.2:

![Figure 3.3.2: Roman keyboard](image)

The basic information of the buttons’ function for the Roman keyboard is shown in the table 3.3.2:
<table>
<thead>
<tr>
<th>Key(s)</th>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-3</td>
<td>Single/ phrasal mode</td>
<td>In normal mode*&lt;br&gt;For Associate mode: not allowed shift to single mode</td>
</tr>
<tr>
<td></td>
<td>Phrasal a nd c hoose character mode</td>
<td>Associate mode only: not in choose character mode</td>
</tr>
<tr>
<td></td>
<td>Select character(s)</td>
<td>In Character Selection Mode&amp;</td>
</tr>
<tr>
<td>4-9</td>
<td>Type code</td>
<td>Not in choose character mode&lt;br&gt;When code length = 6, auto enter choose character mode</td>
</tr>
<tr>
<td></td>
<td>Choose character(s)</td>
<td>For associate mode: In choose character mode</td>
</tr>
<tr>
<td>0</td>
<td>Enter choose character mode</td>
<td>In normal mode</td>
</tr>
<tr>
<td>Delete</td>
<td>Delete one code and enter normal mode</td>
<td>For dynamic mode: Code length &gt; 0&lt;br&gt;For static mode: Code length &gt; 0 and not entered choose character mode</td>
</tr>
<tr>
<td></td>
<td>Delete all codes</td>
<td>Static mode only: Code length &gt; 0 and entered choose character mode</td>
</tr>
<tr>
<td></td>
<td>Cancel associate mode</td>
<td>In associate mode</td>
</tr>
<tr>
<td></td>
<td>Back space</td>
<td>Not typing Chinese Characters</td>
</tr>
<tr>
<td>+</td>
<td>Next page</td>
<td>N/A</td>
</tr>
<tr>
<td>-</td>
<td>Last page</td>
<td>N/A</td>
</tr>
<tr>
<td>*</td>
<td>Single/Punctuation Mode</td>
<td>Not for associate mode</td>
</tr>
<tr>
<td>/</td>
<td>T9/G6 input</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Table 3.3.1: Further Function Description of Numeric keyboard

Remark: *Normal mode is for typing code.

#Character Selection mode is for selecting character/phrase in the list.
<table>
<thead>
<tr>
<th>Key(s)</th>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>H/N/M</td>
<td>Single/phrasal mode</td>
<td>Associate mode&lt;br&gt;Press “Shift” for changing modes for associate phrases</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Static mode: Code length &gt; 0</td>
</tr>
<tr>
<td>P</td>
<td>Single/Punctuation Mode</td>
<td>Not for associate mode</td>
</tr>
<tr>
<td>J/K/L/U/I/O</td>
<td>Choose first character</td>
<td>In choose character mode &amp;&lt;br&gt;Type code</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Not in choose character mode&lt;br&gt;When code length = 6, auto enter choose character mode</td>
</tr>
<tr>
<td>Y</td>
<td>T9/G6 input</td>
<td>N/A</td>
</tr>
<tr>
<td>Space</td>
<td>Choose first character</td>
<td>In normal mode in Dynamic Mode/Static Mode</td>
</tr>
<tr>
<td>V/ Page Up</td>
<td>Last Page</td>
<td>N/A</td>
</tr>
<tr>
<td>B/ Page Down</td>
<td>Next Page</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Delete one code and enter normal mode</td>
<td>For dynamic mode: Code length &gt; 0&lt;br&gt;For static mode: Code length &gt; 0 and not entered choose character mode</td>
</tr>
<tr>
<td></td>
<td>Delete all codes</td>
<td>Static mode only: Entered choose character mode</td>
</tr>
<tr>
<td></td>
<td>Cancel associate mode</td>
<td>In associate mode</td>
</tr>
<tr>
<td></td>
<td>Back space</td>
<td>Code length = 0</td>
</tr>
<tr>
<td>Escape</td>
<td>Clear all codes</td>
<td>N/A</td>
</tr>
<tr>
<td>1-9/A/S/D/F/G/W/E/R/T</td>
<td>Choose character(s)</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Table 3.3.2: Further Function Description of Roman keyboard

Remark: *Normal mode is for typing code.<br>#Character Selection mode is for selecting character/phrase in the list.
3.4. Simplified Chinese to Traditional Chinese conversation *(Not implemented)*

In this version, the characters of both simplified Chinese and traditional Chinese will be appeared in the same database. As a result, users can type both of them in the same G6. Moreover, it is available for users to choose Traditional/Simplified mode. In Traditional/Simplified mode, whatever the users typing in traditional/simplified Chinese, the corresponding Traditional/Simplified characters will only be displayed. Some example is shown in Figure 3.4.1.

![Figure 3.4.1: Examples with using Simplified mode](image)

However, it is difficult to generate an accurate conversation list for Simplified Chinese to Traditional Chinese conversation. Since the accuracy is the most significant factor for Input Method, this feature will not be provided before an accurate conversation list created.

3.5. Associate characters

Associate characters are the phrases which are according to the single characters that the user typed. When a character is typed, the associate phrases will be available for selection. In G6 Input Method, the associate phrases list will automatically appear after the user typed a single character and the associate phrases adopt the characteristic of G6 Input Method, which separates the 2-character, 3-character and multi-character. Initially, the 2-character associate phrases will show in the associate phrase list and the users can type 3-character/multi-character button to look up 3-character/multi-character associate phrases. In Figure 3.5.1, the associated 2-character/3-character/multi-character is shown.
3.6. Phrasal Mode

In Phrasal mode, users can type phrases directly simply entering first 3 strokes of the first character and first 3 strokes of the last character in the phrase, and typing 2-character(二字)/3-character(三字)/multi-character(多字) then the phrase can be typed directly (no need choose in associate phrases). In Figure 3.6.1, some examples for typing phrases are given.

For the timing of typing 2-character/3-character/multi-character is very flexible in dynamic mode. The users can shift to 2-character/3-character/multi-character every time. The users then can add/delete codes in that mode.
For Chinese Input Methods, not only the Chinese characters can be typed, but also the Chinese Punctuation. There are 2 methods for typing Punctuation: using Punctuation mode and typing directly. For using Punctuation mode, once the user changes the input mode into Punctuation mode, the punctuation can be chosen from the list. In Figure 3.7.1, an example for typing Punctuation(s) is given.

For some common Punctuation which is on the keyboard such as comma and full stop, the user can type the Punctuation directly from the keyboard. Once the user types the Punctuation directly from the keyboard, the corresponding Punctuation in Chinese will be output.
3.8. User defined phrase

Although the size of phrase in G6 is very large, users may want to type the phrases which are not common. In this version, users can define their own phrases. Once the user adds the user defined phrase, the user can choose the phrase directly from a separated list. In Figure 3.8.1, an example for typing user defined phrase is provided.

For the method to add user defined phrase, see 3.9.
3.9. Dictionary

If users do not know the codes of character(s) and want to type the character(s) by other Input Method to look up the codes, a dictionary is provided for checking all the characters in G6 Input Method. When users type the character(s), the corresponding codes, in both Traditional Chinese and Simplified Chinese, will be displayed. In addition, the location of that character/phrase will be shown in terms of number of page and number of row. If the output is “No this character/phrase” (無此字詞) in either Traditional Chinese or Simplified Chinese, that means the user cannot type that character/phrase in that mode. In Figure 3.9.1, a dictionary implemented in G6 Input Method is shown.

![Figure 3.9.1: G6 dictionary example](image)

3.9.1. Add user defined phrase

If the phrase cannot be found in both Traditional and Simplified Chinese Mode, the user can click the add button to add the phrase into user defined phrase. Once clicking the “Add” button, the codes of the phrase will be generated automatically based on the coding standard of G6; show the dialog message with codes and the phrase, and the user can type the phrase immediately. In Figure 3.9.2, the flow for inserting user defined phrase is shown.
3.10. Advance User Interface

The main propose of making advance user interface is to let the advance users can type Chinese character in convenient environment and increase the typing speed. As a result, it is not necessary for advance users to use mouse but using lots of shortcuts instead. In table 3.10.1, the list of functions for advance users and which mode of the functions design for is shown.

<table>
<thead>
<tr>
<th>Functions</th>
<th>Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Static mode for typing (靜態模式)</td>
<td>N/A</td>
</tr>
<tr>
<td>Auto shift for input mode (自動轉詞)</td>
<td>Static Mode/Associate character</td>
</tr>
<tr>
<td>Auto text output (自動輸入首字)</td>
<td>Static Mode &amp; code length &lt; 6</td>
</tr>
<tr>
<td>Direct selection (直接選字)</td>
<td>Dynamic Mode in Numeric Area &amp; code length = 6</td>
</tr>
</tbody>
</table>

Table 3.10.1: Functions for advance users
3.10.1. Auto shift for input mode

When users want to type 2-character/3-character/multi-character, they may just enter the codes first then finally shift to the corresponding mode. If the codes do not exist, the codes in the candidate window will change from green to red such as the one in Figure 3.10.1. For the advance users, the chance of typing wrong is very low and they should want to type a phrase in this case. Therefore, there is an option for the advance users which shifting the input mode from single character to 2-character/3-character/multi-character automatically so that the users can reduce the time for changing input mode manually.

![Auto shift for input mode](image)

Figure 3.10.1: Auto shift for input mode
3.10.2. Auto text output

For some character(s), they have unique codes (only has one option in the list) and an example is shown in Figure 3.10.2. For the same reason, the advance users probably want to choose that character(s). If using this function, the character will be automatically typed in this case.

![Figure 3.10.2: Auto text output](image)

3.10.3. Static mode for typing

Some advance users may prefer typing full codes instead of looking for the characters in dynamic code. In static mode, the candidate window will only be shown in the following conditions:

1. The number of codes reach 6
2. The users type 2-character/3-character/multi-character button
3. The users type “choose character” button(for showing single character list)

Once the candidate window is shown, the codes cannot roll back and the users have to enter the full codes from the beginning. In Figure 3.10.3, a demonstration illustrates the properties of Static mode.
3.10.3. Example for Static mode

For the list of character(s), the users can choose only show the exact code of the character(s) for faster searching exactly match results.

3.10.4. Direct selection

By direct selection, the users can save 1 key for entering single characters and phrases with code length equal to 6 because they do not need to type Character Selection key for selecting the character/phrase. However, the flexibility by using this technique will be decreased since the users cannot change the input mode when 6 codes are typed.

3.11. Traditional/Simplified Chinese Mode

In G6 Input Method, character(s) in Traditional Chinese and character(s) in Simplified Chinese are in a separated database. Before changing the database, it is impossible to generate both Traditional Chinese and Simplified Chinese in the same list. However, this has an advantage that the searching time will be much faster since only half of the database needs to be searched.

By this reason, G6 Input Method has the option that choosing typing Traditional Chinese character(s) or Simplified Chinese character(s). To switch the mode, users just need to click the Traditional/Simplified Chinese Mode Conversion Button in Language Bar.
In Figure 3.11.1, the presentation of using Traditional/Simplified Chinese Mode is shown.

![Simplified Chinese Mode](image1)

![Traditional Chinese Mode](image2)

Figure 3.11.1: Presentation of using Traditional/Simplified Chinese Mode

3.12. Chinese/English mode

Even though G6 is a Chinese Input Method, it is essential to be available for typing English as well since almost all users need to type both Chinese and English at the same time.

Moreover, for English Input Methods, they usually only can type half-width English and symbol. However, some users may want to type full-width English or symbol. To provide a convenient environment to users for typing what they need, it is essential that a Chinese Input Method supports typing English as well.

To switch the mode of typing Chinese/English, users just need to click the Chinese/English Mode Conversion Button in Language Bar, or type “Shift” directly from the keyboard.

In Figure 3.12.1, the presentation of using Chinese/English Mode is shown.
3.13. Half Width/Full Width mode

As stated in 3.12, some users need to type full width English or symbols, so it is necessary for G6 Input Method to implement Full Width mode. To switch the mode of half width/full width, user just need to click the half width/full width Mode Conversion Button in Language Bar, or type “Shift”+”Space” directly from the keyboard.

In Figure 3.13.1, the presentation of using Half Width/Full Width Mode is shown.

3.14. On-screen Keyboard

G6 Input Method is a new Chinese Input Method surely since it is still developing and only some testing purpose version released. Therefore, almost all of the users will not know anything about G6. For example, they will not know how to form the codes of character(s), the number of codes for g6, etc. For assisting the user remembering the key assignment in G6, the most significant thing that can help the beginners in G6 is to provide an On-screen Keyboard which contains the location of G6 code. In Figure 3.14.1, the main On-screen Keyboard for G6 is shown.
There are 2 regions for typing Chinese character in G6: QWERTY area and numeric area. In QWERTY area, the user can type Chinese character by two hands, but with faster input speed and more convenient typing environment. In numeric area, the user can type Chinese character by only one hand.

The reason of choosing Roman keys Mode as the main On-screen Keyboard is that the users will have benefits if they type G6 in QWERTY area since the users can change to type English immediately after fast shift to English mode by typing “Shift” key on the keyboard. Therefore, by using G6 in QWERTY area, the user not only can type Chinese characters more conveniently, but also the English characters, numbers and Punctuation.

To use the On-screen Keyboard, the users just click the corresponding buttons on the On-screen Keyboard, and then having the same effects as they type in a physical keyboard.

3.15. G6 Setting

Every user has different preference for using a Input Method. For example, some users usually type English characters rather than Chinese characters and some users do not want to use some features in G6 like associate character and displaying full codes. Therefore, a setting application is provided for users to change some default setting in G6. In Figure 3.15.1, the setting dialog for G6 is shown.
In the setting, there are options provided for fulfilling users need. In Table 3.15.1, the options in the setting are shown.

<table>
<thead>
<tr>
<th>Functions</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input Language</strong></td>
<td>Chinese/English</td>
</tr>
<tr>
<td><strong>Traditional/Simplified Chinese Mode</strong></td>
<td>Traditional/Simplified Chinese</td>
</tr>
<tr>
<td><strong>Chinese Input Mode</strong></td>
<td>Dynamic/Static</td>
</tr>
<tr>
<td><strong>Half/Full Width Mode</strong></td>
<td>Half/Full Width</td>
</tr>
<tr>
<td><strong>G6/T9 Mode</strong></td>
<td>G6/T9</td>
</tr>
<tr>
<td><strong>Display Associate Characters</strong></td>
<td>Enable/Disable</td>
</tr>
<tr>
<td><strong>Display Full Codes</strong></td>
<td>Enable/Disable</td>
</tr>
<tr>
<td><strong>On-screen Keyboard Types</strong></td>
<td>QWERTY/Numeric/Both</td>
</tr>
<tr>
<td><strong>Default display OSK</strong></td>
<td>Enable/Disable</td>
</tr>
<tr>
<td><strong>Display Legend in OSK</strong></td>
<td>Enable/Disable</td>
</tr>
</tbody>
</table>

Table 3.15.1: Functions/Options in Setting
3.16. About G6

For a standard application, it is necessary to show the information about it. Therefore “About G6 Dialog” is provided to users for obtaining some important information like the version of G6. In Figure 3.16.1, the “About G6 Dialog” is displayed.

![About G6 Dialog](image)

Figure 3.16.1: About G6 Dialog

3.17. T9 Chinese Input Method

Since the advantages of G6 is easy to learn and easy to use. Although 3+3 rule is very easy to understand, it is not easy for beginners to enter the last 3 strokes in single characters since users do not familiar with these methods. For achieving the goal of G6’s advantages, one more option for typing single characters, T9 Chinese Input Method is also implemented into G6.
T9 Chinese Input Method is a stroke-based Input Method which is equivalent to G6. In G6, only the first 3 strokes and last 3 strokes of the single characters are needed. In T9, all strokes are needed. Therefore, the users need to type more codes for a single character. However, for normal users, it is easier and faster to type single character in T9 at the beginning since it is according to the stroke order. In Figure 3.17.1, an example of using T9 Input mode is shown.

Figure 3.17.1: Single character by T9
Chapter 4: Methodology

4.1. Implementation G6 in MS-Windows

In MS-Windows, there are 2 methods for implementing Input Method: using the frameworks provided by Microsoft for building Input Method and implementing the Input Method in standalone format. Examples of these 2 methods are Changjie Input Method (倉頡輸入法) by using framework provided by Microsoft and Q9 Input Method (九方輸入法) by using standalone application.

The advantage of using frameworks provided by Microsoft is that it is more user-friendly since this is the standard method for implementing Input Method in MS-Windows. In this method, there is a language bar for choosing the standard Input Method and self-defined buttons for other purposes can be used.

By using standalone application, it can be simulate the same effects like the previous method by using key input event listener so the users can type characters in every text input area. The advantage of this method is that it is not necessary to have installation process so the users can launch the application and use it immediately.

Since G6 is implemented by using the frameworks provided by Microsoft, the same method has been adopted in this project. In this project, Microsoft Text Services Framework is used and Microsoft has defined it’s as follows:

Some frameworks are provided by Microsoft for programmers to write different type of programs in Microsoft Windows. For input method programs, there are Input Method Editors (IMEs) and Text Services Framework (TSF). IMEs is outdated after Microsoft Windows XP and it is fully replaced by TSF afterwards.

Microsoft® Windows® Text Services Framework (TSF) is a system service included in Windows XP and later versions of the Windows operating system. TSF provides a simple and scalable framework for the delivery of advanced text input and natural language technologies. TSF can
**be enabled in applications, or as a TSF text service. A TSF text service provides multilingual support and delivers text services such as keyboard processors, handwriting recognition, and speech recognition.** [3]

4.1.1. Using Text Service Framework

Microsoft has provided some TSF example which has some basic function including registering the services, setting up the language bar, some event handlers, etc. Therefore it is not necessary to write the TSF from an empty project.

There are many interfaces provided by Text Service Framework for handling different events and creating different effects. However, in G6 Input Method, only some of these interfaces are adopted but not all.

For using Microsoft Text Service Framework, Microsoft Visual Studio with Microsoft Platform SDK is needed. In this project, Microsoft Visual Studio 2005 SP1 has been adopted.

4.2. Database structure

In G6 Input Method, text files are adopted as the database and there are nine text files available for seeking character(s) purpose as listed in Table 4.2.1:

<table>
<thead>
<tr>
<th>Type</th>
<th>Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Character</td>
<td></td>
</tr>
<tr>
<td>2-character phrase</td>
<td>Traditional/Simplified Chinese</td>
</tr>
<tr>
<td>3-character phrase</td>
<td></td>
</tr>
<tr>
<td>multi-character phrase</td>
<td></td>
</tr>
<tr>
<td>Punctuation</td>
<td>N/A</td>
</tr>
<tr>
<td>User defined Phrase</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Table 4.2.1: Types of Database in G6

To read these files, the coding should be in UTF-8.

32
4.2.1. Database Format

In the text files, all characters that can be typed in G6 Input Method will be listed in the following structure:

<table>
<thead>
<tr>
<th>Codes of characters</th>
<th>tab</th>
<th>Character(s)</th>
</tr>
</thead>
</table>

Some examples are provided in the Figure 4.2.1.

![Figure 4.2.1: Examples of G6 Input Method Database](image)

4.2.2. Priority of the character(s)

For the priority of the character(s), the top character(s) in the list has the highest priority and the bottom character(s) in the list has the lowest priority. There are examples shown in Figure 4.2.1.

Take single character as an example, the priority of the character is 一 > 是 > 了 > 不 > 在 > 有

4.2.3. Codes presentation

In the text files, the codes of the character(s) are presented as numbers ranging from 1 to 5. In Table 4.2.2, the alias/actual codes conversion in G6 is shown.

<table>
<thead>
<tr>
<th>Alias code</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual code</td>
<td>一</td>
<td>丿</td>
<td>丶</td>
<td>フ</td>
<td>未</td>
</tr>
</tbody>
</table>

![Table 4.2.2: The alias/actual codes conversion in G6](image)
4.2.4. Loading Database

The G6 Database is loaded when G6 is invoked. However, not every database is loaded from the beginning since loading the database takes time (about 2 seconds for loading all databases) and occupies memory. Therefore, only the necessary databases are loaded from the beginning. Since there is Traditional/Simplified Chinese Mode, only one of them will be loaded, depending on the default setting. The remaining part will be loaded only when necessary. Moreover, all databases will be stored as linked list.

4.3. Function Description for G6 Input Method

For an Input Method, it is not only a standalone application, but also need to communicate with other applications since Input Method needs to run in other applications. Therefore, G6 Input Method has to perform good cooperation with other application.

Moreover, since G6 Input Method has many different modes for users to choose for typing, the logic flow of G6 Input Method is very complicated if using single flow chart for presentation only. As a result, the flowcharts are going to show are stated as follow:

1. Life cycle of G6 Input Method
2. Query in Database
3. Typing sequence
4. Chinese/English mode
5. Activate/Deactivate in G6 Input Method
6. Dictionary
7. Setting
8. About G6
4.3.1. Life cycle of G6 Input Method

For every Input Method Applications, they are invoked by other applications and then providing text service in the applications. Therefore, the life cycle of G6 Input Method and the application invokes G6 is similar. In Figure 4.3.1, the life cycle of G6 Input Method is shown.

![Figure 4.3.1: The life cycle of G6 Input Method](image)

In Figure 4.3.2, a demonstration is provided for showing how to invoke G6 Input Method in an application.

![Figure 4.3.2: Invoke G6 Input method](image)
4.3.2. Query in Database

Searching codes in Database is in the running part in the life cycle and called by G6 Input Method Application when the list of characters needs to be shown. In G6 Input Method, there are several types of codes for typing, i.e. 2-Character, 3-Character, Multi-Character and Associate Character. In these types of codes, the searching methods are different. In Figure 4.3.3, the flowchart of searching all types of codes is shown.

![Flowchart of Query in Database](image)

Figure 4.3.3: Flowchart of Query in Database

For the priority of the characters/phrases, they normally follow the database. However, there is an exception for single character and the criteria are shown as follows:

1. The code(s) typed is exactly match the single character.

2. The priority of the single character is first 6,000

If both of them are satisfied, the single character(s) will be set as the highest priority. In Figure 4.3.4, an example is shown for the case.
Before the codes typed do not exactly match codes of the character “白”, its priority is lower.

After the codes typed exactly match, its priority becomes the highest.

The reason of using this approach is to let users choose their desired characters easier. If the character’s stroke is less than 6 and the priority is not very high, it is difficult to type the character since it is not in the first page. For ensuring the users can find their character with less than 6 strokes in the first page, this approach can fulfill the users’ requirement. For the low-priority characters, since the users has little opportunity to type. If setting them into the highest priority, there is a disturbance but not contribution.

4.3.3. Typing sequence

There consist two modes for typing in G6 Input Method: Normal Mode and Associate Mode.

Normal Mode is the mode that the users type characters normally and associate mode means showing a list of phrases after users typed a single character in normal mode. When the user has typed a single character, the associate character will be shown afterward.

In Normal Mode, there consist two modes for typing: Dynamic and static mode. Note that the typing sequence in QWERTY area and numeric area is different. In the following paragraph, all the code sequence is in QWERTY area for simplicity. For the conversion in QWERTY/numeric area, see 4.3.3.5.
4.3.3.1. Dynamic mode

Dynamic mode for typing is an essential part in G6 Input Method since the result of the typed codes will be always shown which can help the beginners for easier typing and the advance users for quick typing of characters. In Figure 4.3.5, an example of using dynamic mode to type single character is shown. In Figure 4.3.6, examples of using dynamic mode to type phrase with different sequence are shown.

![Single Character “恆”](image)

**Code Sequence:** ˋ ˋ ˋ | ˋ ˋ ˋ + 1

<table>
<thead>
<tr>
<th>訂 (頭) 頭 (尾)</th>
<th>1/100</th>
<th>訂 (頭) 頭 (尾)</th>
<th>1/100</th>
<th>訂 (頭) 頭 (尾)</th>
<th>1/100</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 這</td>
<td>1 家</td>
<td>1 情</td>
<td>1 情</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 為</td>
<td>2 實</td>
<td>2 性</td>
<td>2 性</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 說</td>
<td>3 法</td>
<td>3 快</td>
<td>3 快</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 就</td>
<td>4 沒</td>
<td>4 慎</td>
<td>4 慎</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 家</td>
<td>5 聲</td>
<td>5 慎</td>
<td>5 慎</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 於</td>
<td>6 定</td>
<td>6 慎</td>
<td>6 慎</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 之</td>
<td>7 性</td>
<td>7 性</td>
<td>7 性</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 文</td>
<td>8 活</td>
<td>8 忙</td>
<td>8 忙</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 方</td>
<td>9 它</td>
<td>9 慎</td>
<td>9 慎</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>訂 (頭) 頭 (尾)</th>
<th>1/100</th>
<th>訂 (頭) 頭 (尾)</th>
<th>1/100</th>
<th>訂 (頭) 頭 (尾)</th>
<th>1/100</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 忙</td>
<td>1 恆</td>
<td>1 恆</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 慎</td>
<td>2 慎</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 慎</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 慎</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 慎</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 慎</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 慎</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 慎</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 慎</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 4.3.5: Example of typing single character in Dynamic Mode

From the figure, it is shown that the corresponding results have been shown for every code input. For typing the single character “恆” in Dynamic Mode, it is found that it has appeared only 4 codes typed. Therefore, not only the beginners can follow the tracks by the results, but also the advanced users can type the characters quickly for the high priority characters.
Figure 4.3.6: Examples of typing phrase in Dynamic Mode
From these 2 examples of typing phrases in Dynamic Mode, it can be found that the input mode can be changed from the beginning or at the end. The purpose of this design is for fulfilling different users’ need. Although the results can be shown if the users change the mode into 2-character mode first, it is not flexible enough if changing the mode is allowed from the beginning only.

For rollback the codes/input mode in dynamic mode, it is very flexible so the users can change everything before a character/phrase typed. In Table 4.3.1, the events for rollback codes/input mode are shown.

<table>
<thead>
<tr>
<th>Event</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Backspace</strong></td>
<td>Delete 1 code</td>
</tr>
<tr>
<td><strong>Type n-character in n-character mode</strong></td>
<td>Return to single character mode</td>
</tr>
<tr>
<td><strong>Type n-character in non n-character mode</strong></td>
<td>Switch to n-character mode</td>
</tr>
</tbody>
</table>

Table 4.3.1: Rollback events in Dynamic Mode

In Figure 4.3.7, a demonstration of rollback codes and input mode is shown.
4.3.3.2. Static mode

Static mode for typing is an advance method for typing since there are no query results shown until the request for showing the results. Therefore, static mode in G6 Input Method is similar to some of other Input Methods like Changjie Input Method. For the time to switch input mode, the users have to change after codes type. In Figure 4.3.8, an example of using static mode to type single character is shown. In Figure 4.3.9, examples of using static mode to type phrase with different sequence are shown.
From the figure, it is shown that the results are shown only when the code length reaches 6. Although it is necessary to type full codes for typing character/phrase in static mode, the input speed can be faster than dynamic mode because only exactly match results will be shown in static mode. There are only few results when the stroke number of the characters/phrases is less than 6. By this property, users can type these characters/phrases in a faster rate. Also, static mode is designed for advanced users and their input rate is fast enough so they can type 6 codes in a fast speed.

Note that static mode does not support T9 mode for typing single character since the input speed will be very slow by the characteristic of static mode: only exactly match results are shown.
In static mode, the users have to select the input mode after full codes typed because only exact match results will be shown in static mode. In QWERTY area, when 6 codes are typed, the results for single character will be shown. If it is found that there are no results in single character, it will change into 2-character mode and show the results automatically. If it is found that there are no results in 2-character, it will search 3-character and then multi-character. In Figure 4.3.9, the user does not need to change the input mode because of this property.

For rollback the codes in static mode, it is possible only when the results are not displayed. Once the results are shown, all codes will be cleared by typing backspace. For rollback the input mode in static mode, it is not supported.
4.3.3.3. Associate Mode

After single character typed, matched associate character will be displayed. The results are separated into 2-character, 3-character and multi-character. In default, 2-character phrases will be shown. If it is found that there are no results in 2-character, it will search 3-character and then multi-character.

For selecting the associate characters, the users just need to type 1-9. For changing the input mode, the users need to type Shift + n-character. In Figure 4.3.10, an example of typing associate characters is shown.

4.3.3.4. Punctuation

Since there is lots of Chinese Punctuation, the Punctuation on the keyboard cannot satisfy users’ need. Therefore, the users can type Punctuation by using Punctuation mode. In Figure 4.3.11, an example of typing Punctuation in Punctuation mode is shown.
In G6, not only single characters can be typed directly but also the phrases. In Punctuation, this property is also applied so the users can type Punctuation with more than 1 length directly.

4.3.3.5. Numeric Area

In numeric area, it is slightly different from QWERTY area in dynamic mode. The users cannot change the input mode after full codes are typed because it becomes choosing character mode after full codes typed.

In static mode, even though the full codes are typed, the results will not be shown automatically but the user need to type “Choose character” or n-character to choose the mode. If it is found that there are no results in that mode, it will search for next mode automatically. If it is found that there is only a single result, the result will output automatically.
4.3.4. Chinese/English mode

In G6 Input Method, not only it is able for typing Chinese but also available for typing English. In the conversion of Chinese/English, the major concern is for the showing/hiding components used in Chinese Mode, i.e. the candidate window and the coding window. In the Table 4.3.2, the effects of the components in Chinese/English conversion are shown.

<table>
<thead>
<tr>
<th>Mode</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chinese</td>
<td>Show Chinese Component</td>
</tr>
<tr>
<td>English</td>
<td>Hide Chinese Component</td>
</tr>
</tbody>
</table>

Table 4.3.2: Effects of the components in Chinese/English conversion

For demonstration, see Graphical User Interface effects part.

4.3.5. Activate/Deactivate in G6 Input Method

Since G6 Input Method runs in other applications, when the application runs G6 is deactivate, the service of G6 should be temporary disabled. As a result, similar to Chinese/English mode conversion, the components used in Chinese Mode will show/hide. If the users choose another Input Method, G6 Input Method will not just hide that component but deactivating the text service. After the users choose G6 Input Method again, it will activate again and no need to create a new instance.
4.3.6. Dictionary

There are 2 functions in G6 Dictionary: looking up G6 codes and inserting user defined phrase. For looking up G6 codes, users can obtain the codes of the character/phrase. Also, the location of the character/phrase in G6 mode is also displayed so that the users do not need to find the character/phrase from list.

For inserting user defined phrase, there are some restrictions: Firstly, the users cannot insert user defined character. Also, the phrase cannot contain any characters which are not in G6 database. If the phrase is valid, the phrase will be added into list and then the dictionary will send a message to the G6 main application for updating the list of user defined phrase so that the users can use their phrase immediately.

4.3.7. G6 Setting

In G6 Setting, the users can edit the setting in G6. Once the users submitted the change, the Setting application will send a message to G6 main application for updating the setting immediately. However, Chinese/English mode and Half/Full width mode will not be changed immediately but only the default setting since the users can change these setting in normal use. If the users change Traditional/Simplified Chinese mode, G6 will load the necessary database since only the necessary database is loaded only from the beginning. If the users change the setting about On-screen Keyboard, G6 main application will reopen the On-screen Keyboard for using latest setting.
4.3.8. About G6

In About G6, the following information is provided:

1. Trademark of G6
2. G6 version number
3. Official Website of G6
4. Email of G6

When the users click the website, a browser will access the official website of G6 automatically. When the users click the Email, Microsoft Outlook will automatically prepare some information for sending email to G6’s email.

4.4. Graphical User Interface Description and Effects

In G6 Input Method, there is some Graphical User Interface for helping users to type Chinese characters and the components are listed below and the detail description of each of the component are shown:

1. Candidate Window
2. Code Window
3. Language Bar
4. On-screen Keyboard
5. Dictionary Window
4.4.1. Candidate Window

The only purpose of showing Candidate Window is to let users select the character(s) that they prefer to type. A candidate window is shown in Figure 4.4.1.

![Candidate Window in G6](image)

**Figure 4.4.1: Candidate Window in G6**

In the Candidate list, there are maximum nine options. For the reason to choose nine choices per page, since G6 Input Method has the advantage that users can use one hand only for typing Chinese Characters in G6, the number of choices per page is important part. To maximize the number of choices without losing the degree of user friendly, displaying nine results per page is optimum.

For every characters/phrases/Punctuation except user defined phrase, users can choose them from Candidate window.
4.4.2. Code Window

In the Code Bar, the format of codes is as follow:

<table>
<thead>
<tr>
<th>First 3 codes</th>
<th>(blank)</th>
<th>Last 3 codes</th>
</tr>
</thead>
</table>

Since the codes of G6 Input Method depends on 3+3 rule, i.e. the first 3 strokes and the last 3 strokes. By using a blank to separate the first 3 codes and last codes can let users remind this rule effectively. In Figure 4.4.2, a code window is shown.

![Code Window in G6](image)

Figure 4.4.2: Code Window in G6

There are 3 colours available for the codes in three different situations and these are shown in Table 4.4.1.

<table>
<thead>
<tr>
<th>Colour</th>
<th>Mode</th>
<th>Situation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>Normal Mode</td>
<td>Has choice(s) in list</td>
</tr>
<tr>
<td>Red</td>
<td>Normal Mode</td>
<td>No choices in list</td>
</tr>
<tr>
<td>Black</td>
<td>Static Mode</td>
<td>Not in Choosing character mode</td>
</tr>
<tr>
<td></td>
<td>Associate Mode</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Table 4.4.1: Colour Presentation for the codes in Code Bar
4.4.3. User defined phrase Window

User defined phrase Window is for displaying user defined phrase. In dynamic mode, all user defined phrases which are matched the codes will be displayed in single character mode, regardless the length of phrases. In static mode, no results will be displayed. In n-character mode, only n-character phrases will be displayed.

Note that only 9 results is supported per set of codes in 2-character, 3-character and multi-character phrase since it is sufficient for normal users and only 9 results displayed is more user-friendly since the users can enter user defined phrase in single page. If it is found that it is not enough for users, more than 9 results can be provided to users in further development.

4.4.4. Positioning

For the position displayed of the previous component, the default position is right under the text cursor (the position which is typing). If it is found that there is not enough space for displaying whole candidate window, the position will change to at the top side of the text cursor and on the left side of the text cursor when necessary. In Figure 4.4.3, all scenarios are shown.
4.4.5. Language Bar

Language Bar is a component implemented by Microsoft Windows. Therefore, when G6 Input Method is registered, it becomes available to choose G6 within the language bar. In Figure 4.4.4, the language bar which is currently using G6 Input Method is shown.

In the self-defined Buttons part, users can click those buttons to change settings of G6 Input Method. In Figure 4.4.5, the functions of these buttons are shown.
4.4.6. On-screen Keyboard

By clicking the “Keyboard” in the Setting menu from the Language Bar, the On-screen Keyboard will shows/hides. In Figure 4.4.6, the On-screen Keyboard designed for G6 is shown.

The default position of the On-screen Keyboard is on right bottom corner on the screen and it is movable.

The effect of clicking the On-screen Keyboard is the same as the users typing in the physical keyboard.
4.5. Key Assignment

Key Assignment is a critical part for every Input Method since the level of user-friendly is based on it. If the keys are not assigned optimally, the key’s location will be more difficult to remember and the input speed will be slower.

4.5.1. QWERTY area

In QWERTY area, the keys available are far more than G6’s need. However, this is a challenge to assign the keys well. In Figure 4.5.1, the key assignment in QWERTY area is shown.

![Figure 4.5.1: Key assignment in QWERTY area](image)

In the keyboard, there are 4 functional areas as shown in Table 4.5.1.

<table>
<thead>
<tr>
<th>Areas</th>
<th>Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue</td>
<td>Enter G6 Codes</td>
</tr>
<tr>
<td>Orange</td>
<td>Input Mode Selection</td>
</tr>
<tr>
<td>Green</td>
<td>Character Selection</td>
</tr>
<tr>
<td>Pink</td>
<td>Cancellation</td>
</tr>
</tbody>
</table>

Table 4.5.1: Functions Description in Areas

The functions in each buttons are explained in Table 3.3.2.

For choosing “J”, “K”, “L”, “U”, “I”, “O” keys for typing G6 codes, there are 2 reasons. Firstly, “J”, “K”, “L” keys are the home position for right hand. It is no doubt that blue area’s keys the
most important keys, so 3 codes in blue area are put into “J”, “K”, “L” keys’ location. For remaining 3 codes, since it is more user-friendly if all codes can be typed by one hand, left hand side is not considered in the case. Therefore, “U”, “I”, “O” keys are chosen for assigning the remaining 3 codes since the users can use the same fingers as “J”, “K”, “L” keys.

For assigning the position of the codes, it is based on the frequency of the codes. In Table 4.4.2, the frequency of the 5 basic strokes is shown.

<table>
<thead>
<tr>
<th>Codes</th>
<th>—</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>304,934</td>
<td>212,134</td>
<td>170,961</td>
<td>164,200</td>
<td>159,269</td>
</tr>
</tbody>
</table>

Table 4.5.2: Code frequency in G6

By this result, the codes are assigned as Figure 4.5.1.

The second reason is that the users can type some common Punctuation directly from the keyboard if the codes are assigned on right hand side.

For selecting the input mode, “Y”, “H”, “N”, “M”, “P” keys are adopted, since it is more user-friendly to assign the orange area on the same side as blue area. For 2-character, 3-character, multi-character and G6/T9 mode, they are assigned to “Y”, “H”, “N”, “M” keys since it is easier to remember in the sequence, and “P” key stands for Punctuation which is easy to remember.

For the character selection area, the Enter key is used for entering first results as usual like other Input Method. For the Space key, it is used for looking up the next page results in general. For entering the characters/phrases in list, the users can type 1-9 keys as usual. However, it is not user-friendly if the users only use one hand for input in QWERTY area since there are not enough keys the key selection assignment for one hand input. Therefore, 2 hand input is necessary for QWERTY area.

Since the area surrounding the home position of left hand, “A”, “S”, “D”, “F” keys, are unused in this stage. It can have some benefit if the character selection can be used in that area other
than 1-9 keys because the typing speed will be slower for typing 1-9 keys since they are far away from the home position. Also, right hand’s workload is reduced since all character selection jobs can be assigned to left hand.

For the key assignment for selecting 1-9, it is easy to understand that the higher priority characters/phrases will be chosen more frequently on average. Therefore, 1-5 are assigned to “A”, “S”, “D”, “F”, ”G” keys. Since there is a special technique for selecting the first result which will be explained in 4.x.x, 1 is placed on “G” key. For 2-9, they are assigned in a sequence as “F”, “D”, “S”, “A”, ”T” , “R”, “E”, ”W”. Although returning to last page for result list is less common to use, it is also assigned to the “Q” key. Also, the user can use Page Up and Page Down keys for showing last page and next page results in list.

In pink area, the users can use Backspace key for roll back one code. For clearing all codes, Escape key can be used.

4.5.2. Numeric area

In numeric area, the keys available are fit in size for G6. Therefore, no used keys in numeric area are unused. In Figure 4.5.2, the key assignment in numeric area is shown.

![Figure 4.5.2: Key assignment in numeric area](image)

For the key assignment in 1-9 keys, there are 3 versions as shown in Figure 4.5.3. In the first version, the keys are assigned according the mobile phone key assignment so the users can
remember the keys’ location easily. However, the location of 1-9 in numeric area is inverted to the mobile phone key pad. In the second version, the keys are assigned as the mobile phone with same shape. However, the keys are the equivalent to the mobile phone again. In the third version, the keys are assigned by considering the level of user-friendly but not according to the design in mobile phone. In numeric area, the home position is in 4-6 keys. As stated before, “—”, “|”, “丿” are the codes having the most frequently use rate, so blue area is assigned into 4-9 keys like the QWERTY area.

“0” key is similar to space key in QWERTY area. The difference is that “0” key does not enter the first results but only change the normal mode to character selection mode. In normal mode, all function in 1-9 keys act as the keys shown. In character selection mode, 1-9 keys become entering 1-9 results in list. The Enter, “+”, “-”,”*”, “/” keys have the same behavior as the Enter, “B”, “V”, “P”, “Y” keys in QWERTY area.

Note that the numeric lock has to be locked for typing Chinese character in numeric area in G6. Since the functions and key events will be same as the arrow keys, home key, end key, etc. Therefore, it is difficult to handle the event if setting the key events in G6 when the numeric lock is unlocked.

Currently, the third version is implemented into G6 and some key assignment is changed in this stage.
4.5.3. Special Key event

Although all characters/phrases can be typed by general setting, some special key events are designed for having faster input speed. In Figure 4.5.4, the list of these events is shown.

<table>
<thead>
<tr>
<th>Keys</th>
<th>Events</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Codes in QWERTY area</td>
<td>1. Code length = 6 &amp; not typing single character with T9 mode</td>
<td>1. Enter first result in list</td>
</tr>
<tr>
<td></td>
<td>2. Associate mode</td>
<td>2. Type the code for new character</td>
</tr>
<tr>
<td>Input modes in QWERTY area without Shift Key</td>
<td>Associate mode</td>
<td>Select the input mode for new character/phrase/Punctuation</td>
</tr>
<tr>
<td>Input modes in Numeric area</td>
<td>1. Dynamic mode</td>
<td>Enter the result correspondingly (Direct choose)</td>
</tr>
<tr>
<td></td>
<td>2. Code length = 6</td>
<td></td>
</tr>
</tbody>
</table>

Table 4.5.3: Special key events

For typing codes when full codes are typed, the speed will be increased obviously since two actions are performed by typing one key. By this feature, it is less important to select the first results by other keys like “A”, “S”, “D”, “F” keys on left hand side of the QWERTY area.

For typing codes or input modes without Shift key, since associate mode is a less important feature in G6, the users need to press Shift key for changing the input mode in associate mode.

By using this setting, the users can type codes in the same sequence continuously.

For Dynamic mode in Numeric area, the input speed can be faster for forbidding the users change the input mode when full codes are typed.

4.5.4. Text Input Sequence

The text input sequences are different in different typing area and using different typing mode.

Therefore, there are 4 different text input sequence in G6 as shown in Table 4.5.4.
4.5.4.1. Input Sequence for Type I

The input sequence of this type is the most flexible with a fast speed in both single character and phrase. In Figure 4.5.3, the input sequence of typing single characters is shown.

C C C C C CS C C C C C C CS ...

C: Code
CS: Code Selection

Figure 4.5.3: Input sequence of typing single character

In this type, no matter how long of the length of the codes is, the users also can select the characters in the list directly.

For typing phrase, the users can select the input mode every time before selecting a phrase from the list so there are 7 cases in general. If the users are typing single character with T9 mode and then select the input mode, no matter how long the codes are typed, say that more than 6 codes, the codes will be truncated and only first 6 codes will be used. In Figure 4.5.4, all cases for typing phrase in this type are shown.
Although it is flexible to select the input mode, it is highly recommended to select the input mode from the beginning because the results may be on the first page even the full codes are not typed. In Figure 4.5.5, a demonstration is provided to show the input sequence in Type I.

Phrase: “今天天氣很不錯”

By using the optimum input sequence in Type I, only 19 keys are needed for typing 7 characters in Figure 4.5.5.
4.5.4.2. Input Sequence for Type II

In this type, if the users want to type single character with 6 or more strokes in G6 mode. It is equivalent to Type I. Otherwise, the users need to type Character Selection key. In Figure 4.5.6, the cases for typing single character in this type are shown.

<table>
<thead>
<tr>
<th>G6 Mode</th>
<th>C</th>
<th>C</th>
<th>C</th>
<th>C</th>
<th>C</th>
<th>C</th>
<th>CS</th>
</tr>
</thead>
<tbody>
<tr>
<td>G6 Mode</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>CSM</td>
<td>CS</td>
<td></td>
</tr>
<tr>
<td>T9 Mode</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>CSM</td>
</tr>
</tbody>
</table>

C: Code
CS: Code Selection
CSM: Code Selection Mode

Figure 4.5.6: Cases for typing single character in Type II

For typing phrases, there are 2 versions which can be used since they have their own advantages. For the version 1, the users have to change the input mode before full codes typed so there are 7 cases in general. In Figure 4.5.7, all cases for typing phrase in this type are shown.
Although it is relatively not flexible compared with Type I, the performance in this type is good since only one hand is needed for typing. In Figure 4.5.8, a demonstration is provided to show the input sequence in Type II version 1.

By using the optimum input sequence in Type II, only 23 keys are needed for typing 7 characters in Figure 4.5.8.
For the version 2, the users can select the input mode freely as Type I before typing Character Selection key. Therefore, they input sequence is the same as Type I except one more key for entering character selection mode needed before selecting the characters/phrases in list.

In these two versions, the only difference is when full codes typed. Since the users can choose the phrases directly in version 1, version 1 is chosen for faster input speed.

4.5.4.3. Input Sequence for Type III

In this type, the results will be shown only when character selection key is typed or full codes are typed. As a result, there are 2 cases for typing single character in this type as shown in Figure 4.5.9.

![Figure 4.5.9: Cases for typing single character in Type III](image)

For typing phrases in this type, it is not flexible compared with Dynamic mode since the codes have to be typed before selecting the input mode. There is only 1 case for typing phrases in this type as shown in Figure 4.5.10 since the length of codes does not take part in this type.
C: Code  
CS: Code Selection  
IMS: Input Mode Selection

For showing the performance in this type, a demonstration is provided to show the input sequence in Type III in Figure 4.5.11.

By using the optimum input sequence in Type III, 22 keys are needed for typing 5 characters in Figure 4.5.11. For typing the 7 characters in Figure 4.5.8, 26 keys are needed. It is obvious that the number of keys needed for input is more than Type I and Type II.

Since there are no advantages for using 2 hands input in Type III, it is highly recommended to use Static mode in numeric area.
4.6. Installation Guide

4.6.1. Installation Step for End Users

1. Install Microsoft Visual C++ 2005 Redistributable Package in the following URL:


2. (For Windows XP only)

   2.1. Right click the language bar and then click setting:

   ![Language Bar Setting]

   2.2. Click Advanced Tab and then select the checkbox as follow:

   ![Advanced Tab Setting]

3. Install G6 Input Method Windows Version in the following URL:

   http://www.ee.cityu.edu.hk/~g6code
4.6.2. Installation steps for Developers

1. Install Microsoft Visual C++ 2005

2. Install Windows SDK for Windows Server 2008 and .NET Framework 3.5 in the following URL:
   

4. Click “Projects and Solutions”->”VC++ Directories”,

Select “Library files” in “Show directories for”

Click new line button->browse and select “C:\Program Files\Microsoft SDKs\Windows\v6.1\Lib"

5. Select “Include files” in “Show directories for”

Click new line button->browse and select “C:\Program Files\Microsoft SDKs\Windows\v6.1\Include"

Click OK Button
# Chapter 5: Performance Evaluation

In Table 5.1, the performance of different aspect in G6 Input Method is shown.

<table>
<thead>
<tr>
<th>Item</th>
<th>Performance</th>
<th>Reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type single character</td>
<td>Excellent</td>
<td>Searching time is less than 5ms</td>
</tr>
<tr>
<td>Type phrases</td>
<td>Excellent</td>
<td>Searching time is less than 5ms</td>
</tr>
<tr>
<td>Show associate phrases</td>
<td>Excellent</td>
<td>Searching time is less than 10ms</td>
</tr>
<tr>
<td>Beginner User Interface</td>
<td>Excellent</td>
<td>With features designed for beginner users</td>
</tr>
<tr>
<td>Numeric Keys and Roman Keys Modes</td>
<td>Excellent</td>
<td>Key assignment is optimum and easy to edit in further development</td>
</tr>
<tr>
<td>Punctuation</td>
<td>Good</td>
<td>2 methods are provided which can enter Chinese Punctuation easily</td>
</tr>
<tr>
<td>Dictionary</td>
<td>Excellent</td>
<td>Detailed information are shown and user defined phrase can be added easily</td>
</tr>
<tr>
<td>Advance User Interface</td>
<td>Excellent</td>
<td>Optimum input sequence is set for advance users</td>
</tr>
<tr>
<td>Traditional/Simplified Chinese mode</td>
<td>Excellent</td>
<td>The users can change the mode in the setting</td>
</tr>
<tr>
<td>Chinese/English mode</td>
<td>Excellent</td>
<td>The users can change the mode by typing Shift key</td>
</tr>
<tr>
<td>Full/Half Width mode</td>
<td>Excellent</td>
<td>The users can change the mode by typing Shift+Space key</td>
</tr>
<tr>
<td>On-screen Keyboard</td>
<td>Excellent</td>
<td>Provided clear information for key assignment and performing interaction for key events</td>
</tr>
<tr>
<td>Setting</td>
<td>Excellent</td>
<td>All necessary setting is provided and the setting is updated immediately</td>
</tr>
<tr>
<td>About G6</td>
<td>Excellent</td>
<td>Sufficient information is provided</td>
</tr>
<tr>
<td>Installation</td>
<td>Acceptable</td>
<td>The Installation process is not user-friendly limited by Windows XP</td>
</tr>
</tbody>
</table>

68
# Chapter 6: Time chart of the progress

## Summer:

<table>
<thead>
<tr>
<th>Date</th>
<th>Assigned Job</th>
<th>Actual job done</th>
<th>Completion (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jun 2008</td>
<td>Getting familiar with G6 Chinese input system</td>
<td>Getting familiar with G6 Chinese input system</td>
<td>2.5</td>
</tr>
<tr>
<td>Jul 2008</td>
<td>Getting familiar with G6 Chinese input system</td>
<td>Getting familiar with G6 Chinese input system</td>
<td>5</td>
</tr>
<tr>
<td>Aug 2008</td>
<td>Preparing the G6 proposal</td>
<td>Preparing the G6 proposal</td>
<td>10</td>
</tr>
</tbody>
</table>

## Semester A:

<table>
<thead>
<tr>
<th>Date</th>
<th>Assigned Job</th>
<th>Actual job done</th>
<th>Completion (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sept 2008</td>
<td>Improving database design and associate characters</td>
<td>Getting familiar with Text Service Framework and Visual C++ (Temporary give up the enhancement of Database)</td>
<td>15</td>
</tr>
<tr>
<td>Oct 2008</td>
<td>Beginner User Interface Numeric Keys and Roman Keys Modes Associate characters Phrasal Mode</td>
<td>Beginner User Interface Numeric Keys Modes Phrasal Mode Traditional/Simplified Chinese mode</td>
<td>20</td>
</tr>
</tbody>
</table>

## Semester Break:

<table>
<thead>
<tr>
<th>Date</th>
<th>Assigned Job</th>
<th>Actual job done</th>
<th>Completion (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>Bug fixing GUI enhancing Extra function implementation</td>
<td>Rewrite text service part Associate characters</td>
<td>40</td>
</tr>
<tr>
<td>Week 2</td>
<td>Bug fixing GUI enhancing Extra function implementation</td>
<td>GUI enhancing Punctuation</td>
<td>50</td>
</tr>
<tr>
<td>Week 3</td>
<td>Bug fixing GUI enhancing Extra function implementation</td>
<td>Advance User Interface Dictionary Chinese/English mode</td>
<td>65</td>
</tr>
<tr>
<td>Date</td>
<td>Assigned Job</td>
<td>Actual job done</td>
<td>Completion (%)</td>
</tr>
<tr>
<td>---------</td>
<td>--------------------------------------------------</td>
<td>------------------------------------------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Week 1</td>
<td>Bug fixing Writing Progress Report</td>
<td>Bug fixing Writing Progress Report</td>
<td>70</td>
</tr>
<tr>
<td>Week 2</td>
<td>Writing Progress Report Key event Enhancement</td>
<td>Writing Progress Report Key event Enhancement</td>
<td>75</td>
</tr>
<tr>
<td>Week 3</td>
<td>Database Enhancement On-Screen Keyboard Design</td>
<td>Database Enhancement On-Screen Keyboard Design</td>
<td>77.5</td>
</tr>
<tr>
<td>Week 4</td>
<td>User defined mode</td>
<td>Half/Full width mode</td>
<td>80</td>
</tr>
<tr>
<td>Week 5</td>
<td>Simplified Chinese to Traditional Chinese</td>
<td>User defined mode</td>
<td>82.5</td>
</tr>
<tr>
<td>Week 6</td>
<td>About G6 Bug fixing</td>
<td>About G6 Bug fixing</td>
<td>85</td>
</tr>
<tr>
<td>Week 7</td>
<td>G6 Setting Bug fixing</td>
<td>G6 Setting Bug fixing</td>
<td>87.5</td>
</tr>
<tr>
<td>Week 8</td>
<td>Synchronization between G6 components Bug fixing</td>
<td>Synchronization between G6 components Bug fixing</td>
<td>90</td>
</tr>
<tr>
<td>Week 9</td>
<td>T9 Mode Bug fixing</td>
<td>T9 Mode Bug fixing</td>
<td>92.5</td>
</tr>
<tr>
<td>Week 10</td>
<td>Key event Enhancement On-Screen Keyboard Design</td>
<td>Key event Enhancement On-Screen Keyboard Design</td>
<td>95</td>
</tr>
<tr>
<td>Week 11</td>
<td>Bug fixing Preparation for presentation</td>
<td>Bug fixing Preparation for presentation</td>
<td>96</td>
</tr>
<tr>
<td>Week 12</td>
<td>Bug fixing and writing report</td>
<td>Bug fixing and writing report</td>
<td>98</td>
</tr>
<tr>
<td>Week 13</td>
<td>Bug fixing and writing report</td>
<td>Bug fixing and writing report</td>
<td>100</td>
</tr>
</tbody>
</table>
Chapter 7: Conclusion

G6 Bihua Chinese Input Method has provided a platform to users for typing single characters and phrases very easily since they only need to know the stroke order of the characters and 3+3 rule for single character and phrase. To implement G6 into MS-Windows platforms with very user friendly design, the G6 Input System has been implement and the performance is not only can maintain the main advantages of G6: easy to remember and easy to learn, but also provide a fast in input speed and easy to use environment for users to type Chinese Character/phrase in every text area in MS-Windows very conveniently.
References

[1] W3Counter
   http://w3counter.com/

   http://www.ee.cityu.edu.hk/~g6code/