

An Introduction to iSCvM

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Obtaining *iSCVM* source code

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The source code is maintained at github:

<https://github.com/smartell/iSCAM>

Prerequisites

- A C++ compiler (preferably gcc)
- AD Model Builder (version 11.0 or later)
- R (version 2.15 or later)
 - ▶ PBSmoothing package (and dependencies)
 - ▶ Hmisc package (and dependencies)

Working with Distributed Version Control (git)

Before using git, I would highly recommend spending some time learning how to use git. There are many online resources and most of them can be found at:

<http://git-scm.com/documentation>

A video tutorial:

<http://www.youtube.com/watch?v=ZDR433b0HJY>

Cheat sheet: <http://cheat.errtheblog.com/s/git/>

Read the Readme file for more instructions.

Initial checkout

Essentially want to make a clone of the repository on your computer.

```
git clone git://github.com/smartell/iSCAM.git
```

The above command will make a copy of the repository, including the directory structure, on your computer. It will also copy all of the branches and branch history. You may not wish to do this. If you wish to clone only a single branch (i.e. master), then the following should be done.

```
mkdir iSCAM-project  
cd iSCAM-project  
git init  
git remote add -t master -f origin git://github.com/smartell/iSCAM.git  
git checkout master
```

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Directory structure

- iSCAM-project
 - ▶ dist
 - ▶ docs
 - ▶ examples
 - ▶ fba
 - ▶ scripts
 - ▶ src

Directory structure

- iSCAM-project
 - ▶ dist
 - ▶ debug
 - ▶ R
 - ▶ release
 - ▶ docs
 - ▶ examples
 - ▶ fba
 - ▶ scripts
 - ▶ src

dist contains the compiled
ADMB code in debug and
release versions, and the R
scripts for dealing with output.

Directory structure

- iSCAM-project
 - ▶ dist
 - ▶ docs
 - ▶ API
 - ▶ iSCAM-guide
 - ▶ userGuide
 - ▶ examples
 - ▶ fba
 - ▶ scripts
 - ▶ src

docs contains directories for the users guide, this presentation, and the API documentation for the source code.

The users guide and presentation is written in latex, and the API is built using doxygen.

Directory structure

- iSCAM-project

- ▶ dist
- ▶ docs
- ▶ examples
 - ▶ 4VWXHerring
 - ▶ Cusk
 - ▶ ...
 - ▶ Makefile
 - ▶ makeproject
- ▶ fba
- ▶ scripts
- ▶ src

examples directory contains several different examples and a Makefile for running the examples.

makeproject is a Unix script for setting up a new example directory.

Directory structure

- iSCAM-project

- ▶ dist
- ▶ docs
- ▶ examples
- ▶ fba
 - ▶ BC-herring-2011
 - ▶ makeproject
 - ▶ ReadMe.txt
- ▶ scripts
- ▶ src

fba is a directory for “full blown assessment”

The ReadMe.txt file documents the various projects, and makeproject is a Unix script for setting up a new assessment directory.

Directory structure

- iSCAM-project

- ▶ dist
- ▶ docs
- ▶ examples
- ▶ fba
- ▶ scripts
 - ▶ scripts
- ▶ src

`scripts` contains various scripts that are copied into assessment directories.

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- iSCAM-project

- ▶ dist
- ▶ docs
- ▶ examples
- ▶ fba
- ▶ scripts
- ▶ src
 - ▶ admb-code
 - ▶ r-code

src contains directories for the
ADMB source code and the
R-code and source files for the
R-package.

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Windows

- Textpad <http://www.textpad.com/>

Mac OSX

- Textmate <http://macromates.com/>

Linux

- Vim <http://www.vim.org/>

Cross platform

- Emacs <http://www.gnu.org/s/emacs/>
- eclipse <http://www.eclipse.org/>
- sublime <http://www.sublimetext.com/>

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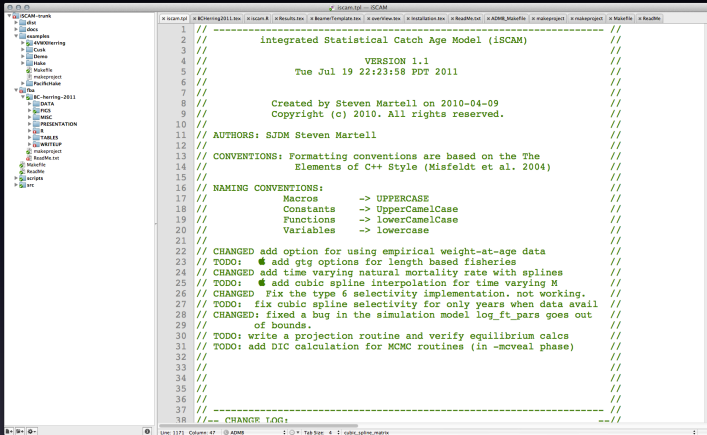
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```
1 // -----
2 //               integrated Statistical Catch Age Model (iSCAM)
3 // -----
4 //
5 //               VERSION 1.1
6 //               Tue Jul 19 22:23:58 PDT 2011
7 //
8 //               Created by Steven Martell on 2010-04-09
9 //               Copyright (c) 2010. All rights reserved.
10 //
11 //  AUTHORS:  SJDM Steven Martell
12 //
13 //  CONVENTIONS:  Formatting conventions are based on the The
14 //                  Elements of C++ Style (Misfeldt et al. 2004)
15 //
16 //  NAMING CONVENTIONS:
17 //      Macros          -> UPPERCASE
18 //      Constants       -> UpperCamelCase
19 //      Functions        -> lowerCamelCase
20 //      Variables       -> lowercase
21 //
22 //  CHANGED add option for using empirical weight-at-age data
23 //  TODO:  * add gtr options for length based fisheries
24 //  CHANGED add time varying natural mortality rate with splines
25 //  TODO:  * add cubic spline interpolation for time varying M
26 //  CHANGED Fix the type 6 selectivity implementation. not working.
27 //  TODO:  fix cubic spline selectivity for only years when data avail
28 //  CHANGED: fixed a bug in the simulation model log_ft_pars goes out
29 //            of bounds.
30 //  TODO:  write a projection routine and verify equilibrium calcs
31 //  TODO:  add DIC calculation for MCMC routines (in -mcveal phase)
32 //
33 //
34 //
35 //
36 //
37 // -----
38 //== CHANGE LOG: ==//
```

Figure: Textmate on Mac OSX

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Compiling ADMB source code

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What you need:

- C++ compiler (gcc recommended)
 - ▶ Mac OSX: install Xcode from appstore
 - ▶ Linux: <http://gcc.gnu.org/>
 - ▶ Windoze: <http://www.mingw.org/>
- ADMB libraries:
<http://admb-project.org/downloads>

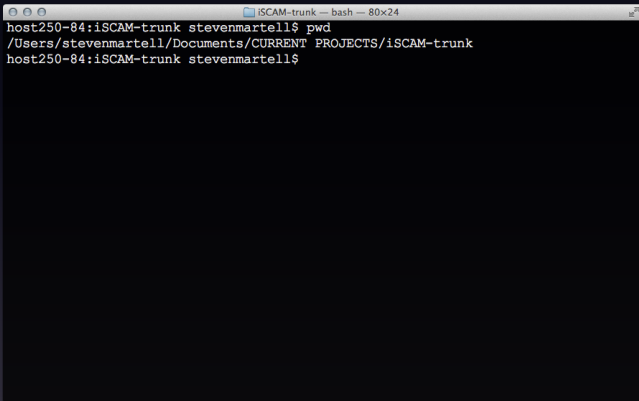
ADMB source code for iSCVM found in:

`./iSCAM-trunk/src/admb-code/`

Compiling from the command line

At the command line:

- use `cd` to navigate to the `./iSCAM-trunk` directory

A terminal window titled "iSCAM-trunk — bash — 80x24" is shown. The prompt is "host250-84:iSCAM-trunk stevenmartell\$". The user has entered the command "pwd", and the output is "/Users/stevenmartell/Documents/CURRENT PROJECTS/iSCAM-trunk". The prompt is now "host250-84:iSCAM-trunk stevenmartell\$".

```
host250-84:iSCAM-trunk stevenmartell$ pwd
/Users/stevenmartell/Documents/CURRENT PROJECTS/iSCAM-trunk
host250-84:iSCAM-trunk stevenmartell$
```

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Compiling from the command line

At the command line:

- use `cd` to navigate to the `./iSCAM-trunk` directory
- Linux or Mac OSX: type `Make`

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```
iSCAM-trunk — bash — 80x24

cp iscam ../../dist/debug
make --directory=src/admb-code --file=linux.mak opt
admb iscam

*** tpl2cpp iscam

*** CXXFLAGS="-m64" adcomp iscam
g++ -c -m64 -O3 -Wno-deprecated -D_GNUDOS__ -Dlinux -DOPT_LIB -DUSE_LAPLACE -fpermissive -I. -I/usr/local/admb/include iscam.cpp

*** LDFLAGS=" -m64" adlink iscam
g++ -m64 -L/usr/local/admb/lib iscam.o -ldflb2o -ladmod -ladt -lado -ldflb2o -ladmod -ladt -lado -o iscam

Done

cp iscam ../../dist/release
cp ./src/r-code/iSCAM.R dist/R
cp ./src/r-code/iSCAMViewTracker.txt dist/R
cp ./src/r-code/iSCAMWin.txt dist/R
cp ./src/r-code/read.admb.R dist/R
cp ./src/r-code/iScamLogo.gif dist/R
host250-84:iSCAM-trunk stevenmartell$
```

Compiling from the command line

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At the command line:

- use `cd` to navigate to the `./iSCAM-trunk` directory
- Linux or Mac OSX: type `Make`
- Windows: see <http://gnuwin32.sourceforge.net/packages/make.htm>

Using the make file will compile the *iSCvM* source code and place copies of the code in the distribution directory ("dist")

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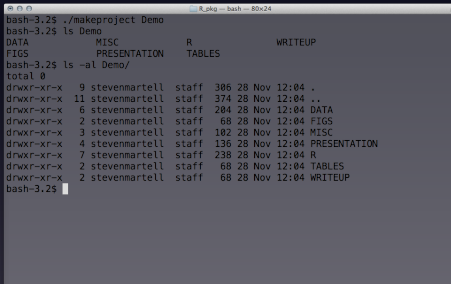
Makefile

Examples in iSCAM-trunk/examples

- Demo
- Hake

Demo

- The Demo directory is not present in the examples when you first checkout a copy of *iSCVM* from the svn repository.
- To build the Demo directory cd to the examples directory and use `./makeproject Demo`



```
bash-3.2$ ./makeproject Demo
bash-3.2$ ls Demo
DATA          MISC          R              WRITEUP
FIGS          PRESENTATION  TABLES
bash-3.2$ ls -al Demo/
total 0
drwxr-xr-x  9 stevenmartell staff 306 28 Nov 12:04 .
drwxr-xr-x 11 stevenmartell staff 374 28 Nov 12:04 ..
drwxr-xr-x  6 stevenmartell staff 204 28 Nov 12:04 DATA
drwxr-xr-x  2 stevenmartell staff  68 28 Nov 12:04 FIGS
drwxr-xr-x  3 stevenmartell staff 102 28 Nov 12:04 MISC
drwxr-xr-x  4 stevenmartell staff 136 28 Nov 12:04 PRESENTATION
drwxr-xr-x  7 stevenmartell staff 238 28 Nov 12:04 R
drwxr-xr-x  2 stevenmartell staff  68 28 Nov 12:04 TABLES
drwxr-xr-x  2 stevenmartell staff  68 28 Nov 12:04 WRITEUP
bash-3.2$
```

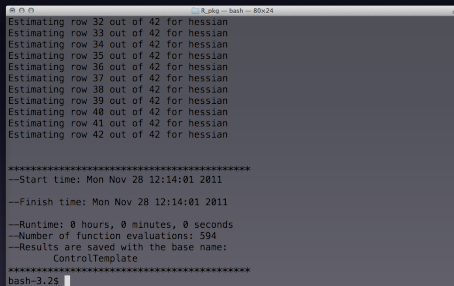
Figure: Using `makeproject` command to create Demo.

Running the ADMB model in Demo

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- cd to the `examples/Demo/DATA` directory
- type `make` at the command line



```
R_pkg -- bash -- 80x24
Estimating row 32 out of 42 for hessian
Estimating row 33 out of 42 for hessian
Estimating row 34 out of 42 for hessian
Estimating row 35 out of 42 for hessian
Estimating row 36 out of 42 for hessian
Estimating row 37 out of 42 for hessian
Estimating row 38 out of 42 for hessian
Estimating row 39 out of 42 for hessian
Estimating row 40 out of 42 for hessian
Estimating row 41 out of 42 for hessian
Estimating row 42 out of 42 for hessian

*****
--Start time: Mon Nov 28 12:14:01 2011
--Finish time: Mon Nov 28 12:14:01 2011
--Runtime: 0 hours, 0 minutes, 0 seconds
--Number of function evaluations: 594
--Results are saved with the base name:
    ControlTemplate
*****
bash-3.2$
```

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Figure: Terminal output after the Demo model has run

More on using Makefile

A makefile is a Unix utility that automatically executes a set of shell commands (rules). Target rules are executed based on dependencies.

Targets

- all: copy executable and run model with DAT & ARG
- run: copy executable and force a run
- mcmc: copy executable and run mcmc and mceval
- retro: copy executable and run retrospective R-script
- clean: remove executable & other ADMB output files

Dependencies

- EXEC - the name of the executable
- CTL - the name of the control file

If the dependencies change then running make will execute the target scripts, otherwise there is no need to re-run the model.

Setting up Makefile

User must supply variable Definitions in the Makefile:

```
EXEC    = iscam
prefix  = ../../../../dist
DAT     = RUN.dat
CTL     = ControlTemplate
ARG     =
MCFLAG  = -mcmc 10000 -mcsave 100 -nosdmcmc
NR      = 4
```

EXEC is the program name, prefix is the (relative) path to the dist directory, DAT is the data file, CTL is the name of the control file, ARG optional command line argument (e.g., make run ARG="-nohess"), MCFLAG is the arguments for make mcmc, and NR is number of retrospective years (e.g., make retro).

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Using make at the command line

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Makefiles are smart, will only execute rules if the dependencies change:

```
bash-3.2$ make
make: Nothing to be done for 'all'.
bash-3.2$
```

Using make at the command line

You can change the Makefile Defs at the command line:

```
bash-3.2$ make run ARG = "--est _-nox"
...
*****
--Start time: Tue Nov 29 11:51:10 2011

--Finish time: Tue Nov 29 11:51:11 2011

--Runtime: 0 hours, 0 minutes, 1 seconds
--Number of function evaluations: 424
--Results are saved with the base name:
      ControlTemplate
*****
bash-3.2$
```

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Parallel execution with Make

Run multiple models in SUBDIR using: `make -j4`

The "-j" option specifies the number of processors to use.

SUBDIR is the list of subdirectories in DATA (one for each model)

```
## Makefile for running models
## Author: steven martell <martell.steve@gmail.com>
```

```
## Macros
SUBDIR = CC PRD QCI SOG WCVI AREA27 AREA2W
TARGET =
.PHONY: default $(SUBDIR) mcmc
```

```
## Targets
default: $(SUBDIR)
$(SUBDIR):
cd $@ && $(MAKE) $(TARGET)

.PHONY: clean
clean_files := $(foreach dir,$(SUBDIR),$(dir)/clean)

clean: $(clean_files)
$(clean_files):
cd $(@D) && $(MAKE) clean
```

Sorry does not work on WINDOZE!

Using guiView

In the R directory, source the iSCAM.R file in R `>guiView()`

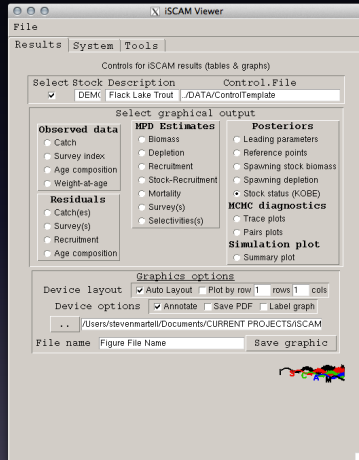


Figure: R gui for iSCvM

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