An Introduction to CodeRunner

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What is CodeRunner?

- CodeRunner is a framework for the automated running and analysis of simulations.
- Because it is a modular system, it can easily be customised to work with any system and any simulation code.

Website: http://coderunner.sourceforge.net
Motivation

• Large amounts of computer time available allowing large parameter scans as well as just single “hero” calculations.
• “Human time” more valuable resource than computer time.
• Large amount of human time spent:
  – Editing and naming input files.
  – Performing standard analysis.
  – General faff.
Motivation

• Many hundreds of simulation codes and HPC systems.
• Each has a different and sometimes complex interface.
• Lots of time spent learning each one.
CodeRunner

- CodeRunner provides a simple universal interface to submit jobs on any system for any code that it has been implemented on.
- CodeRunner does all the organising and sorting:
- It automatically generates any necessary input files, organises the output data and analyses it.
CodeRunner Structure

CodeRunner

Run Class

Code Modules
GS2
Griffin

System Modules
Linux
Juropa
Hector
Making New Modules

• Making new system modules is easy.
  – Start with an existing one.
  – Duck typing

• Making new code modules is a little harder.
  – Can leverage pre-existing analysis code.
  – Can directly interface with Python libraries
  – A package exists for codes that use Fortran
    Namelists.

• Today just looking at a pre-existing code module: GS2crmod.
Interfaces

• CodeRunner has three interfaces.
  – Command line
  – Interactive mode
  – Ruby scripting API
CodeRunner Help and Documentation

• Command line manual.
• Online tutorials
• Dynamically available documentation for the API.
GS2crmod

- GS2crmod is the module that allows CodeRunner to run and analyse GS2.
- Knows about every GS2 input parameter and can provide help for each one.
- Generates GS2 Input files
  - With sanity checks
- Analyses GS2 output
  - Calculates Growth Rates
- Allows CodeRunner to plot many different graphs.
- Website: http://gs2crmod.sourceforge.net
Visualizations

- GS2crmod provides a visualisation API for GS2
The Goal

- A simple, portable API for GS2 that will allow:
  - Easy data analysis
  - Easy visualisation of GS2 results
  - Other systems to access GS2 data
- Other Goals:
  - Standardisation of GS2 results (definition of a namespace of visualisations)
GraphKits

- A visualisation or graph is a rendering of a set of data points in 1-5 dimensions, (e.g. 3 space, colour, time) into an image.
- A GraphKit is an object which contains everything you need to make such a visualisation.
- It is an intermediate stage:
GraphKit Structure

• GraphKits consist of three parts.
  – Standardized Data Container.
  – Standard basic graph options.
  – Non standard custom options for various packages.
The API in Ruby

```ruby
runner = CodeRunner.fetch_runner('a/folder/')
runner.conditions = 'g_exb==1.0'
graphkit = runner.run_graphkit('phi2tot_vs_time')
graphkit.gnuplot # plot in an X11 window
graphkit.gnuplot_write('phi_graph.eps')
```

All graphs can be plotted from the command line.