



Introduction to Travis CI  
with git and GitHub  
with a focus on developing a software pipeline

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[www.github.com/richelbilderbeek/CppPresentations](http://www.github.com/richelbilderbeek/CppPresentations)



# Continuous worries

I saw your GitHub Issue  
and I've submitted a Pull Request  
with a fix.



*haxxorsid*



*Mr Worry by Roger Hargreaves*



# Continuous worries

I cannot get your code to run.  
I think it is broken.  
Please help!



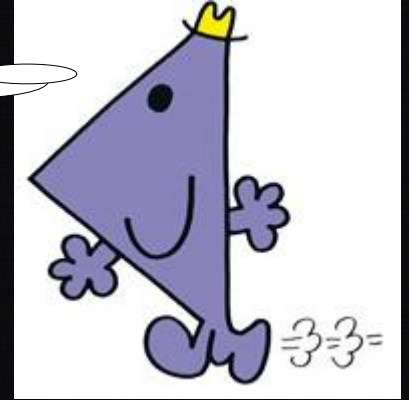
*N00bG1rl*



*Mr Worry by Roger Hargreaves*

# Continuous worries

Can I do it more efficient?



*Mr Rush,  
by Roger Hargreaves*

Do I really  
need to do this  
every time?



*Mr Perfect,  
by Roger Hargreaves*

Yes, I should



*Mr Lazy,  
by Roger Hargreaves*



# Continuous solution

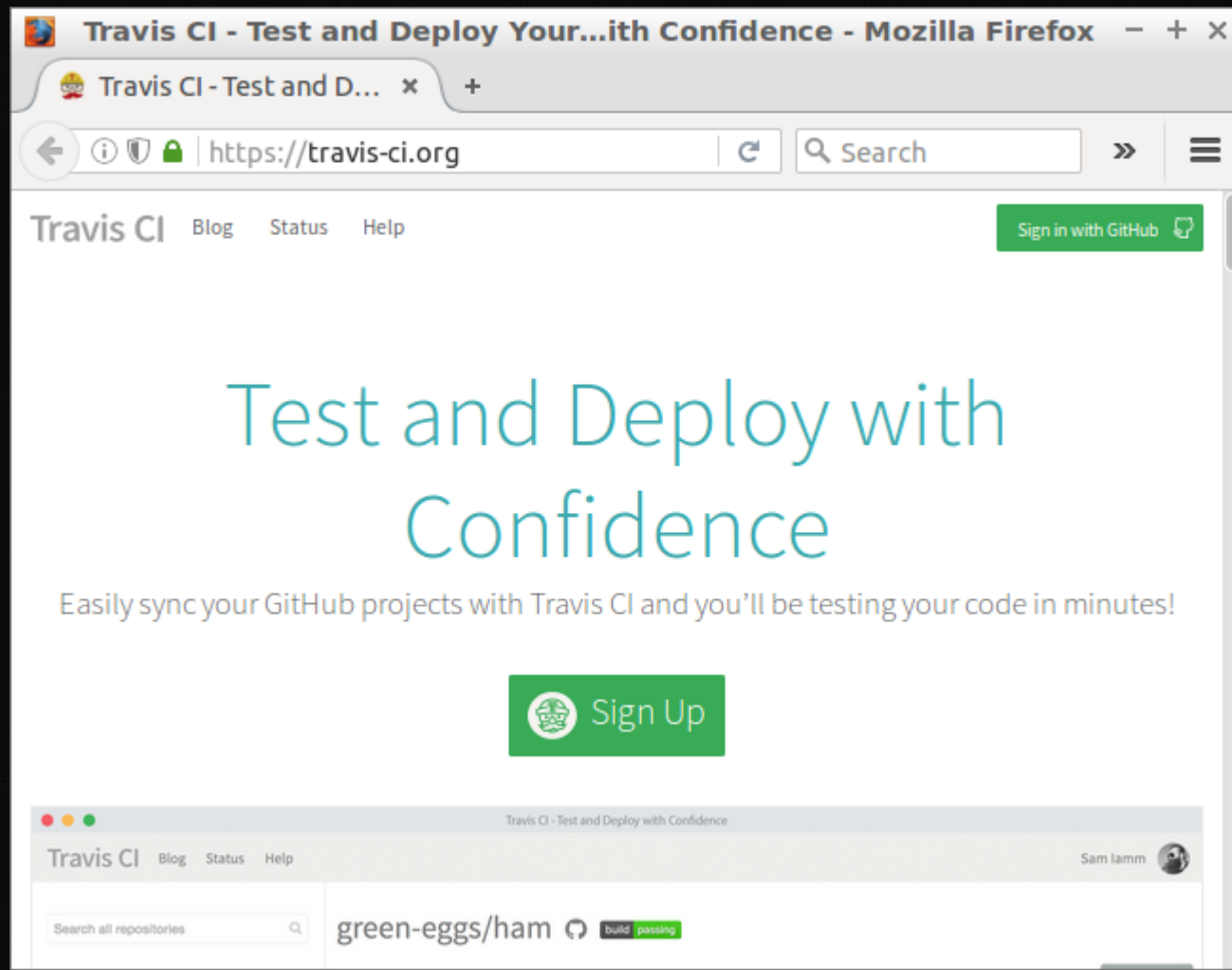
I can do all bash commands you like  
every time you push

- Test if nothing breaks
- Test if pipeline works
- Gather diagnostics
- Other goodies



# Activate Travis

- Go to <https://travis-ci.org>



# Activate accounts

Richel Bilderbeek - Profile - Travis CI - Mozilla Firefox

Richel Bilderbeek - P... x +

https://travis-ci.org/profile/richelbi Search

Travis CI Blog Status Help Richel Bilderbeek

**Richel Bilderbeek**  
Repositories 453  
Token:

[Sync account](#)

We're only showing your public repositories. You can find your private projects on [travis-ci.com](#).

**Organizations**

- Hive5**  
Repositories 4
- BEAST2-Dev**  
Repositories 16
- DIYbio Groningen**  
Repositories 11
- LucKey Productions**  
Repositories 12

Is an organization missing?  
[Review and add your authorized organizations.](#)

**1** **tra**  
Click the repository switch on

**2** **tra**  
Add .travis.yml file to your repository

**3** **tra**  
Trigger your first build with a git push

☒ richelbilderbeek/AminoAcidFighter

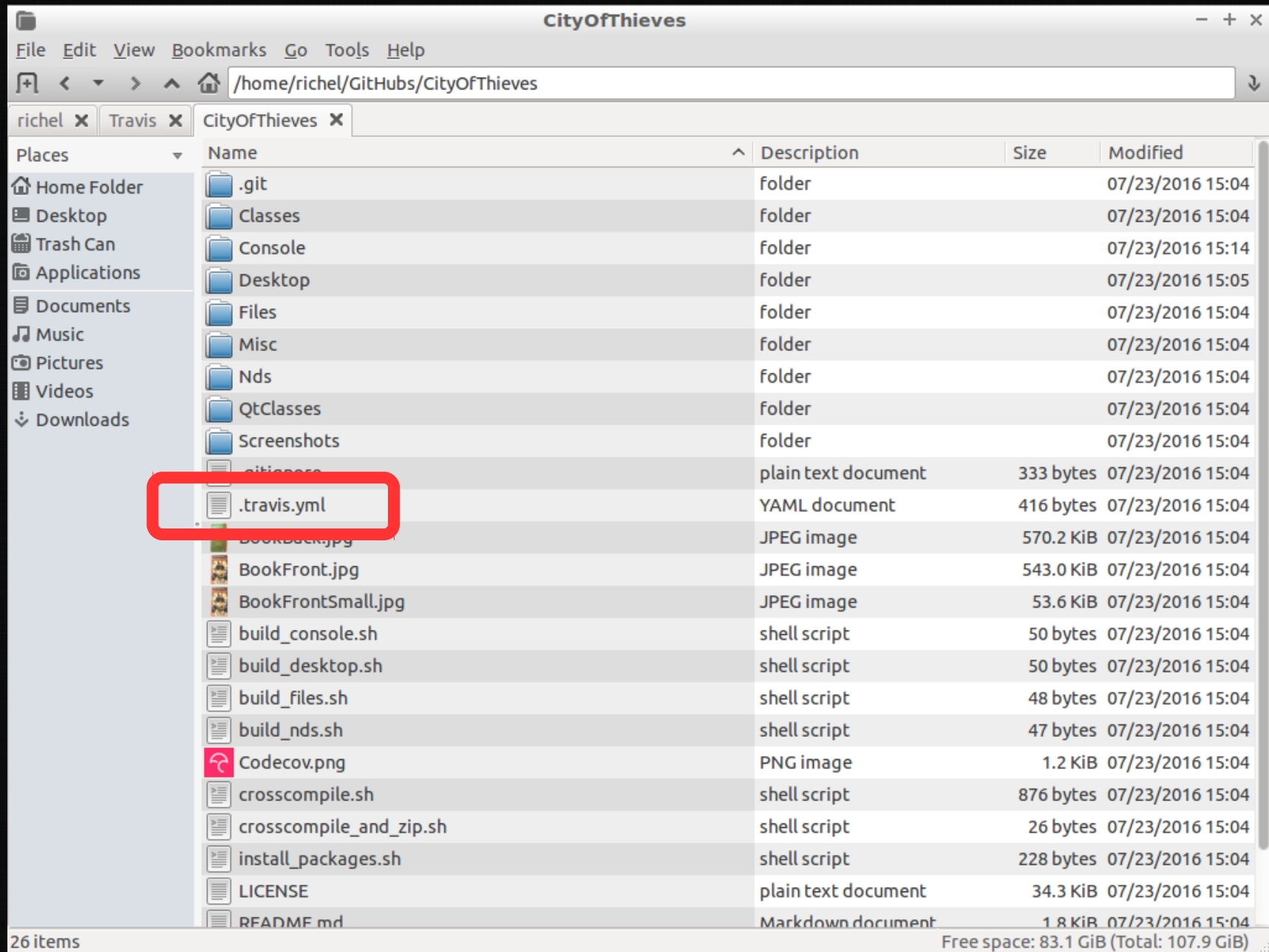
☐ richelbilderbeek/Android

☐ richelbilderbeek/Apfloat

☐ richelbilderbeek/ApplicationVerifierExamples



# Configure Travis files





# .travis.yml

- 'Yet another Markup Language'
- Just use the bash scripts you would use in the 'script' section



# Example .travis.yml

```
script:
```

- echo "Hello"
- ls





# Result

```
135 $ echo "Hello"
136 Hello
137
138
139 The command "echo "Hello"" exited with 0.
140 $ ls
141 LICENSE  README.md
142
143
144 The command "ls" exited with 0.
145
146 Done. Your build exited with 0.
```

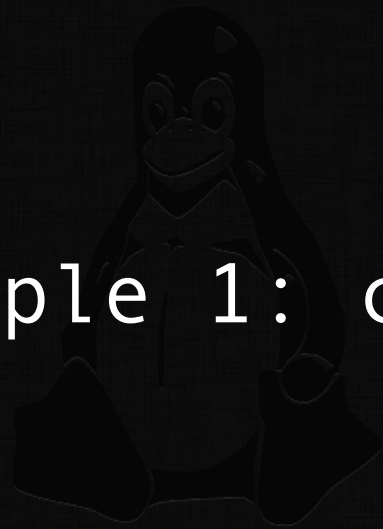
# How to get a more complex .travis.yml file

- Go to  
[https://github.com/richelbilderbeek/travis\\_cpp\\_tutorial](https://github.com/richelbilderbeek/travis_cpp_tutorial)
- Copy the best fitting Travis configuration file



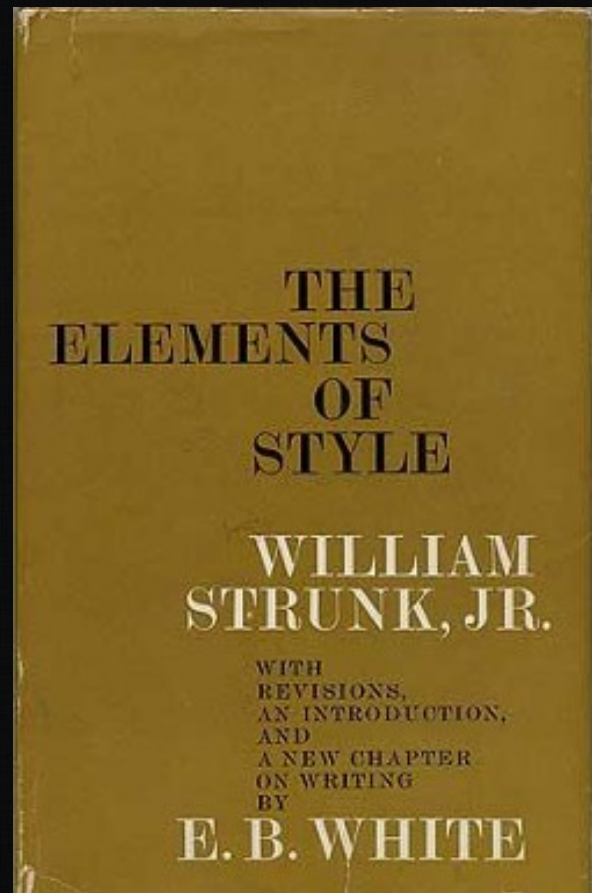
# More examples

- `proselint`
- `cowsay`
- `convert`
- pipeline example 1: `convert image to cowfile`



# proselint

- Python tool that tests prose for style errors
- Put prose in file called 'my\_prose.md'
- From [https://github.com/richebilderbeek/travis\\_proselint](https://github.com/richebilderbeek/travis_proselint)





# my\_prose.md

I do not want this poem to go too deep. It's premature, and love's too far away. But there are things I feel the need to say rather than more days of silence keep. I hope for you it's not too great a leap to hear me talking to you in this way. My fears sometimes my sentiments betray, telling me to put my thoughts to sleep. Ever since we met I've thought of you as something more than just a passing friend. You seem so lovely, like a melody that haunts me with the wisp of something true. You haunt me still, and so I won't pretend: I tell you this that you might think of me.

# .travis.yml

```
dist: trusty
```

```
install:
```

```
- sudo pip install proselint
```

```
script:
```

```
- proselint my_prose.md
```





# Result

```
▶ 129 $ sudo pip install proselint
153 $ proselint my_prose.md
154 my_prose.md:2:41: misc.but No paragraph should start with a 'But'.
155
156
157 The command "proselint my_prose.md" exited with 1.
158
159 Done. Your build exited with 1.
```

# cowsay

- Command-line tool to let a cow (or other ASCII art) say something
- From [https://github.com/richelbilderbeek/travis\\_cowsay](https://github.com/richelbilderbeek/travis_cowsay)





# .travis.yml

```
dist: trusty
```

```
install:
```

- sudo apt-get install cowsay
- export PATH=/usr/bin:/bin:/usr/games

```
script:
```

- cowsay "Howdy" | cowsay -n -f stegosaurus

# Result

```
325 $ cowsay "Howdy" | cowsay -n -f stegosaurus
```

326

328 | &lt; Howdy &gt;

329

330 |        \    ^ ^        |

331 | \ (oo)\ |

332 | ( ) \ ) \ |

333 | | - - - - w | |

334 \ \ \ /

339 \ \ \ -

341

342      ----- \ /

343 0 \ /

345

352 The command "cowsay "Howdy" | co

```
354 Done. Your build exited with 0
```

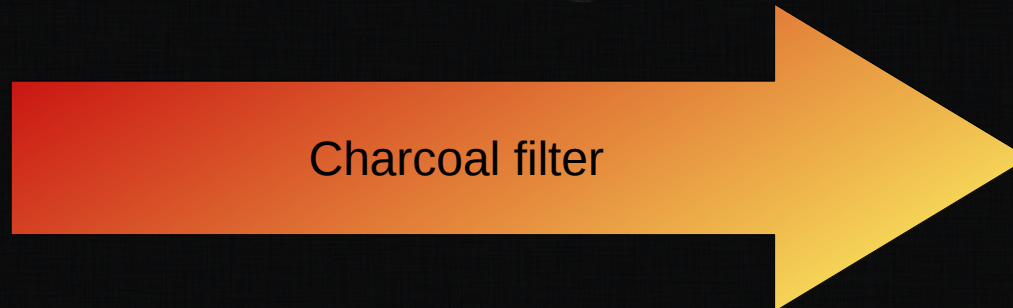
The command `"cowsay "Howdy" | cowsay -n -f stegosaurus"` exited with 0.

```
Done. Your build exited with 0.
```



# convert

- Part of Imagemagick
- Command-line tool to work on images
- From [https://github.com/richelbilderbeek/travis\\_convert](https://github.com/richelbilderbeek/travis_convert)



Lenna, from  
<https://upload.wikimedia.org/wikipedia/en/2/24/Lenna.png>



# .travis.yml

script:

- rm \*.png
- ./run
- ls \*.png



```
#!/bin/bash
```

```
wget https://upload.wikimedia.org/wikipedia/en/2/24/Lenna.png
```

```
convert Lenna.png -charcoal 1 Edge.png
```



# Result

```
143 $ rm *.png
144
145
146 The command "rm *.png" exited with 0.
147 $ ./run
148 --2017-01-18 18:18:20-- https://upload.wikimedia.org/wikipedia/en/2/24/Lenna.png
149 Resolving upload.wikimedia.org (upload.wikimedia.org)... 208.80.154.240, 2620:0:861:ed1a::2:b
150 Connecting to upload.wikimedia.org (upload.wikimedia.org)|208.80.154.240|:443... connected.
151 HTTP request sent, awaiting response... 200 OK
152 Length: 473831 (463K) [image/png]
153 Saving to: `Lenna.png'
154
155 100%[=====>] 473,831      --.-K/s   in 0.01s
156
157 2017-01-18 18:18:21 (42.6 MB/s) - `Lenna.png' saved [473831/473831]
158
159
160
161 The command "./run" exited with 0.
162 $ ls *.png
163 Edge.png  Lenna.png
164
165
166 The command "ls *.png" exited with 0.
167
168 Done. Your build exited with 0.
```

# Pipeline example 1

- Convert image to cowfile
- From [https://github.com/richelbilderbeek/travis\\_example\\_pipeline](https://github.com/richelbilderbeek/travis_example_pipeline)



Lenna, from  
<https://upload.wikimedia.org/wikipedia/en/2/24/Lenna.png>





# .travis.yml 1/2

```
dist: trusty
```

```
# Boost
```

```
addons:
```

```
  apt:
```

```
    packages: libboost-all-dev
```

```
before_install:
```

```
  # C++14
```

```
  - sudo add-apt-repository --yes ppa:ubuntu-  
toolchain-r/test
```

```
  - sudo apt-get update -qq
```



# .travis.yml 2/2

install:

# C++14

- sudo apt-get install -qq g++-5

# Cowsay

- sudo apt-get install cowsay

- export PATH=/usr/bin:/bin:/usr/games

script:

- ./run



# run 1/3

```
#!/bin/bash
```

```
# Download Lenna.png
```

```
wget
```

```
https://upload.wikimedia.org/wikipedia/en/2/24/Lenna.png
```

```
# Convert to edge detected version
```

```
convert Lenna.png -charcoal 1 Edge.png
```

```
# Download prerequisites
```

```
git clone https://github.com/richelbilderbeek/AsciiArter
```

```
git clone https://github.com/richelbilderbeek/DotMatrix
```

```
git clone https://github.com/richelbilderbeek/RibiClasses
```

```
git clone https://github.com/richelbilderbeek/RibiLibraries
```

# run 2/3

```
# Build AsciiArter
```

```
cd AsciiArter
```

```
qmake AsciiArterConsole.pro
```

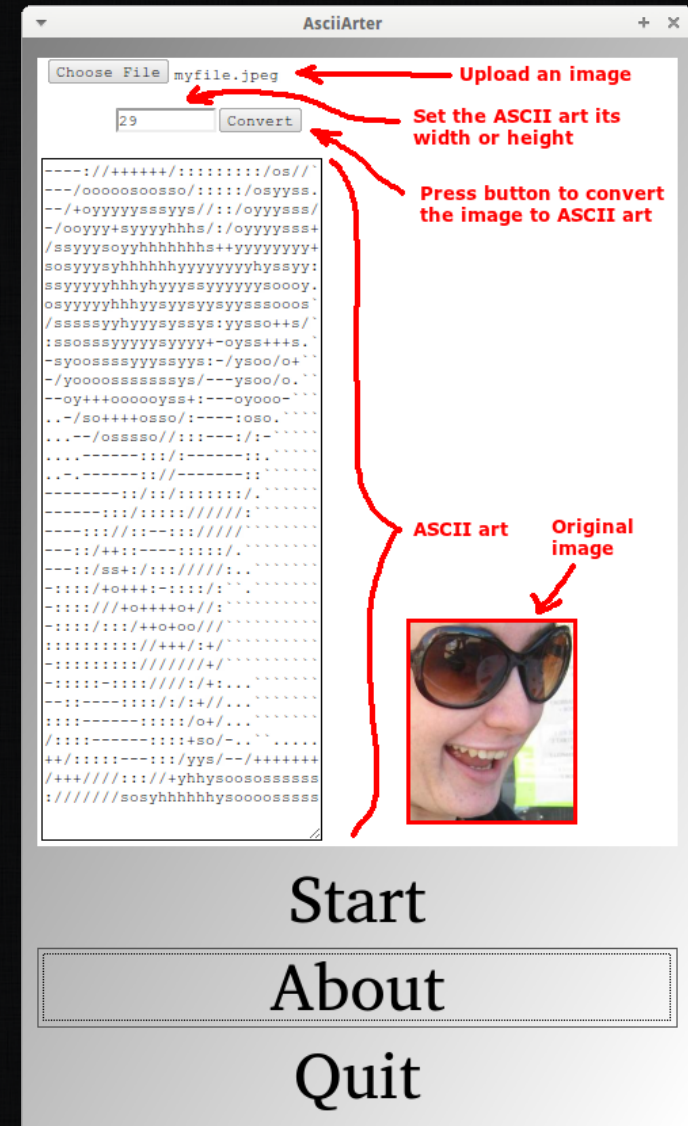
```
make debug
```

```
cp AsciiArterConsole ../
```

```
cd ..
```

```
# Convert Edge to ascii art
```

```
./AsciiArterConsole Edge.png  
art.txt 78
```



AsciiArter GUI menu, from  
<https://github.com/richelbilde/rbeek/AsciiArter>



## run 3/3

```
# Create cowfile
```

```
echo "\$the_cow = <<\\"E0C\\";" > art.cow
```

```
echo "  \$thoughts" >> art.cow
```

```
echo "  \$thoughts" >> art.cow
```

```
cat art.txt >> art.cow
```

```
echo "E0C" >> art.cow
```

```
# Use cowfile
```

```
cowsay -f ./art.cow "Hello!"
```



# Result





```
986 < Hello! >
987 -----
988 \
989 \
990 ssssoosso++osooooosysaoosooosssyasy+ossoosso+ysys+sssoosso+oyoyyaoosososssosso
991 ososooosyo++osss+aoosososossssoosooosssosososssss/s+ossssoosoo+syd++sssoossoys/o
992 ssoossssoooooosooososooossssssoooooooosssosooos+ossooyosoo+ysd+osssysso+oo
993 +ooososss++++ooooossoooooosss+ooooooossssoosooossoosssosssss+hyd/ososoo+os
994 sosooooosso+ooooossssoooooosossoooooooossssooooo+soooooossoos+hhh/oy++osoo
995 oss+osoysoosso+osssososss+ossooooooysoys+osssosssssosssss+ooooosso+hyha/oooo+o
996 sss:sssssy++ososossoosssso+oooo+osossssssssoooooossoys+sssoossoyosoo+hd+osssosso
997 ss//oyossoo+ooooossssoooo+sossooyaoossssssssyyyoosss+ossssoossoossoosyo/ooo+oo+o:
998 hoo+ssoosooooosooosyyaoosossssssoosssssyyssy/sao+ooosso/ayososooho++os+s++oy
999 sos+ssooooo+ssoysaoosossoooooosssyossssoohsssoosss/ossoosss:syooosso/oo+oo+osyo
1000 +os+ssoosso+ssoooo+sso+osooooosssyssoososssssosssssyooosssos/+yyssso+ooo++++yoo
1001 +oo/ossoooooosssss+sso/sso+sssssosossssoossooyosyyooyo+ssooo+s/aysoo/ossoos+/h+ss
1002 ooo+sssoossoosssosss/y/osossssssoossssoosssssosssod+yosss:+yhyssyoooooo+oy+ssss
1003 os++ssssss+ooosoooyos+syssossoossoossssoosssssysoossssoooohysso+osooo+o/yososo
1004 oooooosssso+ooysooooosssssssss+oosyooossssoosssssssysoosssssysooooooyooooos/yosssss
1005 oosooosssy++sosoos+ssoooooos+sso+ssoooooosssyssoossssssoosss+sy+oo+o/yosssosoo
1006 ooo+ssssss++sssoos+osos+syyssoossssoooooosssossoooooosssossoosss/a+o++++yosssosso
1007 osossssoos+os+oos/osss+sssssoooooossssoysssssyooosyyosoyoo+o/y+os/aosososos
1008 so+oooyosooooosso+ssoooooossssssssoo++ssoo//:oyooosssyo++++s+so++ssoosssss
1009 sso+ssssso+ssoosos+osooooossssoyhs+++o/+o/:sssoosssysoooooos+oooo/ysoooooosso
1010 ooo+syooos+ssoossoo+soy+ssoosssso+++o/+o++++ssoyossoy/ss+sso+oo+oo+ssooo+oosso
1011 oso+ososo/ooooosss/ssoossoos+oo+o++oosy+sso+ssoyo+os+oss+oo+oosssossoosoo
1012 osy+ososyo+ssss+ssoos+y+ssssso/o++oo++:++osysoosssssyh:/sy/o+oo+o:hooosossoosso
1013 sso+ssyoso+ssoooooossoosyo/+o++y//+oooooyooossssoh+:ts/o+s+o+soyooooososss+
1014 sos+osssyo+ossoosso+osss//+/o++/+ooosoyss+ssoosss//s+oos+o/yooooossssooooo
1015 ossoosss+ooooooosoo:+o/o+o/oo++:++y+hshy+oossooyss+/o+++++s+o+oosssyssoos
1016 oos+osssso+o+sso+oys+://+++/o/+o+osss//:/:+ssoyy///++ss+oo/sssoossssssoosso
1017 o+o+oyssso+os+++oo//+++++++oo/+ysss+yoyyo+o+d/oshs:/+oooo+ossssoooooosooo+os
1018 sososssso+oooooo++/oo+oooo+os:++ssssssso+oooo/m+ssoy++/s+oo/ysoos+ssoossoys
1019 oos+ososos+ssooo+o++s+/+os+oo++/s+ysssssoos+s/dooosy++/h+os+ssooooos+oohssos
1020 ooo+osssos+o+sso++++oo//s+/+s/+yossssssoosoo+ysoosss+:hao/h+aoosooossoooooos
1021 os+osssso/+os+s+o+o++o/oo/:/yooosso+ssoosso++dsoso+o:yooossssooyos+thoosyo
1022 oso+ooosso:oooo+/o/o+/o:+++ss+ooooooosso+haoohoy/os+os:ysssoosso+yysssoos
1023 oyo+ssoosy+sso+o+/+ooo:o//+o+o+osoyossssssoos+soso+oo+th/yosososoosoyossoo
1024 sos+yooos/ooos+/o+oo++:so//+oo+osooooossssoosoyosoo+sso/ysssoossooohsoooooos
1025 oso+oosyy:/o/o+os++o/oho/+o+os:osyyooossoo//+oy+ooos/yyssooyooosss/ysssoosys
1026 ootoyosss+/o++++o+oo+y+o+oo+os/sossoosyosoysssy+oo+/oo/oss+oo+ssoo/hsoosyso
1027 os+ssoosss-+o++++o+o+ssoo+ssoo+oos+oosssso++ooos/oo+o+ssoosossoyosso/dooosooos
1028 so+ssoosssy/+o+/o/os+o+/ooo/o+oso+o/oysssooyssso+oo+ososooosyooos+so/dooosyyy
1029 +oyaoosy+:+ooots//+sso+s/ssooooo+oss+ooosssso+ooooooosooooossoosshsoy/:+
1030 s++o+sso+/++/o/sos+o+o++/oooooo+ossssoosooos+sso+/ssoo+ssooooo+s/yosdo++so
1031 oys+/ssoyso+o+/++/:++os+/o+/s+o+s++yssoossoossoosssy++s/ossosss/y:hsyh-osoo+
1032 /yyo:yyssso+++o/o+/+++os+/+/+ooos+ssoossssoossssoh:o:ssoosssso/dsy++oosos
1033 /+ha-ysssy/+o+oo/+o+o+y++osoo+ssy/yoso+ooossssoosssso+syoosooos+yssyy/osyoso
1034 +oys.yssso/o+o++o+oo+oosyy/+os+o+ys+sssoossssoossssooy++ssoosoo+shsyh:oo+yso
1035 /yy.hsoys+oo/+o+o+o/yoo++oo++yssoossoossssoossssoossssoosoo+oyoo/oooyoso
1036 o/hy.ysoos+/+o+o+++++oo++o+osy/ysoooooossoossoossoohy+ssysoo+th/ooooosoy
1037 o-hh:ssoyyo/o+oooo+/os+o/+oo/aysssoosss+osossoossssoosoo+o+os+yd/ooooos+
1038 s/sd/syohys+ooo+oo++oso+oo+oss:oyoooysoossoossoossoossh+yoo++-mods/sosoo+yo+
1039 sosh/ssoyso+o+o++/o++oo++oo+o+ssooooo+ssoossoossoossoossooyossoos/hh+ooos+oyoo
1040 +osh/ssoyoo++oo+o:o+o+os/o+oosysssssoossoossoooooooosssos+ssoos+/sooyoooo+os+
1041 +++ssos+yo+ooos/++s:oo+oo/ossssoosssossssssoossssoossoosh/ossssoosoyso+hs++oo
1042
1043
1044 The command "./run" exited with 0.
1045
1046 Done. Your build exited with 0.
```



# Other uses



# Project health

Branch	 Travis CI	
master	build failing	codecov 87%
cine	build failing	codecov 82%
daic	build passing	codecov 82%
elly	build passing	codecov 94%
jaan	build failing	codecov unknown
jobo	build failing	codecov 89%
kewe	build failing	codecov 87%
lyke	build passing	codecov 82%
pbd	build failing	codecov 87%
ribi	build error	codecov 85%
sado	build passing	codecov 80%



# Testing

```
4276 Running 151 test cases...
```

```
4277
```

```
4278
```

```
4279
```

```
4280 elly_results_test.cpp(479): error in "elly_convert_to_daisie_input_wit  
std::count(branching_times.begin(), branching_times.end(), 1.0) failed
```

```
4281
```

```
4282 *** 1 failure detected in test suite "test_elly_module"
```

```
4283
```

```
4284
```

```
4285 The command "if [[ $TRAVIS_BRANCH == "elly" || $TRAVIS_BRANCH == "mast  
./elly_test; fi" exited with 201.
```

# Code cover- age

```
238 9 void elly::cladogenesis island only(simulation& s)
239 {
240 9   assert(s.count species(location::island only) > 0);
241 9   cladogenesis island only(s.get populations(), s.get time(), s.get rng());
242 }
243 2 void elly::cladogenesis island only(simulation& sim, const species& s)
244 {
245 2   assert(sim.count species(location::island only) > 0);
246 2   cladogenesis island only(sim.get populations(), sim.get time(), s);
247 }
248
249 3 void elly::both extinction island(simulation &s)
250 {
251 3   both extinction island(s.get populations(), s.get time(), s.get rng());
252 }
253 2 void elly::both extinction island(simulation &sim, const species& s)
254 {
255 2   both extinction island(sim.get populations(), sim.get time(), s);
256 }
257
258 3 void elly::both extinction mainland(simulation& s)
259 {
260 3   both extinction mainland(s.get populations(), s.get time(), s.get rng());
261 }
262 2 void elly::both extinction mainland(simulation& sim, const species& s)
263 {
264 2   both extinction mainland(sim.get populations(), sim.get time(), s);
265 }
266
267 7 void elly::both anagenesis(simulation &s)
268 {
269 7   both anagenesis(s.get populations(), s.get time(), s.get rng());
270 }
271 2 void elly::both anagenesis(simulation &sim, const species& s)
272 {
273 2   both anagenesis(sim.get populations(), sim.get time(), s);
274 }
275
276 10 void elly::cladogenesis global on island(simulation &s)
277 {
278 10   cladogenesis global on island(s.get populations(), s.get time(), s.get rng());
279 }
280 2 void elly::cladogenesis global on island(simulation &sim, const species& s)
281 {
282 2   cladogenesis global on island(sim.get populations(), sim.get time(), s);
283 }
284
285 0 void elly::cladogenesis global on mainland(simulation &s)
286 {
287 0   cladogenesis global on mainland(s.get populations(), s.get time(), s.get rng());
288 }
289 2 void elly::cladogenesis global on mainland(simulation &sim, const species& s)
290 {
291 2   cladogenesis global on mainland(sim.get populations(), sim.get time(), s);
292 }
```



# Style checking

```
3128 OCLint Report
3129
3130 Summary: TotalFiles=195 FilesWithViolations=1 P1=0 P2=0 P3=4
3131
3132 /home/travis/build/richelbilderbeek/pbdmms/elly_clade.cpp:146:1: long line [size|P3] Line
    exceeds limit of 100
3133 /home/travis/build/richelbilderbeek/pbdmms/elly_clade.cpp:158:3: redundant local variable
3134 /home/travis/build/richelbilderbeek/pbdmms/elly_clade.cpp:148:3: long variable name [namir
    42 characters is longer than the threshold of 20
3135 /home/travis/build/richelbilderbeek/pbdmms/elly_clade.cpp:158:3: long variable name [namir
    35 characters is longer than the threshold of 20
3136
3137 [OCLint (http://oclint.org) v0.10.3]
3138 OCLint: Compiler error, can only be warnings :-(
3139 OCLint: Fail
3140
3141
3142 The command "./do_oclint" exited with 1.
3143
3144 Done. Your build exited with 1.
```

# Profile

Flat profile:

Each sample counts as 0.01 seconds.

% time	cumulative seconds	self seconds	calls	self ms/call	total ms/call	name
59.23	3.82	3.82	939651438	0.00	0.00	sado::gausser_impl_lut
17.06	4.92	1.10	240827	0.00	0.02	sado::calc_comp(sado::p
						sado::parameters const&)
9.46	5.53	0.61	60877	0.01	0.03	sado::get_attractivene
						double, sado::parameters const&)
8.53	6.08	0.55	60877	0.01	0.01	sado::get_summed(std::v
						const&)
3.41	6.30	0.22	60877	0.00	0.01	sado::create_kids(sado
						std::vector<double, std::allocator<double> > const&, sado::parameters const&)
1.71	6.41	0.11				sado::gausser_impl_lut
0.16	6.42	0.01	2124253	0.00	0.00	sado::Uniform()



# Other uses

- Memory leak detection
- Data race detection
- Undefined behavior sanitizer
- To not forget how to do something

# Conclusion

- Travis CI can be used to automate everything you can do from a terminal
- Travis CI results in a reproducible build/pipeline
- Set up once, profit every push