Workflow Notes

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1 Vim Tips and Tricks

Some good references are [7, 40]. A more advanced tutorial that I haven't watched yet is [6]. A document on effective text editing written by the creator of Vim can be found at [32].

- In Linux based systems, put 'setxkbmap -option "caps:escape' into ~/.bashrc to map the caps lock key to escape.

- To set Vim as your default text editor, use 'sudo update-alternatives –config editor'.

- Suppose the cursor is in the middle of a word. Whilst 'cw' and 'dw' will change/delete until the end of the word, 'ciw' and 'diw' to change or delete the whole word, thereby not requiring you to move the cursor to the beginning of the word first.

- To reformat a paragraph, use 'gq'. Reformatting includes enforcing the wrap limit which can be set in your vimrc with 'set tw=<number>'. Other options can be se such as indentation. Note that this command requires a minimum of two lines, so you'll need to at least use 'gqj' and at most use 'gjG' for the rest of the document under the line currently under the cursor.

- Use 'm<key>to set a mark to <key>then <key>to jump to it. Note that if you set it to the capitalized version of <key>then the jumping can occur between buffers. To see your list of marks, use ':mark'.

- Use '"<key>' then an action like 'y' or 'd' to store text in the *register* <key>. Then use '"<key>p' to paste it. Note that using 'd' will automatically store it in the register at register x and 'p' will automatically paste whatever is in register 'x'. Use ':reg' to see the register list.

- Use 'f<key>' to forward search for <key>. To backwards search, use 'F<key>'. To repeat the search, use ';'.

- The 't' stands for 'til'. For example, 'dt=' will delete up to and not including an = sign.

- The '*' can be used to search for the word under cursor.

- 'J' is used to join the line below to the line currently under the cursor. This is useful for reformatting improperly wrapped lines but in general 'gq' is more useful for this purpose.

- 'zt' or 'z¡CR¿' will put the line under the cursor to the to of the window. 'z.' will put the line to the center of the window and 'z-' will put it to the bottom of the window.

- 'z=' will give spelling suggestions for the word under the cursor.

- '[s' and ']s' to cycle backwards and forwards through misspelled words.

- Use 'g$' to go to the end of an unwrapped line.

- If you type a long line of text in insert mode, this counts as one action. Therefore, if you press undo, the whole line will be deleted. To break the undo chain, use <c-g>u while in insert mode. Alternatively, you could map space to <c-g>u so that the undo chain is broken whenever a space is added in insert mode: inoremap <Space><Space><c-g>u

- Use the accent '<shift+6>' in insert mode to move to the first non-white space character in the line.

- Use '%' while your cursor is over a parenthesis, square or curly bracket to move to the corresponding open/-closing parenthesis or bracket.

- Use ':ls' to see the list of buffers then ':b' and the number to select one. A useful mapping for this process is: nnoremap <leader>b:ls<cr>:b<space>

- Use '<number>+ <c-6>' to switch to numbered buffer.

- Use '<c-F>' in command line mode to view the command history in a buffer.

- In general, all yank, change or delete actions such as 'y, c, d, x' etc will register the text object into the "" register. However, any yank action will also register the text object into the "0 register and any delete or change action will register the text object into the "- register.

- Use 's' or 'S' to substitute. This is useful when you want to replace one letter with multiple letters.

- When using search '/<word>', you can use <c-g >and <c-t>to cycle through them without confirming your search with <CR>.

2 Plugin Management

The first part of this section follows [33]. First, we work towards turning /.vim into a git repository:

1. Move ∼/.vimrc into ∼/vim.

2. When vim boots, it's still going to look for .vimrc in the home directory. To ensure that it looks for vimrc in the ∼/.vim directory, we can create a symbolic link to that file using 'ln -s ∼/.vim/vimrc ∼/.vimrc'.

3. Make ∼/.vim into a git repository.

An issue now is if you install a plugin that itself is a git repository, you lose the version-control capabilities of that plugin. To circumvent this issue, we use a plugin manager; in this case *Pathogen*.

2.1 Pathogen

The pathogen plugin makes it possible to cleanly install plugins as a bundle. Rather than having to place all of your plugins side by side in the same directory, you can keep all of the files for each individual plugin together in one directory (see video from first link for example). This makes installation more straightforward, and also simplifies the tasks of upgrading and even removing a plugin if you decide you no longer need it since they are carefully segregated from each other. For a good tutorial on Pathogen, see [27].

Following the readme on the repo at [34], to install Pathogen do the following:

1. Run in terminal:
   mkdir -p ∼/.vim/autoload ∼/.vim/bundle &&
   curl -LSso ∼/.vim/autoload/pathogen.vim https://tpo.pe/pathogen.vim

2. Add the following to your vimrc: execute pathogen#infect()

Now any plugins you wish to install can be extracted to a subdirectory under /.vim/bundle, and they will be added to the 'runtimepath'. For example, to install "sensible.vim", simply run: "cd /.vim/bundle && git clone https://github.com/tpope/vim-sensible.git".

2.2 Submodules: Installing Git Repositories Within Git Repositories

This section follows [33]. Now that we can install plugins via Pathogen, let's see how we preserve the version control capabilities of our plugins. As a worked example, let us install the *Vimtex* plugin:

1. cd ∼/.vim

2. Now to clone a git repository into the bundle directory, use:
   git submodule add https://github.com/lervag/vimtex.git bundle/vimtex

Now, to upgrade this plugin, use:

1. cd ∼/.vim/bundle/vimtex

2. git pull origin master

To upgrade ALL of your plugins, use:

1. cd ∼/.vim

2. git submodule foreach git pull origin master

2.3 Importing Your Vim Configuration and Plugins To a New Machines

One of the main benefits of version controlling your Vim configuration and plugins is the ease of which they can be imported into a new machine. To do so, use the following:

1. cd $\sim$

2. git clone <git repo url>$\sim$/.vim

3. ln -s $\sim$/.vim/vimrc $\sim$/.vimrc

4. cd $\sim$/.vim

5. git submodule init

6. git submodule update

2.4 Vim-plug

Whilst Pathogen is the most basic plugin manager, there are limitations when porting your setup to a new machine:

1. When you run git submodule update, you'll pull the latest versions of the plugins from their respective repositories. So unless you've noted down somewhere all the commit IDs for your favourite version of each plugin, your overall plugin collection cannot be preserved when porting to a new machine.

2. Suppose one of the plugins is no longer being maintained by the owner and suppose also that you've made your own changes to the plugin. If you were to pull your configuration on a new machine, you will pull the latest version of the plugin; that is your changes will not be ported. Further, on your own repository for your configuration, the directories containing the plugins will be treated as repositories. Unless you manually install the plugins, there is no way to preserve your changes onto Github.

The plugin manager Vim-plug [20] has a solution to the first problem. This plugin manager is extremely simple to use:

1. Run in terminal:
   curl -fLo $\sim$/.vim/autoload/plug.vim --create-dirs https://raw.githubusercontent.com/junegunn/vim-plug/master/plug.vim

2. In your vimrc, add the line:
   call plug#begin('$\sim$/.vim/plugged')

3. To include a plugin you wish to install under the line above, in your vimrc add the following line:
   Plug 'https://github.com/lervag/vimtex.git'

4. Under 'Plug <url >' of your last plugin, in your vimrc add the following line:
   call plug#end()

5. Reload your vimrc and use the command ':PlugInstall' while in vim. Now all your plugins are installed.

Now to preserve the versions of your plugin:

1. In Vim, run the command ':PlugSnapshot! <filename >.vim'.

2. To restore the state of your plugins, in vim run the command:
   :source $\sim$/.vim/<filename >.vim
   or, in terminal:
   vim -S $\sim$/.vim/<filename >.vim

See the bradagy's answer in the reddit post [3]. To port your configuration to a new machine:

1. cd $\sim$

2. git clone <git repo url >$\sim$/.vim

3. cd $\sim$/.vim/vimrc

4. :PlugInstall

5. :source $\sim$/.vim/<filename >.vim

To uninstall plugins:

1. Delete 'Plug <url >' line from your vimrc

2. :PlugClean

3   Native Plugin Management

Vim-plug provides a solution to the first of the two issues mentioned in the previous section, but not the second. To address the second issue, we can use Vim's native plugin management system to install a plugin and delete the .git repository. That way, we can track the files and any changes in our own git repository. This section follows [31]. For a more detailed explanation, see [36].

The package feature of Vim 8 follows a pathogen-like model and adds the plugins found inside a custom-path ∼/.vim/pack/ to Vim's runtime path. You can check the version of Vim installed using 'vim –version'. To install using this native feature, we use the following steps:

1. mkdir -p ∼/.vim/pack/plugins/start/

2. git clone <url>

3. :helptags ∼/.vim/pack/plugins/start/<plugin name>

and that's it! To remove a plugin, simply remove its directory: rm -r ∼/.vim/pack/plugins/start/foo.

4   Vimtex

This section discusses the Vimtex [29] plugin. See also the vimways article [41] for a good overview.

4.1   Installing and Running Vimtex

Assuming you are using the Pathogen plugin manager and version controlling your /.vim directory, follow the steps used in Section 2.2. Then use ':Helptags' which is Pathogen's method for generating help tags. With this, we can use ':h vimtex' to see the manual for Vimtex. To confirm that the plugin works, type ":VimtexInfo" to see a summary of the tex file.

4.2   Compiling a Tex File

The following commands are useful:

- :VimtexCompile # this is a continuous compiler meaning that everytime you save with ":w" it will automatically compile

- :VimtexStop # this stops the continuous compiler

- :VimtexCompileSS # this is a single shot compiler. Note that you have to save your file first

- :VimtexClean # Cleans auxiliary files generated in compilation process

I set the following mappings in my vimrc:

```
autocmd FileType tex nnoremap <F5> :VimtexView<Enter>
autocmd FileType tex inoremap <F5> <Esc> :VimtexView<Enter>
autocmd FileType tex nnoremap <F6> :w! <bar> :VimtexCompileSS<Enter>
autocmd FileType tex inoremap <F6> <Esc> :w! <bar> :VimtexCompileSS<Enter>
```

Here are some useful commands I use in my vimrc:

```
" Avoids opening an empty .tx file only to have vimtex recognize it as plain Tex rather than Latex
    let g:tex_flavor = 'latex'

" Use folding. Use zx to unfold and zX to fold all
    let g:vimtex_fold_enabled = 1

" Toggle Error Window On and Off
    autocmd FileType tex map <F4> \le

" Shortcut for Compiling and Viewing PDF
    autocmd FileType tex nnoremap <F5> :VimtexView<Enter>
    autocmd FileType tex inoremap <F5> <Esc> :VimtexView<Enter>
    autocmd FileType tex nnoremap <F6> :w! <bar> :VimtexCompileSS<Enter>
    autocmd FileType tex inoremap <F6> <Esc> :w! <bar> :VimtexCompileSS<Enter>

" VimtexClean on exit
  augroup vimtex_config
    au!
    au User VimtexEventQuit call vimtex#compiler#clean(0)
  augroup END
```

4.3 Forward and Backwards Searching with Synctex

This section follows [11]. For this, you will need a Vimtex server which allows you to do forward and backward to navigate between corresponding sections of the tex file and the pdf. You will also need the pdf viewer *Zathura*. To install, simply use 'sudo apt-get install zathura'. Then, in your vimrc, add the following line 'let g:vimtex_view_method = 'zathura''.

Following [28], to install just use 'sudo apt-get install vim-gnome'. Finally, to edit a tex file with navigation capabilities:

1. In the directory containing the tex file, use:
   vim –servername <servername><texfile>.tex

2. While in tex file, to jump to the text on the pdf corresponding to the line under your cursor, use:
   <leader>lv

3. Move your mouse cursor over some text on the pdf. Then, to jump to corresponding text on the tex file, use:
   Ctrl + left-click

Note that <leader>lv forward search works without the Vim server; it's the backwards search that requires the Vim server.

4.4 Other Useful References

- Good article overviewing Vimtex [41]
- Nice compilation of Vimtex commands [11]
- Quick guide on the basics of Vimtex [17]
- For a comparison with other Vim LaTeX plugins [29]
- Some useful mappings such as the teleportation trick [37, 38].
- Note-taking using Vim and LaTeX for math lectures [5]
- Vim and LaTeX on MacOS [9]

5 IPython

The following mapping may prove useful for starting an IPython terminal in Vim:

```
nnoremap <leader>P :botright vertical terminal ipython −−no−autoindent<CR><C−w><left>
```

5.1 sendtowindow Plugin

When coding in Python with a Vim terminal on the side running IPython, I use the *sendtowindow* plugin [24] to send lines of code to the terminal. See [23] for a Reddit post from the author discussing the plugin. It's a very simple plugin that allows the use of vim motions to move lines of text to terminals left, right, above or below the Vim window. I use the following maps:

```
let g:sendtowindow_use_defaults=0
nmap ,sr <Plug> SendRight
xmap ,srv <Plug> SendRightV
nmap ,sl <Plug> SendLeft
xmap ,slv <Plug> SendLeftV
nmap ,su <Plug> SendUp
xmap ,suv <Plug> SendUpV
nmap ,sd <Plug> SendDown
xmap ,sdv <Plug> SendDownV
```

Note that these mappings must not be noremaps (mappings that are non-recursive). For an explanation on why this is the case, please see [21]. Any one of these mappings will specify to either send some text in normal mode or in visual mode. When in normal mode, to specify which text to send, use the usual Vim movements. For example, ',sr$' will send from the cursor to the end of the line to the window on the right. However, if you are in the middle of a line, it may become tedious having to first go to the beginning of the line and having to type '$'. Therefore, we can define line objects using the following maps:

```
onoremap <silent> <expr> - v:count==0 ? ":<c-u>normal! 0V$h<cr>" : ":<c-u>normal! V" . (v:count) . "jk<cr>"
vnoremap <silent> <expr> - v:count==0 ? ":<c-u>normal! 0V$h<cr>" : ":<c-u>normal! V" . (v:count) . "jk<cr>"
onoremap <silent> <expr> i- v:count==0 ? ":<c-u>normal! ^vg_<cr>" : ":<c-u>normal! ^v" . (v:count) . "jkg_<cr>"
vnoremap <silent> <expr> i- v:count==0 ? ":<c-u>normal! ^vg_<cr>" : ":<c-u>normal! ^v" . (v:count) . "jkg_h<cr>"
```

With '-' alone the indentation is left intact and 'i-' is without indentation. So, for example, ',sr-' will send the line under the cursor to the window on the right with indentation and ',sr8-' will send four lines under the cursor to the window on the right. Note that this is important for Python as if you try send a for loop with 'i-' and leave out the indentation, then it may not run.

Finally, using these mappings, we can create a mapping that sends clear and %reset commands to the IPython terminal. I am aware that these mappings are as hacky as the day is long, but they work:

```
" Send to right window (I only really ever use the right window)
nmap ,s <Plug>SendRight
xmap ,s <Plug>SendRightV

" Insert current file name
inoremap ;F <C-R>=expand("%:t")<CR>

" Clear, Reset, Run Variable, Run Marked Section and Run Code
nnoremap ,sC <c-w>lclear <CR><c-w>h
nnoremap ,sD <c-w>l%reset -f<CR><c-w>h
nmap ,sV mqviw,s`qdmq
nmap ,sM mq'xV'z,s`qdmq
nmap ,sR mqA<CR>run ;F<Esc>V,suuu`qdmq
```

Notice that the clear and reset commands don't utilize the sendtovariable plugin. However, the other commands do as text in the editor needs to be sent to the terminal to the right.

Be sure to use recursive mappings which will allow us to reuse the ',s' and ';F' mapping. In order to preserve the cursor position, I use 'mq' to set a mark at your current cursor location and `q to return to that location after executing the command. When executing marked sections, the mapping above specifies that you need to mark the beginning of the section you wish to run with 'x' and the end of that with 'z'. The plugin vim-signature [26] may come in handy for manipulating the marks. In particular, the plugin displays marks and the command 'dm<mark name>' deletes the mark; so 'dmq' above deletes the mark called 'q'.

5.2 Slimux plugin

There are many plugins that allow interaction between Vim and tmux. For example, there is Vim-Slime [18] and Vimux [2]. The one I use is Slimux [10]. There is a blog post about it here [39]. As discussed in the blog post, Slimux differs from Vimux in that it is more disjoint from tmux. In particular, Vimux will create a pane on which you must run your commands whereas Slimux allows you to select the pane you wish to use. Also, unlike Vim-Slime, you do not need to manually type in the pane to select it; in Slimux an interactive prompt is given. It's also worth noting that Vim-Slime supports many terminal multiplexers such as GNU Screen, kitty and Vim's native terminal.

However, with Slimux, there is an issue with sending commands to IPython where the indentation is constantly carried over [25]. There are three proposed fixes [30, 22, 42]. The first modifies python.vim, the second modifies both slimux.vim and python.vim by implementing IPython's cpaste function and the third modifies a single line of slimux.vim. Since the repo owner hasn't pulled any of these fixes, I opted for the third fix which requires changing line 328 of slimux.vim in the SlimuxSendCode() function:

```
let b:code_packet["text"] = a:text
```

to:

```
b:code_packet["text"] = "\e[200~" . a:text . "\e[201~\r\r.
```

Note that this repository has not been updated in years and so all pull requests have not been fulfilled. Therefore, if you wish to track the fixes you've made, you may want to install the plugin manually so that it does not follow the original repository. This was disussed in Section 3.

I use the following mappings:

```
nmap ,- :SlimuxREPLSendLine<CR>
vmap ,- :SlimuxREPLSendSelection<CR>
nmap ,T :SlimuxShellRun
nmap ,E :SlimuxShellRun exit <CR>
```

```
nmap ,l :SlimuxShellLast<CR>

" Clear, Reset, Run Variable, Run Marked Section and Run Code
nnoremap ,P :SlimuxShellRun ipython<CR>
nnoremap ,C :SlimuxShellRun clear<CR>
nnoremap ,D :SlimuxShellRun %reset −f<CR>
nmap ,V mqviw,−'qdmq
nmap ,M mq'xV'z,−'qdmq
nmap ,R :w!<CR>mqA<CR>run ;F<Esc>V,−uuu'qdmq
```

where SlimexShellRun awaits a command to send to shell and SlimuxShellLast runs the last shell command.

5.3 Other Useful References

- A good Reddit thread on workflow with Vim and IPython can be found at [1]. Note that the majority of the responses indicate that they use vim-slime and tmux.

- The vim-tmux-runner plugin [8] may be worth checking out.

- The vim-ipython-cell plugin [12] may be worth checking out. There is a reddit post [13] by the author on this plugin. Note that this plugin is leverages vim-slime. According to the author, the main contribution of this plugin is that it provides many ways to define and run cells, even using Vim marks.

- Another lightweight workflow can be found in [14]. For this, you will need three plugins: Vimux [2], vim-pyShell [15] and vim-cellmode [19]. However, I have trouble getting this to work. Starting and stopping a pyShell session works fine as well as sending one line of code, but I have issues sending over cells.

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