A Beautiful Mind

Meets Free Software

Game Theory, Competition and Cooperation

Alexandre Oliva lxoliva@fsfla.org
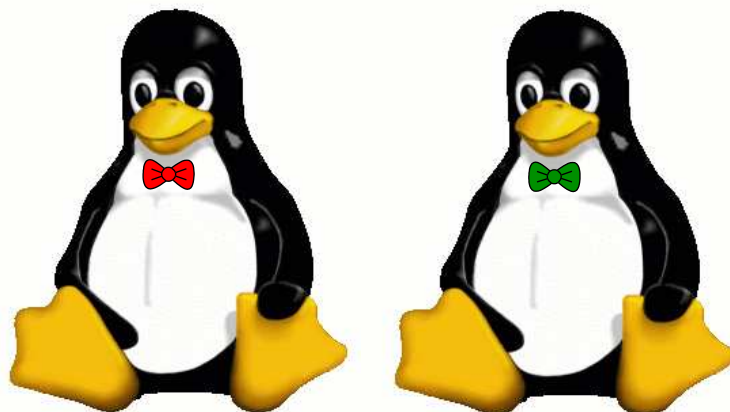
`http://www.fsfla.org/~lxoliva/`

Latin America

Summary

- John Forbes Nash Jr, a Beautiful Mind
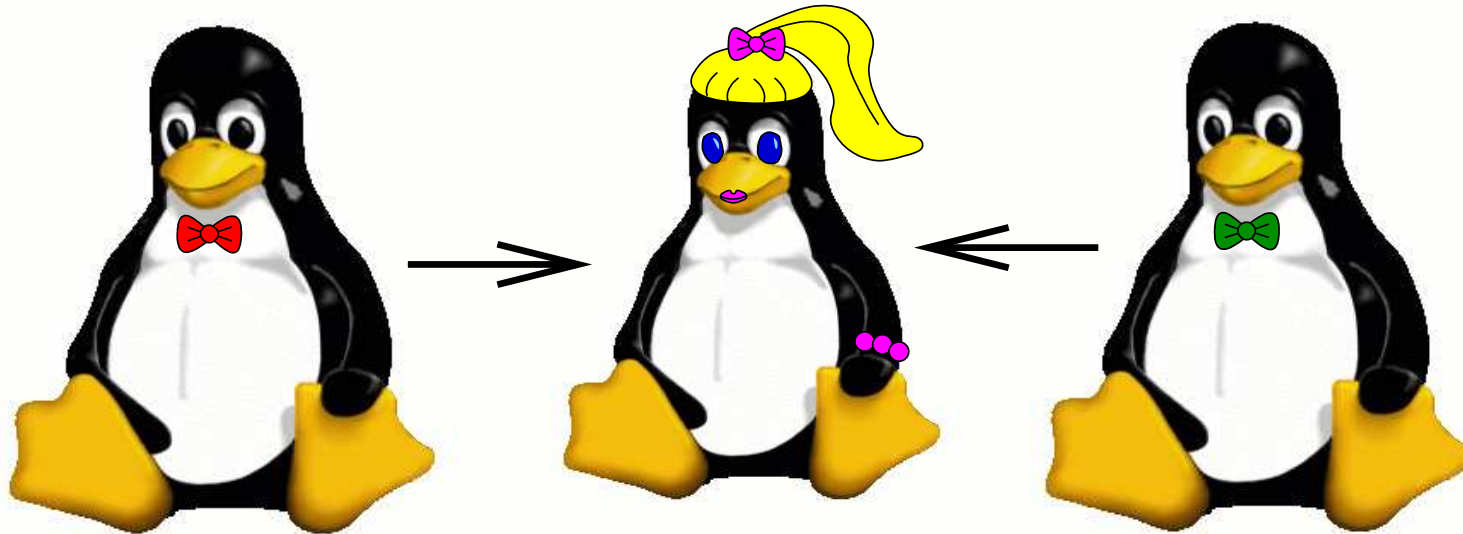
- Game Theory

- Free Software

John Nash

- Mathematician awarded 1994's Nobel Prize

- Inspiration for "A Beautiful Mind" movie

- Proponent of Nash Equilibrium
  - Game Theory
  - Economics

How (not) to get laid

"In competition, individual ambition serves the common good."
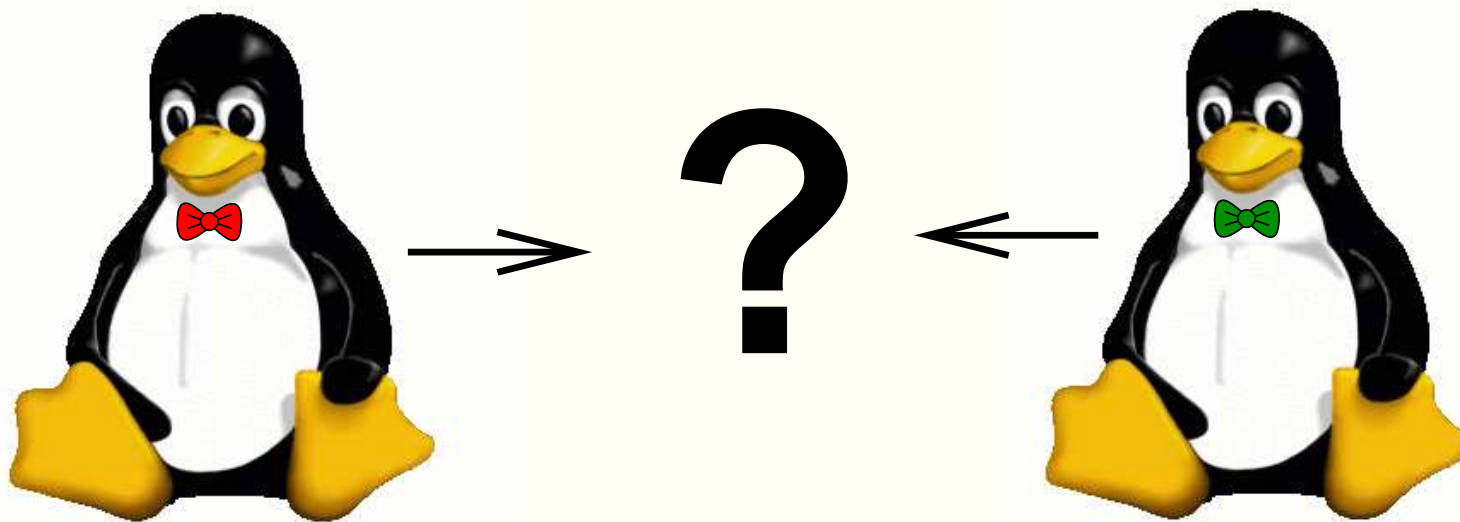— Adam Smith

How (not) to get laid

Russel Crowe as John Nash:
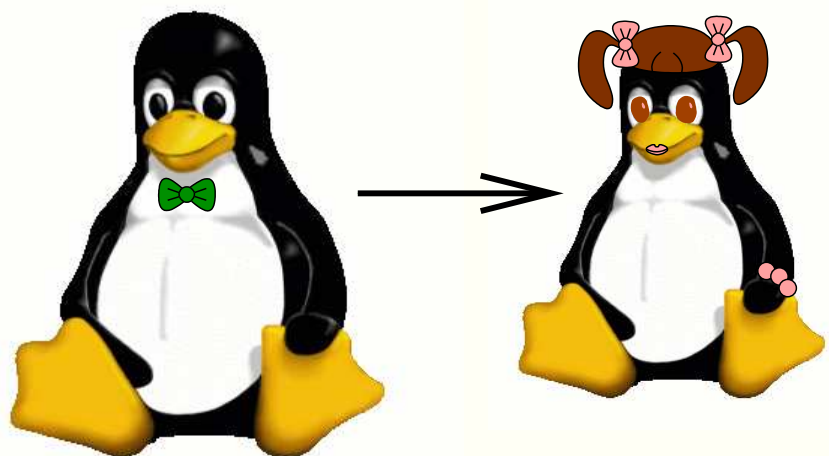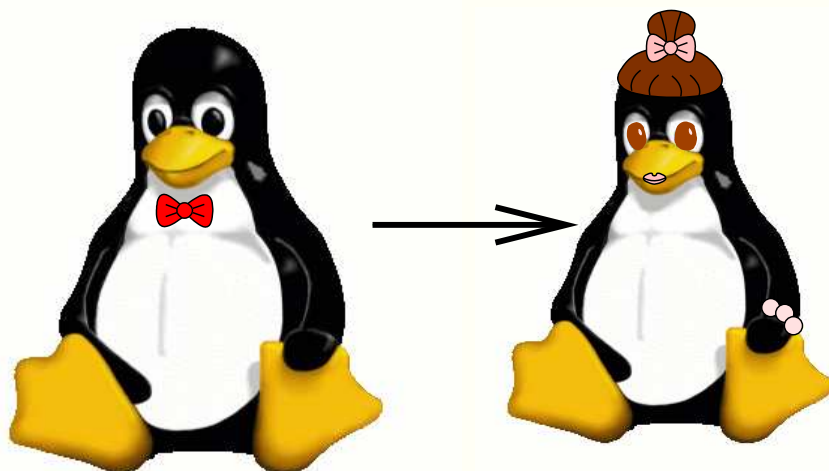
"If we all go for the blonde we block each other.

How (not) to get laid

"Not a single one of us is going to get her.

How (not) to get laid

"So then we go for her friends…"

How (not) to get laid

"...but they will all give us the cold shoulder, because nobody likes to be second choice.

 $\longrightarrow$ **?**

 $\longrightarrow$ **?**

How to get laid

"Well, what if no one of us goes for the blonde? We don't get in each other's way, and we don't insult the other girls. That's the only way we win. That's the only way we all get laid."

?
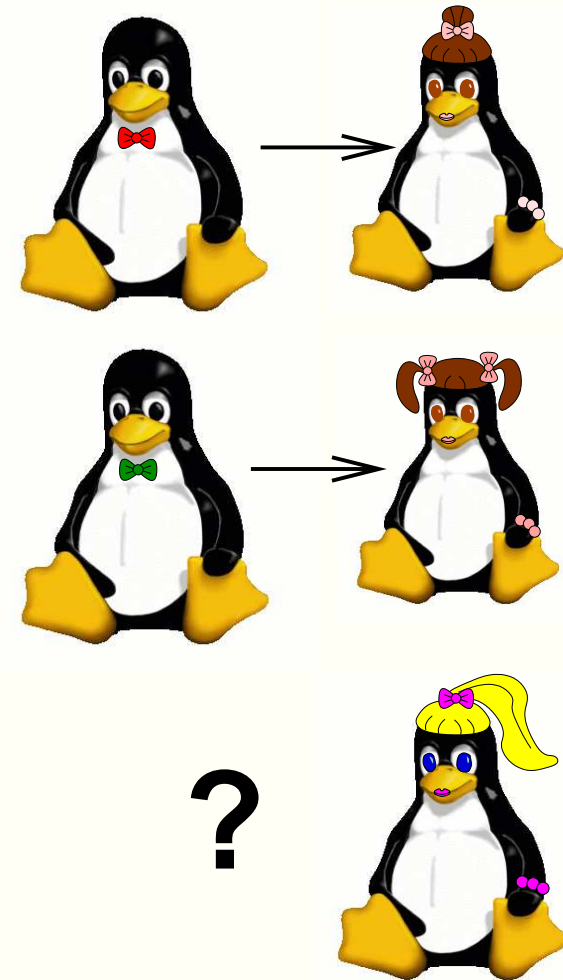
Adam Smith needs revision

"The best result will come from everybody in the group doing what's best for himself, **and the group**." — Russel Crowe as John Nash

Game Theory

- Framework to reason about strategies

- Players are rational and selfish

- Applications

  – Economics

  – Auctions

  – Military

  – Getting laid :-)

Prisoners' Dilemma

- Two burglars caught near a crime scene

- No evidence other than concealed weapon

- Each one is offered the same deal:

  - confess and testify, no jail time

    * if both do, 10 years for both

  - deny and go to jail for 1 year

    * if the other testifies, serve for 15 years

Prisoners' Dilemma

Bob   ←

Jail time	confess	deny
Al confess	10\10	0\15
↑ deny	15\ 0	1\ 1

- No communication $\Rightarrow$ no cooperation

- Dominant strategy leads to worst result

Tragedy of the Commons

- Commoners use area to graze cattle

- Costs are shared, value isn't

Cattle	Value$-$Cost
n	$k_p n - k_{c_N} \quad \dfrac{n}{N}$
$n+1$	$k_p(n+1) - k_{c_{N+1}} \dfrac{n+1}{N+1}$

$\downarrow$

- Overuse depletes common resource

- Free riding: polluting, overfishing, spamming

Nash Equilibrium

- Generalizes dominant strategies

- No player can individually increase payoff

Gentlemen Prefer Blondes

	1\1	1\2
	2\1	0\0

- Maximin leaves the blonde alone

- Credible commitments enable Pareto Optima

A Beautiful Mind meets Free Software
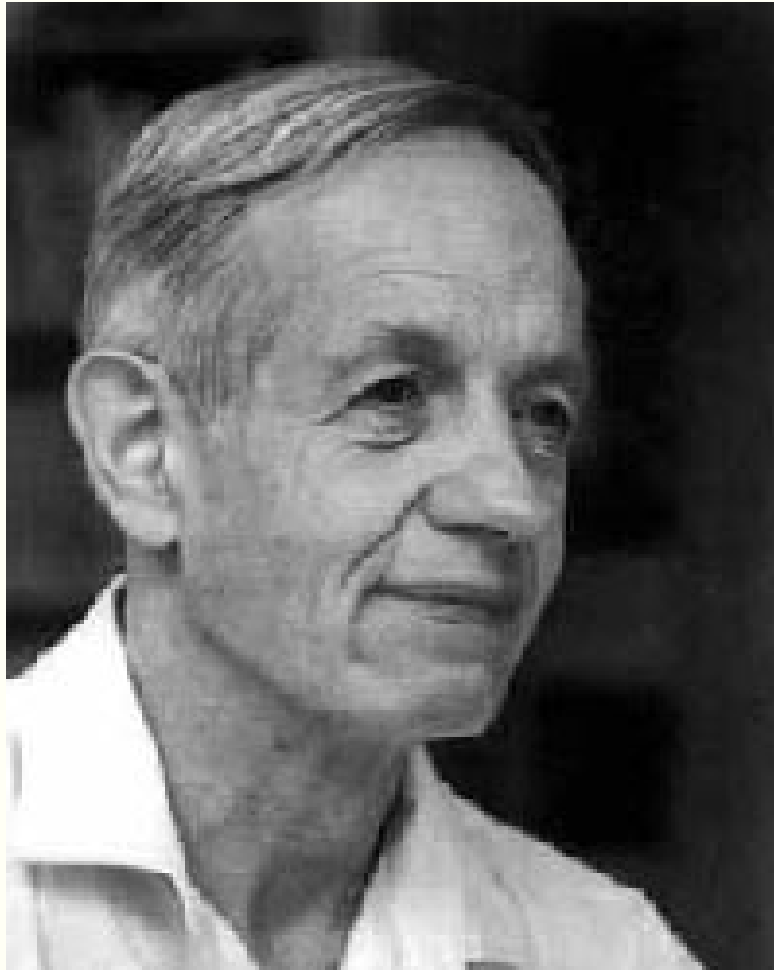
Timeline

- Software was Free

- Vendors made it proprietary

- Unix

- GNU project

- GNU General Public License

- Kernel Linux

- Unix System V $\times$ BSD

Essential Software Freedoms

- Run   (Freedom 0)

- Study and Adapt   (Freedom 1)

- Copy and Redistribute   (Freedom 2)

- Improve and distribute   (Freedom 3)

Proprietary Software Vendors

- Seek edge by denying freedoms

- No-cooperation competition

- Minimize losses to competitors

  – Maximizing payoff, value, or none?

- "Individual ambition serves the common good"
  — Adam Smith

- Prisoners go to jail

BSD-like Free Software Vendors

- Only requirement is attribution

- Sharing is good

- Cooperation is welcome

- Free riders are accepted

- Tragedy of the commons

GNU General Public License

- If you get the binaries, you can get the sources

- Copyleft: for all, rights Preserved

- No further requirements

Copyleft software remains Free

GNU GPL-ed Free Software Vendors

- Competition with cooperation

- Seek edge by improving on the commons
  - Contributing back
  - Better grounds to build upon

- "The best result will come from everybody in the group doing what's best for himself, and the group" — John Nash

- Credible commitment

Choosing the best strategy

License	Proprietary	BSD-like	GNU GPL
Costs	$\dfrac{k}{1}$	$\dfrac{k}{n_b}$	$\dfrac{k}{n_g}$

$\uparrow$

- Similar software with similar production costs

- Market divided evenly among competitors

- Proprietary vendors can't share costs

- Relicensing BSD-like code

GNU Philosophy

GNU/Linux

- Credit

- Freedom

- Open Source?

Further Resources

- Roger A. McCain's "Strategy and Conflict: An Introductory Sketch of Game Theory"
  `http://william-king.www.drexel.edu/top/eco/game/game.html`

- Theodore L. Turocy and Bernhard von Stengel's "Game Theory"
  `http://www.cdam.lse.ac.uk/Reports/Files/cdam-2001-09.pdf`

- `http://wikipedia.org` on Game Theory

Free the Software!

http://www.gnu.org

http://www.fsf.org/

http://www.fsfla.org

http://www.softwarelivre.org

Latin America

mailto:lxoliva@fsfla.org

http://www.fsfla.org/~lxoliva