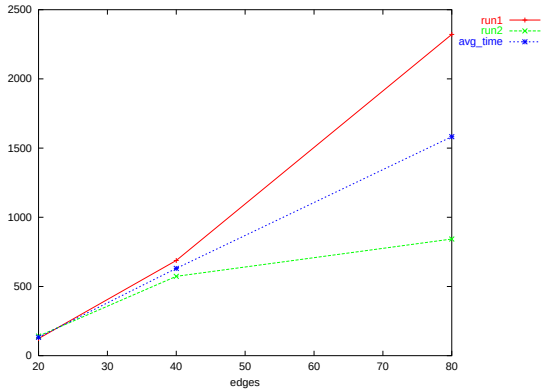
A Tool Set for Computational Experiments

vertices	*edges*	*run1*	*run2*	*avg_time*
10	*20*	*123.6*	*141.3*	*132.4*
20	*80*	*2321.4*	*842.9*	*1582.2*
10	*40*	*432.8*	*832.0*	*632.4*
20	*40*	*943.1*	*314.2*	*628.6*



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The Experimentation Process

do

1. (re)design algorithm
2. (re)implement algorithm
3. gather benchmarking data
4. run benchmark
5. examine results

while (not results_publishable)

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1. (re)design algorithm
2. (re)implement algorithm $\rightarrow$ use CVS
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The Experimentation Process

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4. run benchmark $\rightarrow$ record environment
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publish $\rightarrow$ produce graph or table

Unix Tools You Probably (Should) Use

CVS – for source code version control

make – supports experimentation via compilation flags

gnuplot – for producing graphs of data

python, perl, sed, *etc.* – text processing

your favorite editor

- record how, when, and why an experiment was done
- create input files for graphs or tables

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Note: Replacing these tools is not the goal.

Goals

Generally: Provide a comfortable experimentation environment.

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Specifically:

- simplify running of computational experiments
- document computational environment automatically
- eliminate some of the tedium involved in processing and analyzing output

Design Principles

- Provide tools that can be used separately and in concert.
- Use file formats easily interpretable by humans.
- Focus on language-independent tools.

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Implications

- No restrictions on the kind of experiment
- No restrictions on the output format
- Trying the tools is relatively painless

The Current Tool Set

- **Interface**

Command-line interface with possibility of reading command-line options from a file.

```
labrun --cvs=~/dir --name test -c comment
       --env CXXFLAGS  @optfile
```

- **Configuration Tool**

`labsetup` – creates configuration files for experimental context that remains globally or locally constant

Tools for Running Experiments

`labmex` – makes and executes a program

```
labmex --clean before -m '-DCXXFLAGS=-O3'
       timings 10 20 5
```

`labrun` – runs an experiment and documents its context

```
labrun -n timings -t 10_20_5
       labmex --clean before timings 10 20 5
```

`labrerun` – reruns an experiment given a log file created by a previous run

```
labrerun lab_log/timings-10_20_5.log
```

Output Processing Tools

- Harness the power of Python to be able to manipulate data.
- Use regular expressions and key words to extract data.
- Act as filters by default.
- Use an internal format to achieve many-to-many conversion.

Output Processing Tools

`text2sus` – extracts data from an ASCII file using key words and regular expressions

```
text2sus instance value 'last_val=^final.* (\d+)'
```

`table2sus` – extracts data from an ASCII (`gnuplot`) file

`sus2text` – produces an ASCII (`gnuplot`) file

```
sus2text --sort instance --add same=last_val==value
```

`sus2latex` – produces a simple LaTeX table

`sus2plot` – produces a `gnuplot` graph

`sus2sus` – filter, rearrange, reformat, *etc.*

Features

- Promotes scientific integrity
  - context is documented
  - results are reproducible when possible
- Promotes good programming practice
  - use of source code revision control
  - self-documentation
- No restrictions on the kind of experiment
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Current Status

- We have tested it and used it.
- Beta release is available from
  `http://www.mpi-sb.mpg.de/~hert/ExpTools`

We want feedback!

- First external release expected beginning of August.

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P.S.

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