Free & Open Source Software: The Academic Future

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Theme

- It is now possible to operate a computer using only programs that can be downloaded without charge.

- Even if you have money, it is virtuous to use "free software".

- I would rather learn to write a program than to pay someone else to learn it for me

The Confusing Word "Free"

- "Free Software" does not necessarily mean "free in money"
- Free == liberty
  - Easily distributed
  - Open to volunteer programmers who want to help
- "Copy-lefted" term coined for free software alternative to "copy-righted" software

Free as in "beer" or "lunch"

- You can download many programs without paying
- But many are *not truly free*, because you cannot
  - See the code
  - Revise the code
  - Redistribute the program
- Examples:
  - RealPlayer
  - Acrobat reader

Free as in "Speech"

- Users allowed to
    - Redistribute
    - Inspect code
    - Modify code
- People can charge for free software
- To clear up confusion, the new term:

    Open Source Software

is proposed to replace "free"

The Current State of Affairs

Free & Open Source alternatives exist for
- Operating Systems
  - Linux and Free BSD are complete "drop in" replacements for Microsoft Windows and Macintosh
- Many "volunteer oriented" Linux distributions
  - Slackware: the first widely shared "distribution"
  - Debian: strongest volunteer effort
-

Companies sell free software!

- Many companies have formed to facilitate use of Linux as an OS
  - RedHat
  - Suse (purchased by Novell)
  - Mandrake
- They offer service & support
- Customized "commercial" packages
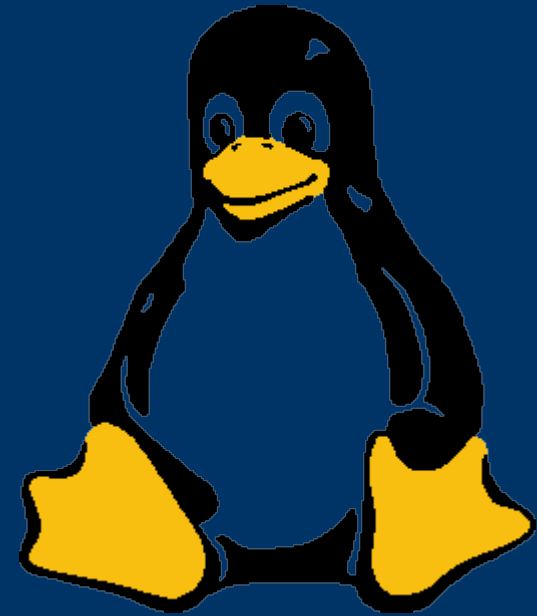
Tux: The Linux Penguin

Free & Open Programs Now Exist

- Most developed on Unix type computers
- Now Windows as well (~~~~)
- "Office Suites" to replace Microsoft office and Word Perfect (Open Office, Koffice, gnumeric)
- Photo Editors (The Gimp)
- High quality publication systems (LaTeX)
- Text Editors (Emacs, Xemacs, + many others)
- Statistical Analysis (R)

The Free Software Movement (begin late 1980s)

- Free Software Foundation
- GNU software tools: Free Unix software
  - Compilers & programmer tools
  - End-user products
- GNU GPL (Greater Public License)
  - People who make a program using GNU libraries must distribute the code when they distribute the program
  - Cannot restrict use of code by consumers
- GNU
  - Acronym "GNU's Not Unix"

GNU Success (early & mid 1990s)

- GNU Philosophy:
  - Write simple, small programs that do specific things
  - Write clear code according to open standards
  - Distribute code widely
  - Facilitate volunteer collaboration
- Volunteers developed programs that are now widely considered to be superior to their commercial counterparts
  - Archiving (tar & gz/bz2)
  - Web server (Apache)
  - Shell (Bash)
  - File Utilities

GNU/Linux (mid & late 1990s)

- Linus Torvalds, a Finnish student, wanted to make a Unix-like kernel for the IBM PC hardware
- The "kernel" manages hardware (core of an "operating system")
- Linux (combine word Linus with Unix) was released under the GPL (1992)
- Combine with GNU tools and you have an **operating system**!
- But not a "graphical interface"

The "Console" would look like this:

```
[pauljohn@pols113 Research]$ df
Filesystem             1K-blocks     Used Available Use% Mounted on
/dev/hda6              15116836   5224516   9124416  37% /
/dev/hda3                225557     11725    202185   6% /boot
none                     257564         0    257564   0% /dev/shm
/dev/hda5              28225596  18444716   8347084  69% /home
/dev/hda7               5036284    577832   4202620  13% /usr/local
[pauljohn@pols113 Research]$ ls -la
total 444
drwxrwxr-x  15 pauljohn pauljohn    4096 Apr  7 14:35 .
drwx------  52 pauljohn pauljohn    4096 May 21 22:35 ..
drwxrwxr-x   2 pauljohn pauljohn    4096 Sep 18  2003 APSAIntGrps
drwxrwxr-x   2 pauljohn pauljohn    4096 Sep 18  2003 APSAMethods
drwxrwxr-x   2 pauljohn pauljohn    4096 Jan 29  2004 Diary
drwxrwxr-x  42 pauljohn pauljohn    4096 Nov  5  2004 Drivers2
drwxrwxr-x  23 pauljohn pauljohn    4096 Jun 17  2004 DriversLicense
drwxrwxr-x   2 pauljohn pauljohn    4096 Jun 24  2004 Hinich
drwxrwxr-x   4 pauljohn pauljohn    4096 Feb 18  2002 IGBook
drwxrwxr-x   6 pauljohn pauljohn    4096 Oct  7  2003 Kluwer
drwxrwxr--  21 pauljohn pauljohn    4096 May 20 20:26 Mathbook
-rw-rw-r--   1 pauljohn pauljohn   65536 Aug 19  2004 McCainReviewerQuestionnair
.doc
drwxrwxr-x   2 pauljohn pauljohn    4096 Apr 15 00:51 Midwest05
-rw-------   1 pauljohn pauljohn  319488 Jan  9  2004 nsf2004.doc
drwxrwxr-x   2 pauljohn pauljohn    4096 Oct 14  2004 RonData
drwxr-xr-x   2 pauljohn pauljohn    4096 Jun 30  2004 simMemAgg02
drwxr-xr-x   5 pauljohn pauljohn    4096 Feb 14  2002 simpap97
[pauljohn@pols113 Research]$ 
```

Merge in an "X Server"

- The X Window system was invented for Unix (1980s)
- A "X Window Server" is a program that "puts boxes" up on your screen.
- XFree86: a free/open source version of X Window System
- Create "programming libraries" that programmers can use to create software
- Now you have a **Graphical User Interface**
- Accomplished by 1996 (when I started w/ Linux)

Applications
Info
Run...
Assorted XTerms
XTerm
Mozilla Firefox
Workspaces
Applications
Utils
Selection
Commands
Appearance
Session

Applications
Gimp
Ghostview
Xpdf
Abiword
Dia
OpenOffice.org
Editors
Multimedia

1 Main

Mozilla Firefox

File   Edit   View   Go   Bookmarks   Tools   Help

Go   G

Members   WebMail   Connections   Biz Journal   SmartUpdate   fig2a.gif (GIF Image, 2...   Mktplace   Seminar Series in Polit...   »

Bookmarks

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    FAST FTP Search v4.0 - The ...
    Numerical Recipes Upgrade In...
    AetnaAccess Online
    Weather Underground: Lawren...
    Research and Marketing Prese...
    Review of: "Essays on Li...
    The Chronicle: Information Tec...
    eCircles - Circle Members - Th...
    Kluwer MS-AS-SO series - Ger...
    Condorcet's Method
    MyFamily.com

Eterm 0.9.3

[pauljohn@pols113 ~]$ df
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/dev/hda3   225557   11725   202185   6% /boot
none   257564   0   257564   0% /dev/shm
/dev/hda5   28225596   18444748   8347052 69% /home
/dev/hda7   5036284   577832   4202620 13% /usr/local
[pauljohn@pols113 ~]$

What's wrong with that?

- The only "integrating feature" is the Window Manager (program that draws frames around windows and interacts with X as you point and click)
- I like it that way!
- Others say desktop should have a tightly integrated, consistent set of programs that work together
- Cool "desktop switcher"
- Many people don't like the "terminal"

Finally, make a "desktop" (1998+)

- Mac and Windows created the expectation of a "point and click" user experience
- Some in GNU/Linux community have attempted to compete on that level
- Full "desktop" environments
  – Gnome (Mexican programmer Miguel de Icaza founded this wonderful project)
  – KDE (German programming team)
- These have all of the "stuff" you might want
  – GUI configuration tools
  – Calculator, media players, etc

Why Academics should prefer open source projects

- Save money for hardware
- Freedom: No longer at mercy of capitalistic exploiters

Bill Gates: Pie in the Face!

Why Academics should prefer open source projects

- Save money for hardware
- Freedom: No longer at mercy of capitalistic exploiters
- Customize software to support research
- Verify algorithms & calculations
- Can inspect for security problems
- Can volunteer to fix bugs and create features for other people

Example 1. Emacs

- Emacs (Editor Macros)
- Created by Richard Stallman, a founder of the Free Software Foundation
- Emacs can run in the console or in graphical interface
- Most important feature:

It is **EXTENSIBLE**

Lisp programming language popular with "the smart crowd"

Emacs Demonstration

- Edit text files
- Compile programs
- MULE: multi language support
- Note many "Tools" collected from volunteers
- I use Emacs for editing programs & writing web pages
- Constantly changing features

emacs.example - emacs@localhost.localdomain

File Edit Options Buffers Tools Help

This is Emacs as it appears in Fedora Core Linux 3. It Has good multi-language support.

Ершы шы Уьфсы фы ше фззуфкы шт Аувщкф Сщку Дштгч Зю Ше рфы пщцв ьгдеш—дфтпгфпу ыгзззщкею

—жЙR:**   emacs.example   (Fundamenta
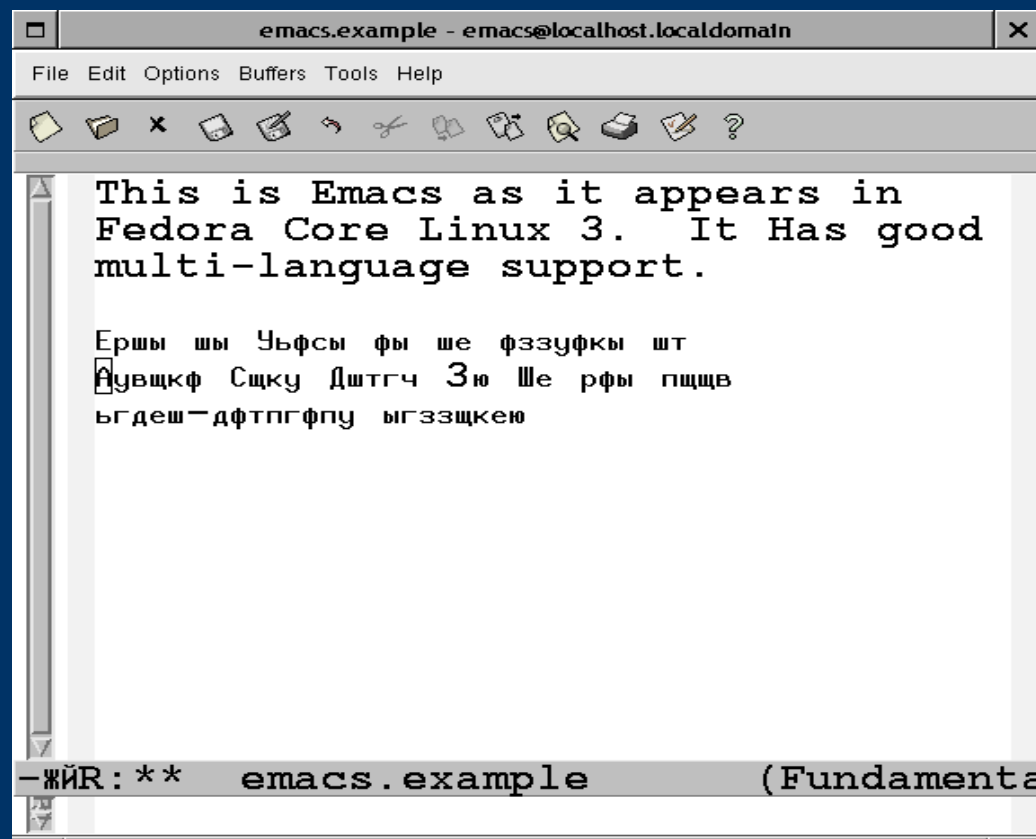
Example 2: Gimp Demonstration

- GTK+ : a famous "graphical toolkit" that is the foundation of Gimp (and Gnome desktop)
- Gimp: best photo editor on the planet!

Johnson Family Christmas Photo

Would Mrs Johnson be happier if

- Mona Lisa, K. Marx & V. Lenin were computing?

Yes!

Example 3: Xfig

- A long-standing free program for drawing

- Interface is not quite so nice as Corel Draw, but the price is certainly lower!
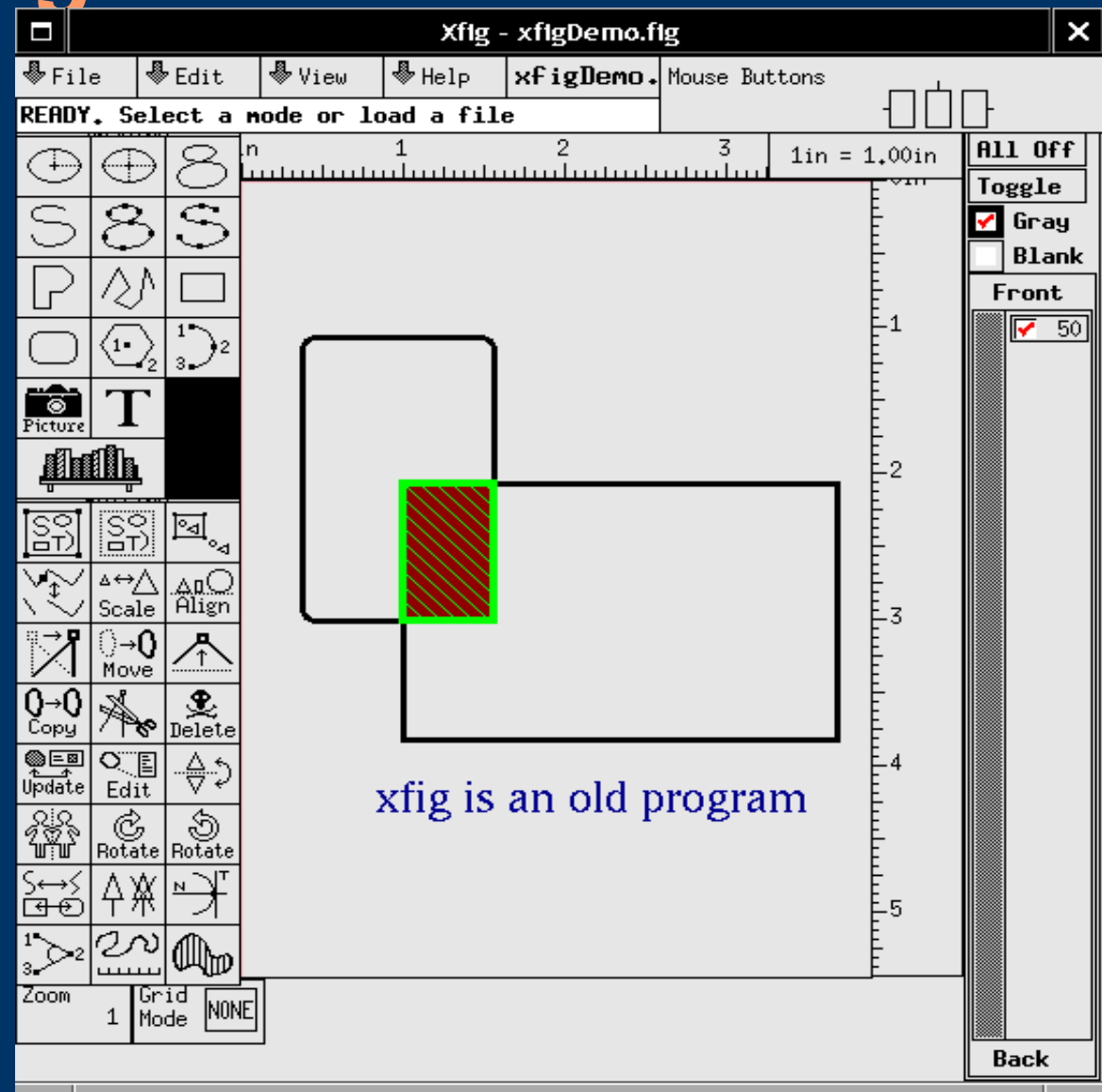
Example 4: R, a statistical program

- http://www.r-project.org
- Complies with the "S" Programming Language
- Very highly EXTENSIBLE
- 100s of free downloadable packages with the very newest innovations in statistics
- Now the preferred software of most top-notch European, Australian, & American statistical departments

R: terminal based
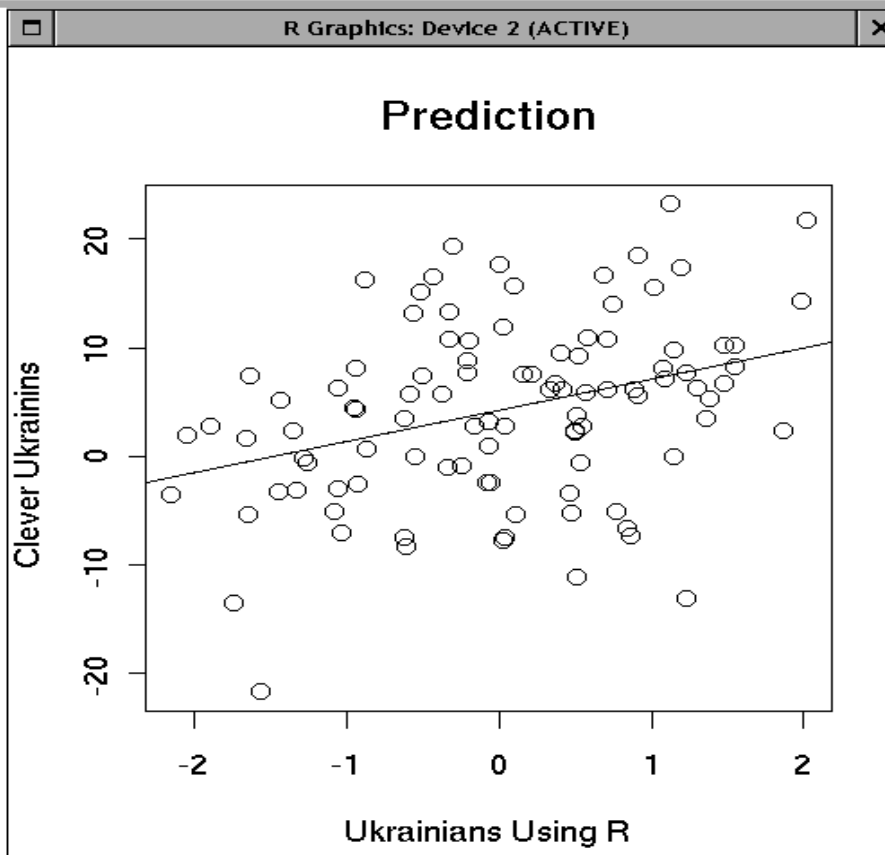
Rcmdr: GUI to help get started

Example 5: LaTeX: document processing system

- Makes beautiful journals and books
- Used by many publishers, especially for math
- Somewhat difficult to prepare LaTeX documents because users are asked to do "markup"
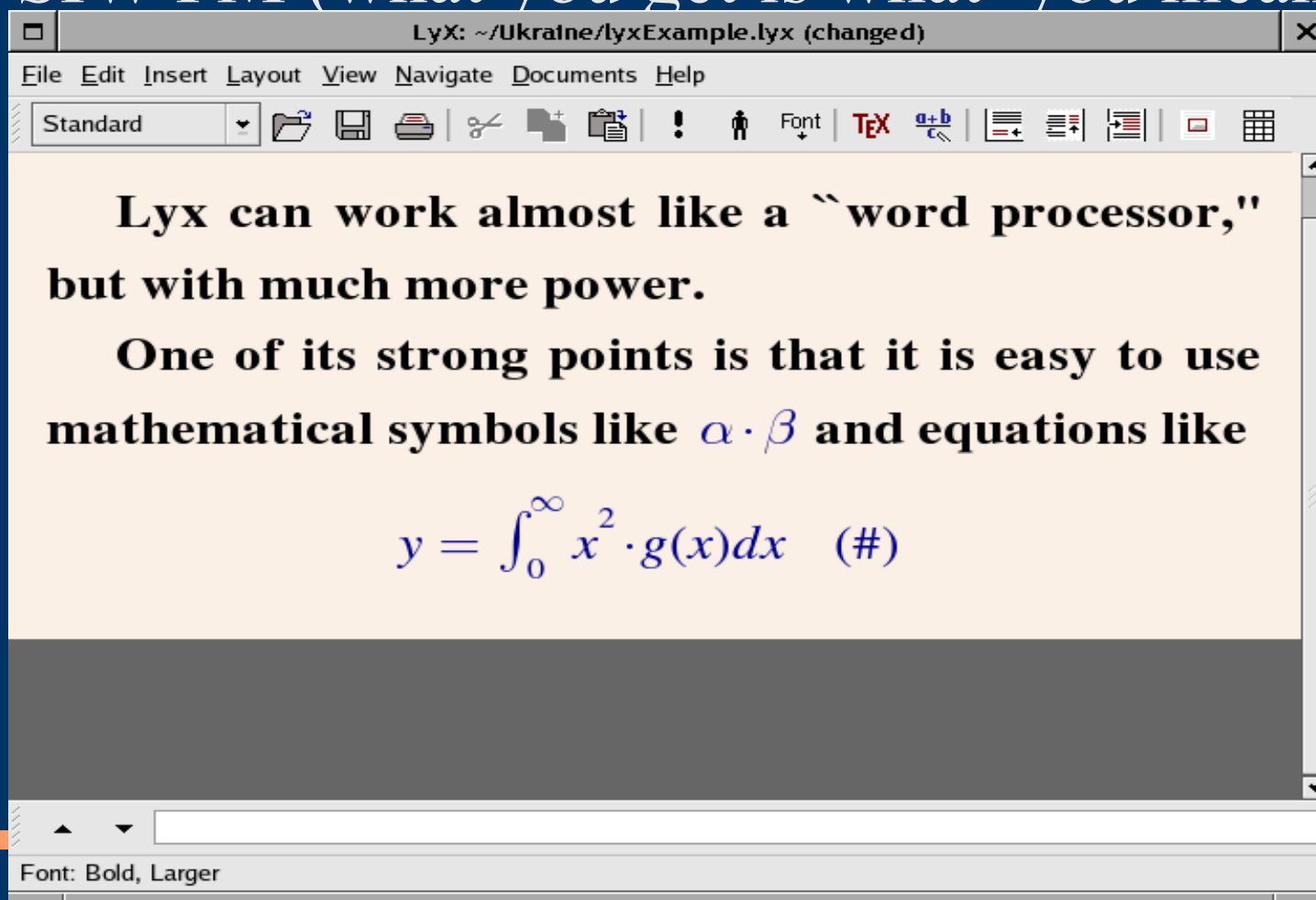- Example, to make bold

   Orange Revolution

   in LaTeX one writes

   \textbf{Orange Revolution}
- Emacs has a good LaTeX mode & preview module, but many people find it too difficult.

LyX to the Rescue

- http://www.lyx.org
- WYSIWYM (what you get is what you mean)

LaTeX is a Large Framework

- LaTeX has automatic features for creation of
  - tables of contents
  - index
  - Bibliographies
- Lyx integrates with
  - Xfig drawings
  - Other eps or picture formats

Example 6: Open Office Impress

- This slideshow produced with Open Office 2 beta (1.9.104) in May, 2005

How Can You Get Started?

- If you have access to a Linux system, try it out!
- Read websites about the "shell" and common commands in the shell ("ls" "cd" "mkdir")
- Open the terminal and investigate some commands
- Install R and read its online documentation

Are You a Prisoner of Windows?

- Emacs for Windows (native!)
- Gimp for Windows (native!)
- R for Windows (native!)
- Open Office for Windows (native!)
- Cygwin (Unix "emulation layer" for Windows)
  - Inside Cygwin, one can compile Unix/Linux programs and run them in Windows
  - Free version of X-server included in recent Cygwin