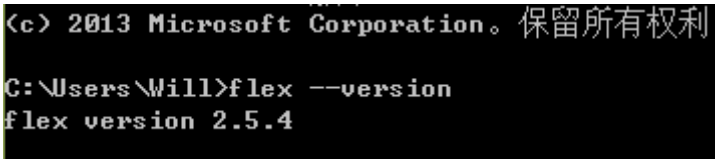
一、整体思路

由于我自身专业的特点，导致我自身并不是很熟悉 windows 下的开发，但是比较熟悉 linux 下命令行开发这种模式，所以当老师交给我在 windows 下配置 lex 这个任务时，我刚开始是没有思路的。老师给了我个工具，叫 parser generator，大概是 windows 下的一个 flex+yacc 的开发套件，网上有很多资料，但大都是将其与配置在 VC6.0 的编译环境中使用，VS 下的配置并不多，且基本没有 VS2010 及以上版本的配置案例，加上我本身并不熟悉，我决定换一种方法。我在网上了解到 windows 下还有 flex+bison 这一组合可以用，其中 flex 为 lex 的升级版，可以当 lex 使用，bison 为 yacc 的升级版。一般这种工具都是 linux 下的开源软件，然后被移植到 windows 下的，linux 下的开发使用的是 gcc，而微软用的是 VC，这两者还是有一定区别的。网上搜 flex 刚开始搜到的都是 linux 下的 flex 安装包，即*.tar.gz，windows 版本的需要搜索 flex for win，下载下来后即*.exe。搞定了 flex，我们就搞定了一般，因为我们知道本次实验需要通过*.l 编译生成*.c，然后*.c 编译生成*.exe。网上说 flex 生成的*.c 有时会以来 gcc 的环境，可能我们的使用范畴都比较小，VC 也能编译，具体我没有尝试，因为我觉得用 gcc 能更清晰明了一些。

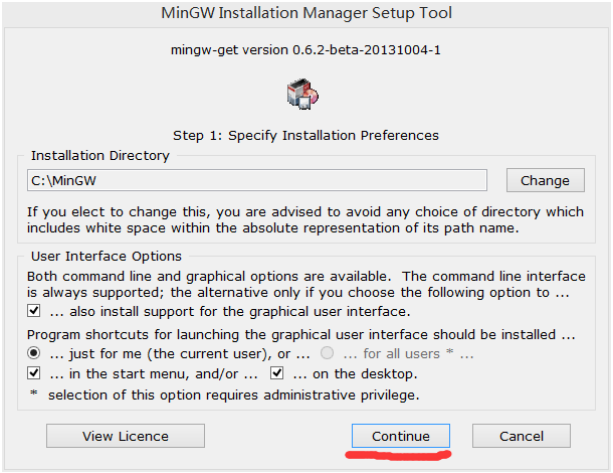
结合以上的考虑，我决定了用 flex+gcc 在 windows 下实现编译原理实验一。

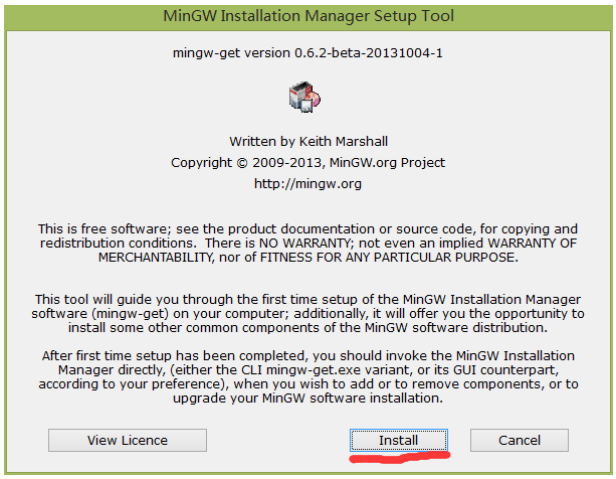


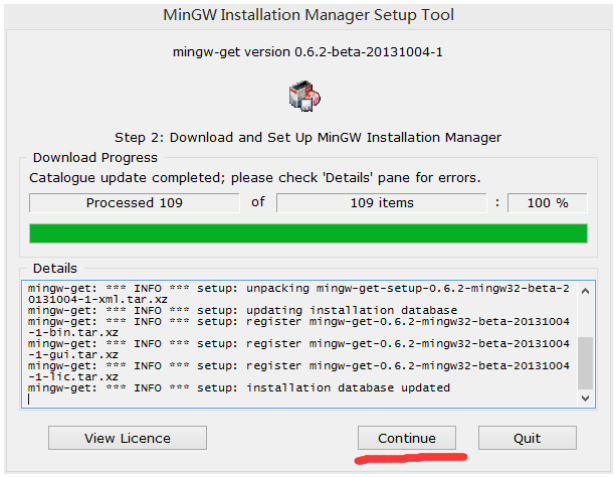
二、配置 GCC

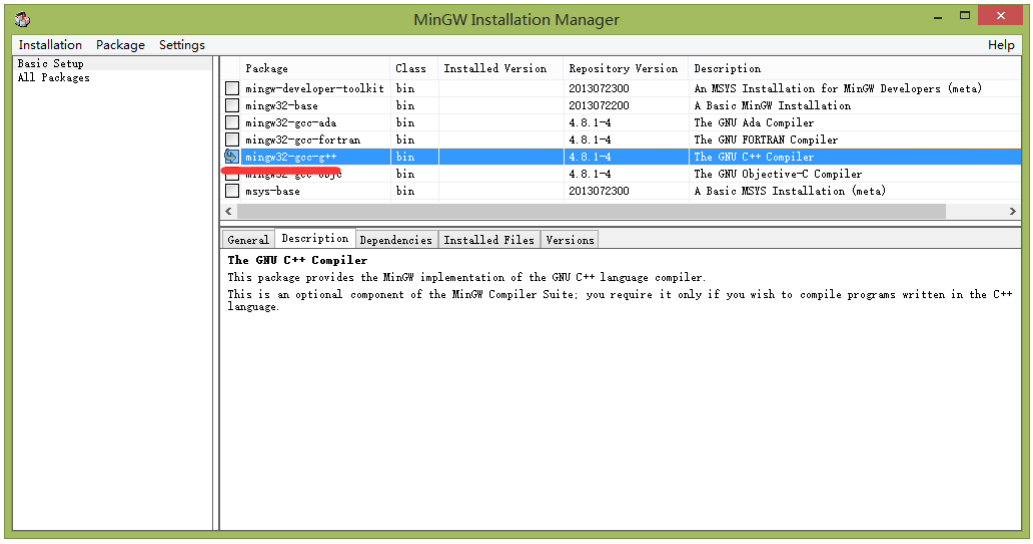
首先，我们得在 Windows 下拥有 gcc 环境，我们可以通过 MinGW 工具来为 Windows 配置 gcc 环境，下载地址为 http://sourceforge.net/projects/mingw/files/Installer/

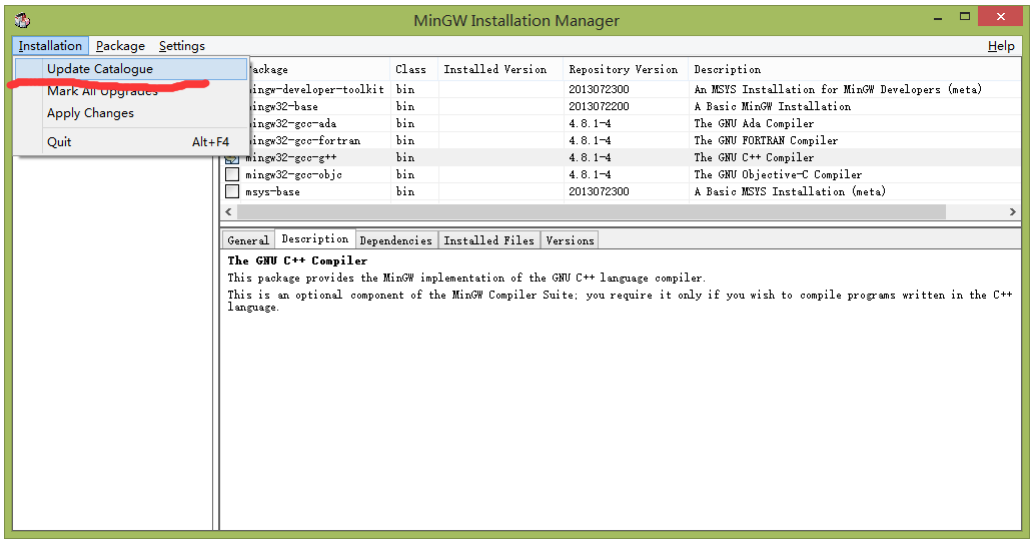
安装步骤为




MinGW Installation Manager Setup Tool
mingw-get version 0.6.2-beta-20131004-1
Written by Keith Marshall
Copyright © 2009-2013, MinGW.org Project
http://mingw.org
This is free software; see the product documentation or source code, for copying and redistribution conditions. There is NO WARRANTY; not even an implied WARRANTY OF MERCHANTABILITY, nor of FITNESS FOR ANY PARTICULAR PURPOSE.
This tool will guide you through the first time setup of the MinGW Installation Manager software (mingw-get) on your computer; additionally, it will offer you the opportunity to install some other common components of the MinGW software distribution.
After first time setup has been completed, you should invoke the MinGW Installation Manager directly, (either the CLI mingw-get.exe variant, or its GUI counterpart, according to your preference), when you wish to add or to remove components, or to upgrade your MinGW software installation.
View Licence
Install
Cancel


MinGW Installation Manager Setup Tool
mingw-get version 0.6.2-beta-20131004-1
Step 2: Download and Set Up MinGW Installation Manager
Download Progress
Catalogue update completed; please check 'Details' pane for errors.
Processed 109
of
109 items
100 %
Details
mingw-get: *** INFO *** setup: unpacking mingw-get-setup-0.6.2-mingw32-beta-20131004-1-xml.tar.xz
mingw-get: *** INFO *** setup: updating installation database
mingw-get: *** INFO *** setup: register mingw-get-0.6.2-mingw32-beta-20131004-1-bin.tar.xz
mingw-get: *** INFO *** setup: register mingw-get-0.6.2-mingw32-beta-20131004-1-gui.tar.xz
mingw-get: *** INFO *** setup: register mingw-get-0.6.2-mingw32-beta-20131004-1-lic.tar.xz
mingw-get: *** INFO *** setup: installation database updated
View Licence
Continue
Quit


MinGW Installation Manager
Installation
Package
Settings
Help
Basic Setup
All Packages
Package
Class
Installed Version
Repository Version
Description
mingw-developer-toolkit
bin
2013072300
An MSYS Installation for MinGW Developers (meta)
mingw32-base
bin
2013072200
A Basic MinGW Installation
mingw32-gcc-ada
bin
4.8.1-4
The GNU Ada Compiler
mingw32-gcc-fortran
bin
4.8.1-4
The GNU FORTRAN Compiler
mingw32-gcc-g++
bin
4.8.1-4
The GNU C++ Compiler
bin
4.8.1-4
The GNU Objective-C Compiler
msys-base
bin
2013072300
A Basic MSYS Installation (meta)
General
Description
Dependencies
Installed Files
Versions
The GNU C++ Compiler
This package provides the MinGW implementation of the GNU C++ language compiler.
This is an optional component of the MinGW Compiler Suite; you require it only if you wish to compile programs written in the C++ language.


MinGW Installation Manager
Installation
Package
Settings
Help
Update Catalogue
Mark All Upgrades
Apply Changes
Quit
Alt+F4
Package
Class
Installed Version
Repository Version
Description
mingw-developer-toolkit
bin
2013072300
An MSYS Installation for MinGW Developers (meta)
mingw32-base
bin
2013072200
A Basic MinGW Installation
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4.8.1-4
The GNU Ada Compiler
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bin
4.8.1-4
The GNU FORTRAN Compiler
mingw32-gcc-g++
bin
4.8.1-4
The GNU C++ Compiler
mingw32-gcc-objc
bin
4.8.1-4
The GNU Objective-C Compiler
msys-base
bin
2013072300
A Basic MSYS Installation (meta)
General
Description
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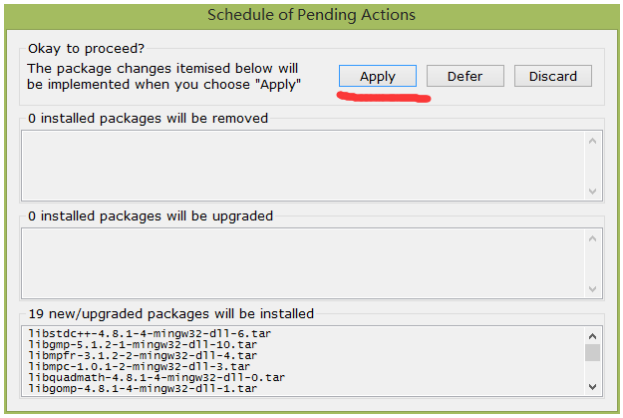
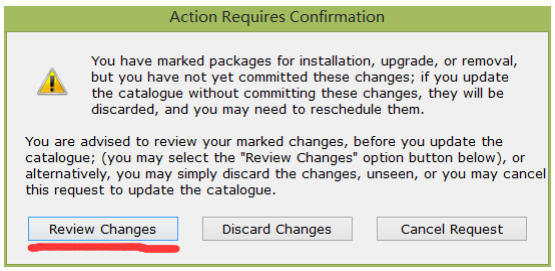
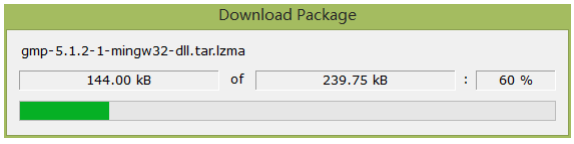
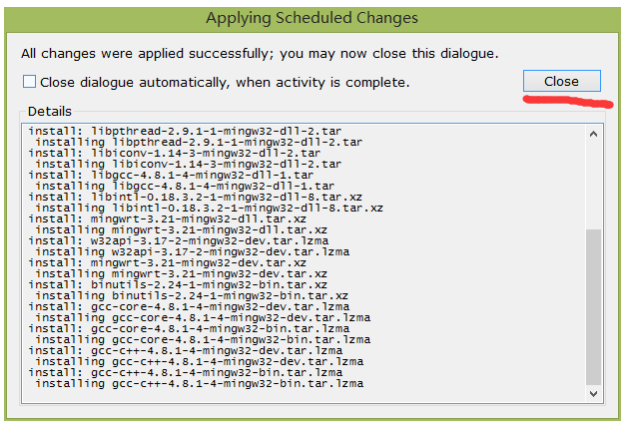
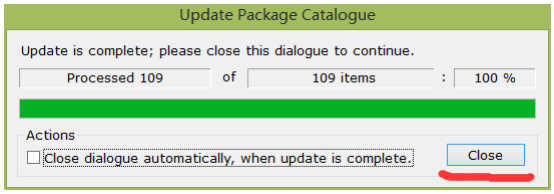
This is an optional component of the MinGW Compiler Suite; you require it only if you wish to compile programs written in the C++ language.

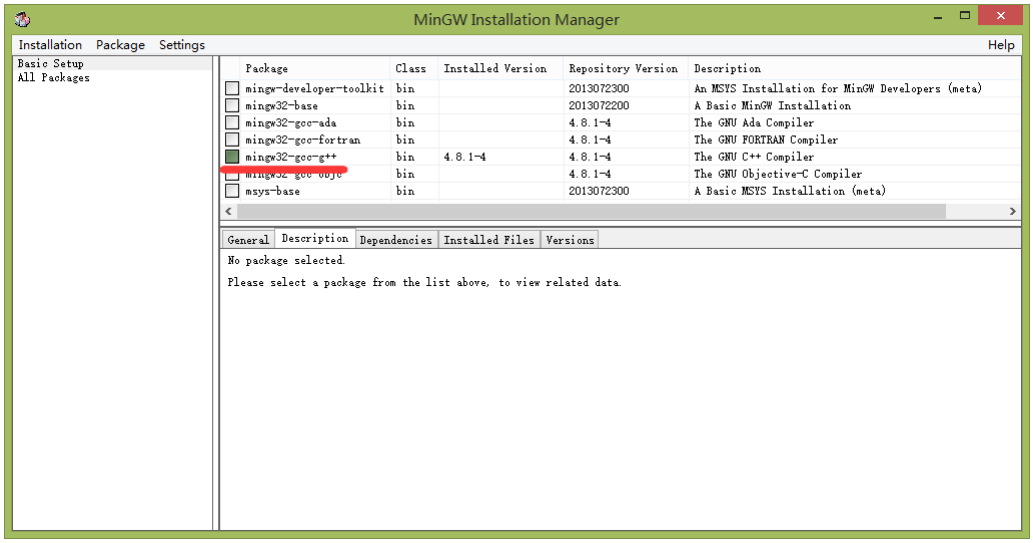

Schedule of Pending Actions
Okay to proceed?
The package changes itemised below will be implemented when you choose "Apply"
Apply
Defer
Discard
0 installed packages will be removed
0 installed packages will be upgraded
19 new/upgraded packages will be installed
libstdc++-4.8.1-4-mingw32-dll-6.tar
libgmp-5.1.2-1-mingw32-dll-10.tar
libmpfr-3.1.2-2-mingw32-dll-4.tar
libmpc-1.0.1-2-mingw32-dll-3.tar
libquadmath-4.8.1-4-mingw32-dll-0.tar
libgomp-4.8.1-4-mingw32-dll-1.tar


Action Requires Confirmation
You have marked packages for installation, upgrade, or removal, but you have not yet committed these changes; if you update the catalogue without committing these changes, they will be discarded, and you may need to reschedule them.
You are advised to review your marked changes, before you update the catalogue; (you may select the "Review Changes" option button below), or alternatively, you may simply discard the changes, unseen, or you may cancel this request to update the catalogue.
Review Changes
Discard Changes
Cancel Request


Download Package
gmp-5.1.2-1-mingw32-dll.tar.lzma
144.00 kB
of
239.75 kB
:
60 %


Applying Scheduled Changes
All changes were applied successfully; you may now close this dialogue.
Close dialogue automatically, when activity is complete.
Close
Details
install: libpthread-2.9.1-1-mingw32-dll-2.tar
installing libpthread-2.9.1-1-mingw32-dll-2.tar
install: libiconv-1.14-3-mingw32-dll-2.tar
installing libiconv-1.14-3-mingw32-dll-2.tar
install: libgcc-4.8.1-4-mingw32-dll-1.tar
installing libgcc-4.8.1-4-mingw32-dll-1.tar
install: libintl-0.18.3.2-1-mingw32-dll-8.tar.xz
installing libintl-0.18.3.2-1-mingw32-dll-8.tar.xz
install: mingwrt-3.21-mingw32-dll.tar.xz
installing mingwrt-3.21-mingw32-dll.tar.xz
install: w32api-3.17-2-mingw32-dev.tar.lzma
installing w32api-3.17-2-mingw32-dev.tar.lzma
install: mingwrt-3.21-mingw32-dev.tar.xz
installing mingwrt-3.21-mingw32-dev.tar.xz
install: binutils-2.24-1-mingw32-bin.tar.xz
installing binutils-2.24-1-mingw32-bin.tar.xz
install: gcc-core-4.8.1-4-mingw32-dev.tar.lzma
installing gcc-core-4.8.1-4-mingw32-dev.tar.lzma
install: gcc-core-4.8.1-4-mingw32-bin.tar.lzma
installing gcc-core-4.8.1-4-mingw32-bin.tar.lzma
install: gcc-c++-4.8.1-4-mingw32-dev.tar.lzma
installing gcc-c++-4.8.1-4-mingw32-dev.tar.lzma
install: gcc-c++-4.8.1-4-mingw32-bin.tar.lzma
installing gcc-c++-4.8.1-4-mingw32-bin.tar.lzma





安装完成之后 g++前面的状态已经改变，其中本次示例安装的安装路径为 C:\MinGW。

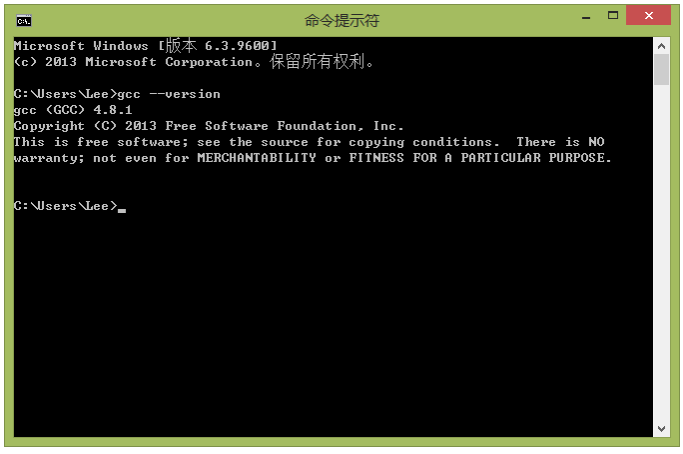
接下来需要配置环境变量，注意环境变量根据自己的安装路径配置，安装路径最好不好包括中文：

a.在 PATH 的值中加入“C:\MinGW\bin”。这是寻找 gcc 编译器的路径。如果 PATH 中还有其他内容，需要用英文状态下分号进行分割

b.新建 LIBRARY_PATH 变量，在其值中加入“C:\MinGW\lib”。这是标准库存放的路径。

c.新建 C_INCLUDE_PATH 变量，在其值中加入“C:\MinGW\include”。这是 Include 查找头文件的路径。

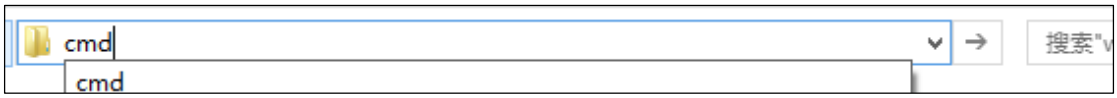
至此，gcc 以安装完毕，在 cmd 中输入 gcc –version，应有以下输出内容打印到控制台：



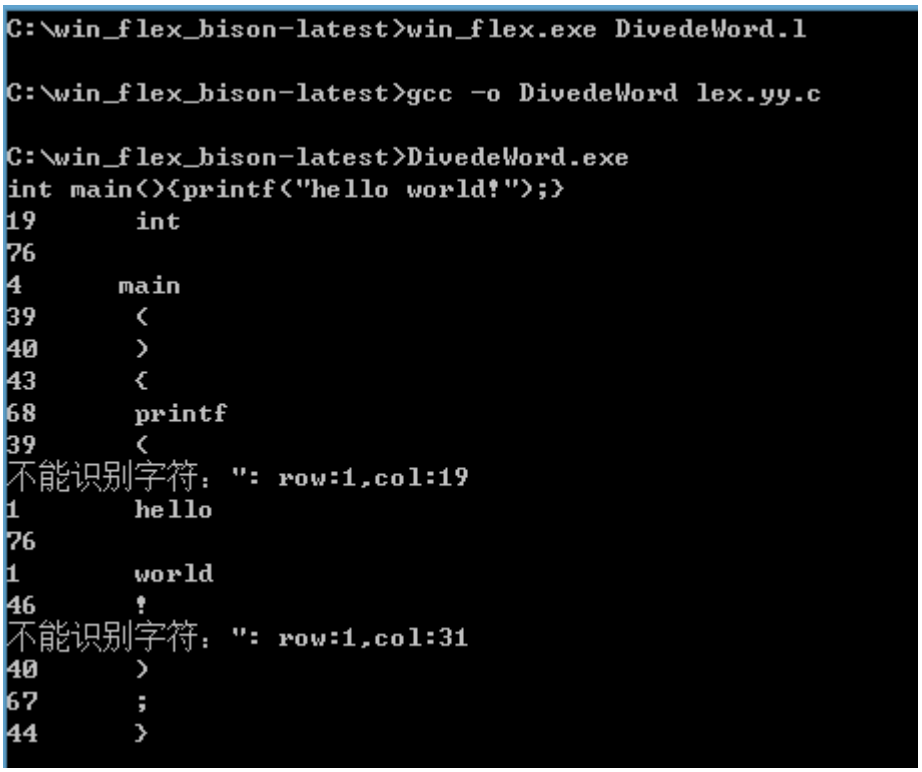
三、使用 lex

将压缩包中的 win_flex_bison-latest.zip 解压到 C 盘根目录（也可以选择其他目录）：

然后在地址栏输入 cmd



打开命令提示符，并且自动切换工作目录到 C:\win_flex_bison-latest
然后在将需要使用的.l 文件拷贝到 C:\win_flex_bison-latest
运行所输命令如下图所示



分词程序运行成功！

四、使用 bison

bison 使用与 flex 一模一样，地址栏输入 cmd 打开命令提示符，自动切换工作目录到 C:\win_flex_bison-latest，如下图所示输入命令编译执行*.y 文件

```
Microsoft Windows [版本 6.3.9600]
(c) 2013 Microsoft Corporation。保留所有权利。

C:\win_flex_bison-latest>win_bison.exe expression.y

C:\win_flex_bison-latest>gcc -o expression expression.tab.c

C:\win_flex_bison-latest>expression.exe
1+1+3/1+4*5
        25
```

表达式求值程序运行成功！

五、发现的问题

由于 word.l 这个例子之前可能使用 parser generator+V6.0 编译的，并没有问题，但是在命令符下提示第十三行语法错误，将此行去掉后即可通过。

另外，在 parser generator+V6.0 的环境下编译器可能比较智能，能够自动链接到库中的 yywarp 函数，但是命令符下提示 yywarp 函数未定义，需要在 lex 文件开头加一句声明：

```
%option noyywrap
```

或者在用户自定义区域加函数：

```
int yywarp(){
    return 1;
}
```