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Administrivia

- Homework 6 posted; due a week from Monday.
- Promised sample `vim` configuration file(s) added to “sample programs” on course Web site.

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The `make` Utility, Recap/Review

- Purpose of this tool is to facilitate efficient compilation — if a source code file changes, rebuild only the parts that depend on it.
- Requires setting up a text “make file” describing dependencies and how to rebuild.
- Worth noting that dependencies are one-way, so `make` doesn't work with languages such as Scala and Java where there can be circular dependencies.

Implicit Rules (Pattern Rules)

- In addition to predefined implicit rules, you can define similar rules — e.g., a makefile to compile `.c` files using the MPI C compiler:

```
MPICC = /usr/bin/mpicc
CCFLAGS = -O -Wall -pedantic
```

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```
%.c: %.c
    $(MPICC) -o $@ $(CCFLAGS) $<
```

`$<` is the first prerequisite (`.c` file here); `$@` is the target.

(Note that this is for GNU `make`. Non-GNU `make` has a similar idea (“suffix rules”) with slightly different syntax.)

(Note also that this is kind of a bogus example — you could get the same effect by just setting `CC` to point to the compiler you want.)

Other Uses For `make`

- One of the more painful aspects to using `make` is getting the dependencies right, in particular for `#include`'s in C programs. `make` can help with this, together with compiler option `-MM`. Discussed in some detail in GNU `make` manual, under “Generating Prerequisites Automatically”. (See example.)
- `make` can be used to automate things other than compiling programs. It's particularly useful for defining implicit rules. For example, I like using it to automate generating PDF (and HTML) from \LaTeX source, sometimes with some preprocessing. (Possibly less necessary than it was, now that we have `pdflatex`.)

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Minute Essay

- Questions about make? things you'd like to hear (more) about?
- I've described some of the ways I use some of the tools discussed. How about you — anything we've talked about thus far that you've been able to put to use to do something that helps you?

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