

Inf1B

Version Control¹

Perdita Stevens

adapting earlier versions by Ewan Klein, Volker Seeker, et al.

School of Informatics

¹Thanks to Karl Broman for much of this content

"FINAL".doc



FINAL.doc!



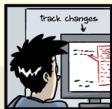
FINAL_rev.2.doc



FINAL_rev.6.COMMENTS.doc



FINAL_rev.8.comments5.
CORRECTIONS.doc



FINAL_rev.18.comments7.
corrections9.MORE.30.doc



FINAL_rev.22.comments49.
corrections.10.#@\$%WHYDID
ICOMETOGRADSCHOOL?????.doc



JERGE CHAI © 2012

WWW.PHDCOMICS.COM

Methods for tracking versions

- ▶ Don't keep track
- ▶ Save numbered zip files
- ▶ Formal version control

Suppose it stops working. . .

- ▶ Don't keep track
 - ▶ good luck!
- ▶ Save numbered zip files
 - ▶ Unzip versions and diff
- ▶ Formal version control
 - ▶ Easy to study changes back in time
 - ▶ Easy to jump back and test

Why use formal version control?

- ▶ History of changes
- ▶ Able to go back
- ▶ No worries about breaking things that work
- ▶ Merging changes from multiple people

Example repository

PUBLIC kbroman / Talk_MAGIC

Unwatch 1

Star 0

Fork 0

Talk for MAGIC workshop in Cambridge, UK, 12 June 2013 — Edit

97 commits

1 branch

0 releases

1 contributor

branch: master Talk_MAGIC /

Greatly simplify the public domain stuff in the ReadMe

kbroman authored 15 days ago

Latest commit f1777ef192

Figs	Add crazy table from preCC paper	4 months ago
Perl	Add lines_of_code_by_version.csv to repository	4 months ago
R	Another fix regarding map expansion in 8-way RIL by selling at k=0	4 months ago
gllignore	Add lines_of_code_by_version.csv to repository	4 months ago
Maketitle	Revise Readme to link to version for web	4 months ago
ReadMe.md	Greatly simplify the public domain stuff in the ReadMe	15 days ago
magic.tex	Fix two slight bugs in slides:	4 months ago

ReadMe.md

Talk for MAGIC Workshop in Cambridge, UK

These are slides for a talk I will give at the [Workshop on MAGIC-type populations](#) in Cambridge, UK, on 12 June 2013.

The PDF is [here](#).

To the extent possible under law, [Karl Broman](#) has waived all copyright and related or neighboring rights to "MAGIC design and other topics". This work is published from: United States.



Code

Issues 0

Pull Requests 0

Wiki

Pulse

Graphs

Network

Settings

HTTPS clone URL

<https://github.com>

You can clone with [HTTPS](#), [SSH](#), or [Subversion](#).

Clone in Desktop

Download ZIP

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Greatly simplify the public domain stuff in the ReadMe

 **kbroman** authored 15 days ago

latest commit `f1777ef192` 

 Figs	Add crazy table from preCC paper	4 months ago
 Perl	Add lines_of_code_by_version.csv to repository	4 months ago
 R	Another fix regarding map expansion in 8-way RIL by selfing at k=0	4 months ago
 .gitignore	Add lines_of_code_by_version.csv to repository	4 months ago
 Makefile	Revise Readme to link to version for web	4 months ago
 ReadMe.md	Greatly simplify the public domain stuff in the ReadMe	15 days ago
 magic.tex	Fix two slight bugs in slides:	4 months ago

rights to "MAGIC design and other topics". This work is published from: United States.



Example history

PUBLIC  kbroman / Talk_MAGIC

Unwatch - 1 Star 0 Fork 0

branch: master - Talk_MAGIC / Commits

Sep 27, 2013



Greatly simplify the public domain stuff in the README

kbroman authored 15 days ago

f1777ef192

[Browse code](#)



Fix url in README.md file

kbroman authored 15 days ago

06515023f9

[Browse code](#)

Jun 17, 2013



Another fix regarding map expansion in 8-way RIL by selfing at k=0

kbroman authored 4 months ago

20ca482f2c

[Browse code](#)



Fix two slight bugs in slides:

- 8-way RIL by selfing: map expansion - 1 at k=0

- Slight repair to definition of 3-pt coincidence

kbroman authored 4 months ago



51d4ca9ceb

[Browse code](#)

Jun 10, 2013



Change one page number

kbroman authored 4 months ago

e0e0608615

[Browse code](#)



Add missing paren

kbroman authored 4 months ago

f4975dee6e

[Browse code](#)



who's -> who is

kbroman authored 4 months ago

886f20f898

[Browse code](#)



rubbish -> bad

kbroman authored 4 months ago

e6fbf2f647

[Browse code](#)



Add link to R/qt page

kbroman authored 4 months ago

4edf3e8d76

[Browse code](#)



Revise slide re analysis issues

kbroman authored 4 months ago

14ebb1eeb5

[Browse code](#)



italicize 'de novo'

kbroman authored 4 months ago

45dda4b4c7

[Browse code](#)



replace plain right arrow with fat arrow

kbroman authored 4 months ago

8bbe305d6c

[Browse code](#)



What is git?

- ▶ Formal version control system
- ▶ Developed by Linus Torvalds (developer of Linux)
 - ▶ used to manage the source code for Linux
- ▶ Tracks any content (but mostly plain text files)
 - ▶ source code
 - ▶ data analysis projects
 - ▶ manuscripts
 - ▶ websites
 - ▶ presentations

Why use git?

- ▶ It's fast
- ▶ You don't need access to a server
- ▶ Amazingly good at merging simultaneous changes
- ▶ Everyone's using it

What is GitHub?

- ▶ A home for git repositories
- ▶ Interface for exploring git repositories
- ▶ Real open source
 - ▶ immediate, easy access to the code
- ▶ Like facebook or a public portfolio for programmers
- ▶ Free 2-year "micro" account for students
 - ▶ education.github.com
- ▶ (Bitbucket.org is an alternative)
 - ▶ free private repositories

Why use GitHub?

- ▶ It takes care of the server aspects of git
- ▶ Graphical user interface for git
 - ▶ Exploring code and its history
 - ▶ Tracking issues
- ▶ Facilitates:
 - ▶ Learning from others
 - ▶ Seeing what people are up to
 - ▶ Contributing to others' code
- ▶ Lowers the barrier to collaboration
 - ▶ "There's a typo in your documentation." vs.
"Here's a correction for your documentation."

Basic use

- ▶ Change some files
- ▶ See what you've changed

```
git status
git diff
git log
```
- ▶ Indicate what changes to save

```
git add
```
- ▶ Commit to those changes

```
git commit
```

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- ▶ Pull changes from your collaborator

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git pull
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Basic use

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- ▶ Pull changes from your collaborator

```
git fetch
git merge
```

Initialize repository

- ▶ Create (and `cd` to) a working directory
 - ▶ For example, `~/Docs/Talks/Graphs`
- ▶ Initialize it to be a git repository
 - ▶ `git init`
 - ▶ Creates subdirectory `~/Docs/Talks/Graphs/.git`

```
$ mkdir ~/workspace/inf1b/booklibrary
```

```
$ cd ~/workspace/inf1b/booklibrary
```

```
$ git init
```

```
Initialized empty Git repository in ~/workspace/inf1b/  
booklibrary/.git/
```

Produce content

- ▶ Create a README.md file

```
## Software to manage a library of book data
```

```
This software was originally created as part of the  
Inf1b coursework and has since been extended.
```

```
The data is taken from the  
[goodreads website](https://www.goodreads.com/).
```

Incorporate into repository

- ▶ Stage the changes using `git add`

```
$ git add README.md
```

Incorporate into repository

- ▶ Now commit using `git commit`

```
$ git commit -m "Initial commit of README.md file"
[master (root-commit) 32c9d01] Initial commit of README
.md file
1 file changed, 7 insertions(+)
create mode 100644 README.md
```

- ▶ The `-m` argument allows one to enter a message
- ▶ Without `-m`, `git` will spawn a text editor
- ▶ Use a meaningful message
- ▶ Message can have multiple lines, but make 1st line an overview

A few points on commits

- ▶ Use frequent, small commits
- ▶ Don't get out of sync with your collaborators
- ▶ Commit the sources, not the derived files
(.java sources not generated .class files)
- ▶ Use a `.gitignore` file to indicate files to be ignored

```
*~  
.idea  
*.iml  
out
```

Using git on an existing project

- ▶ `git init`
- ▶ Set up `.gitignore` file
- ▶ `git status` (did you miss any?)
- ▶ `git add .` (or name files individually)
- ▶ `git status` (did you miss any?)
- ▶ `git commit`

Removing/moving files

For files that are being tracked by git:

Use `git rm` instead of just `rm`

Use `git mv` instead of just `mv`

```
$ git rm myfile
$ git mv myfile newname
$ git mv myfile SubDir/
$ git commit
```


First use of git

```
$ git config --global user.name "Jane Doe"
$ git config --global user.email "janedoe@wisc.edu"

$ git config --global color.ui true

$ git config --global core.editor emacs






$ git config --global core.excludesfile ~/.
  gitignore_global
```

Set up GitHub repository



- ▶ Get a GitHub account
- ▶ Click the "Create a new repo" button
- ▶ Give it a **name** and description
- ▶ Click the "Create repository" button
- ▶ Back at the command line:

```
git remote add origin https://github.com/username/repo
git push -u origin master
```

Set up GitHub repository


 [Explore](#) [Gist](#) [Blog](#) [Help](#)  kbroman   


Owner **Repository name**

PUBLIC   kbroman /

Great repository names are short and memorable. Need inspiration? How about [scaling-octo-wookie](#).

Description (optional)

 **Public**
Anyone can see this repository. You choose who can commit.

 **Private**
You choose who can see and commit to this repository.

Initialize this repository with a README
This will allow you to `git clone` the repository immediately.

|

Set up GitHub repository

GitHub navigation bar: This repository | Search or type a command | Explore | Gist | Blog | Help | kbroman | [Icons]

kbroman / repo

Unwatch 1 | Star 0

Quick setup — if you've done this kind of thing before

[Set up in Desktop](#) or [HTTP](#) [SSH](#) [Copy](#)

We recommend every repository include a [README](#), [LICENSE](#), and [.gitignore](#).

Create a new repository on the command line

```
touch README.md
git init
git add README.md
git commit -m "first commit"
git remote add origin https://github.com/kbroman/repo.git
git push -u origin master
```

Push an existing repository from the command line

```
git remote add origin https://github.com/kbroman/repo.git
git push -u origin master
```



Configuration file

Part of a `.git/config` file:

```
[remote "origin"]
  url = https://github.com/kbroman/ctl.git
  fetch = +refs/heads/*:refs/remotes/origin/*

[branch "master"]
  remote = origin
  merge = refs/heads/master

[remote "brian"]
  url = git://github.com/byandell/ctl.git
  fetch = +refs/heads/*:refs/remotes/brian/*
```

Branching and merging

- ▶ Use branches to test out new features without breaking the working code.

```
git branch devel  
git branch  
git checkout devel
```

- ▶ When you're happy with the work, merge it back into your master branch.

```
git checkout master  
git merge devel
```

Issues and pull requests

- ▶ Problem with or suggestion for someone's code?
 - ▶ Point it out as an Issue
- ▶ Even better: Provide a fix
 - ▶ Fork
 - ▶ Clone
 - ▶ Modify
 - ▶ Commit
 - ▶ Push
 - ▶ Submit a Pull Request

Suggest a change to a repo

- ▶ Go to the repository:
`http://github.com/someone/repo`
- ▶ **Fork** the repository
Click the "Fork" button
- ▶ **Clone** your version of it
`git clone https://github.com/username/repo`
- ▶ Change things locally, `git add`, `git commit`
- ▶ Push your changes to *your* GitHub repository
`git push`
- ▶ Go to *your* GitHub repository
- ▶ Click "**Pull Requests**" and "New pull request"

Pulling a friend's changes

- ▶ Add a connection

```
git remote add friend git://github.com/friend/repo
```

- ▶ If you trust them, just pull the changes

```
git pull friend master
```

- ▶ Alternatively, fetch the changes, test them, and *then* merge them.

```
git fetch friend master
git branch -a
git checkout remotes/friend/master
git checkout -b friend
git checkout master
git merge friend
```

- ▶ Push them back to your GitHub repo

```
git push
```

Merge conflicts

Sometimes after `git pull friend master`

```
Auto-merging README.md
```

```
CONFLICT (content): Merge conflict in README.md
```

```
Automatic merge failed; fix conflicts and then commit  
the result.
```

Inside the file you'll see:

```
<<<<<<< HEAD
```

```
A line in my file.
```

```
=====
```

```
A line in my friend's file
```

```
>>>>>>> 031389f2cd2acde08e32f0beb084b2f7c3257fff
```

Edit, add, commit, push, submit pull request.

git/GitHub with IntelliJ

The screenshot displays the IntelliJ IDEA interface. On the left, the Project tool window shows a file tree with 'src' expanded to 'BookEntry'. A context menu is open over 'BookEntry', listing various actions such as 'New', 'Copy', 'Paste', 'Find Usages', 'Refactor', and 'Git'. The 'Git' option is highlighted, and its sub-menu is visible, containing options like 'Commit File...', 'Add', 'Annotate', 'Show Current Revision', 'Compare with the Same Repository Version', 'Compare with...', 'Compare with Branch...', 'Show History', 'Revert...', and 'Repository'. The background shows a code editor with a Java file named 'BookEntry.java'. The code includes a comment: `/** Start the Library browser program. * @param args not used for arguments */` and a `main` method: `public static void main(String[] args) { LibraryBrowser browser = new LibraryBrowser(); browser.run(); }`. The bottom status bar indicates 'Version Control: Local' and 'Default Character Set: UTF-8'.

Delete GitHub repo

This repository Search or type a command kbroman Explore Git Blog Help

PUBLIC kbroman / RStudioTest Unwatch 1 Star 0 Fork 0

Options

- Collaborators
- Service Hooks
- Deploy Keys

Settings

Repository Name

RStudioTest

Default Branch

Features

Wikis
GitHub Wikis are the simplest way to let others contribute content. Any GitHub user can create and edit pages to use for documentation, examples, support or anything you wish.

Restrict edits to Collaborators only
Public Wikis will still be readable by everyone.

Issues
GitHub Issues adds lightweight issue tracking tightly integrated with your repository. Add issues to milestones, label issues, and close & reference issues from commit messages.

GitHub Pages

Create a beautiful site for your project with our [GitHub Pages](#) generator.

Author your content in our markdown editor, select a theme, then publish.

To publish a page manually, push an HTML or [jekyll](#) site to a branch named gh-pages. [More info.](#)

Danger Zone™

Make this repository private
Please [upgrade your plan](#) to make this repository private.

Transfer Ownership
Transfer this repo to another user or to an organization where you have admin rights.

Delete this repository
Once you delete a repository, there is no going back.

Open source means everyone can see my stupid mistakes.

Version control means everyone can see every stupid mistake I've ever made.

bit.ly/stupidcode

Reading

Online Resources

- ▶ **Github Documentation and Tutorials**
`http://try.github.io/`