

How to give a good research talk

Andreas Zeller

Dear all,

in our Master Seminar this week, I will give a presentation on how to give a good research talk. The presentation features Steve Jobs, Don McMillan, Lawrence Lessig, Mickey Mouse, as well as researchers from the University of Washington. The most frequent word is "chicken".

See you on Wednesday at 16:15 in Room 328 (our seminar room),

Andreas

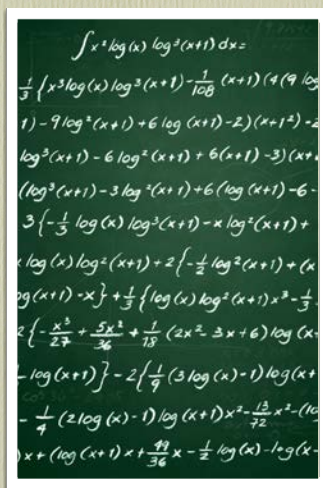
--

Andreas Zeller Saarland University
<http://www.st.cs.uni-sb.de/zeller/>

Goals of the Seminar

- Find your way into *scientific challenges*
- *Structure and present* scientific material
- Train your social and communication skills

The Purpose of your Talk


$$\int x^2 \log(x) \log^2(x+1) dx =$$
$$\frac{1}{3} \left\{ x^3 \log(x) \log^2(x+1) - \frac{1}{108} (x+1)^4 (9 \log(x+1) - 9 \log^2(x+1) + 6 \log(x+1) - 2)(x+1)^2 - 2 \log^3(x+1) - 6 \log^2(x+1) + 6(x+1) - 3 \right\} (x+1) +$$
$$(10 \log^3(x+1) - 3 \log^2(x+1) + 6 \log(x+1) - 6 - 3 \left\{ -\frac{1}{3} \log(x) \log^3(x+1) - x \log^2(x+1) + \log(x) \log^2(x+1) + 2 \left\{ -\frac{1}{2} \log^2(x+1) + (x \log(x+1) - x) \right\} + \frac{1}{3} \left\{ \log(x) \log^2(x+1) x^2 - \frac{1}{3} \right\} \right. \\ \left. \left. + \left\{ -\frac{x^3}{27} + \frac{5x^2}{36} + \frac{1}{18} (2x^2 - 3x + 6) \log(x) - \log(x+1) \right\} \right\} - 2 \left\{ \frac{1}{9} (3 \log(x) - 1) \log(x+1) \right. \right. \\ \left. \left. - \frac{1}{4} (2 \log(x) - 1) \log(x+1) x^2 - \frac{13}{72} x^2 - (10 \log(x) + \log(x+1) x + \frac{49}{36} x - \frac{1}{2} \log(x) - \log(x+1) \right) \right\} \right.$$

You may wish to

* impress people with your brainpower

* tell them you know all and everything

* tell them how you went in there and back

All this is wrong.

The Purpose of your Talk



The Purpose of your Talk

- Make the audience read your paper
(and talk about it)
- Give them an *intuitive feel for your idea*
- Engage, excite, provoke them
- Make them glad they came

From Simon Peyton Jones,
“How to give a great
research talk”

Preparation

- Check the material
- Identify central topics and claims
- Outline the talk
- Make a detailed sketch

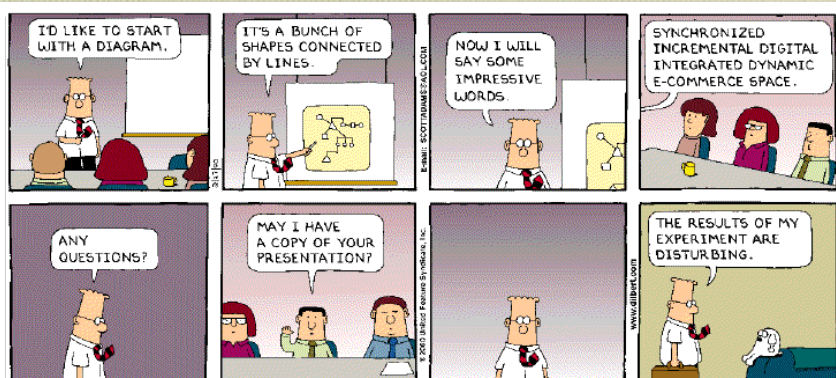
Ask Yourself

- Do the claims hold?
- Are the examples illustrative?
- Can I do better in presenting?
- What are the central claims, anyway?
- And how are they supported?

Ask Yourself

- If someone remembers *one thing* from my research talk, what should it be?

The Perfect Talk



Your Audience

- ~~Have read all your earlier papers~~ *have never heard of you*
- ~~Thoroughly understand Computational Complexity of Bio-inspired Computation in Combinatorial Optimization~~ *have heard of it, but wish they had not*
- ~~Are eagerly awaiting your latest and greatest~~ *could not care less*
- ~~Are fresh, alert, and ready for action~~ *just came back from lunch and are ready for a nap*



Wake up!

Organizing Your Talk

- Motivation
- Solution (including failures)
- Results
- Conclusion



Motivation

- Present the general topic
A village in the woods
- Show a *concrete problem*.
(and make it the *audience's problem*.)
Wicked dragon attacks the peasants
- Show that the state of the art is not enough
Peasants' forks can not pierce dragon armor

Solution + Results

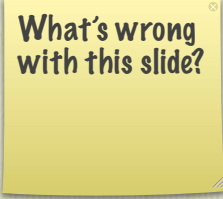
- Show new approach and its advantages
Hero comes with vorpal blade and fights dragon
- Show how approach solves concrete problem
Vorpal blade goes snicker-snack; dragon is slayed
- Does the approach generalize?
Would this work for other dragons, too? Why?

Examples: Your main Weapon

- Motivate work
- Convey basic intuition
- Illustrate idea in action
- Use *examples* first, *generalize* afterwards

Outline

- Tell a story
- Make slides invisible
- Use examples, lots of examples
- Connect to the audience
- Hope for questions and feedback

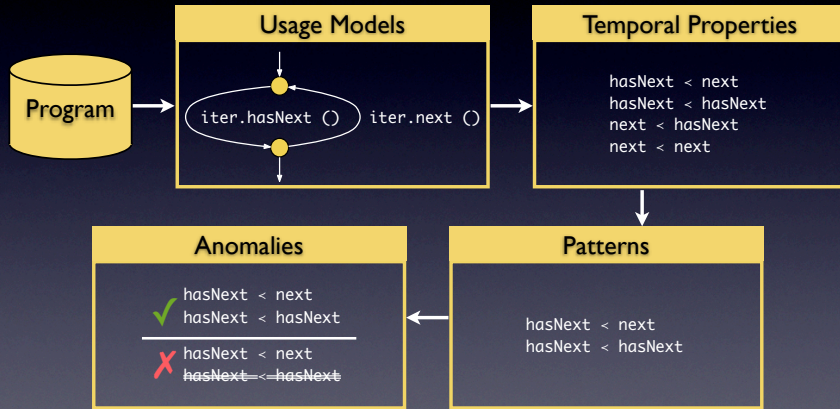


What's wrong
with this slide?

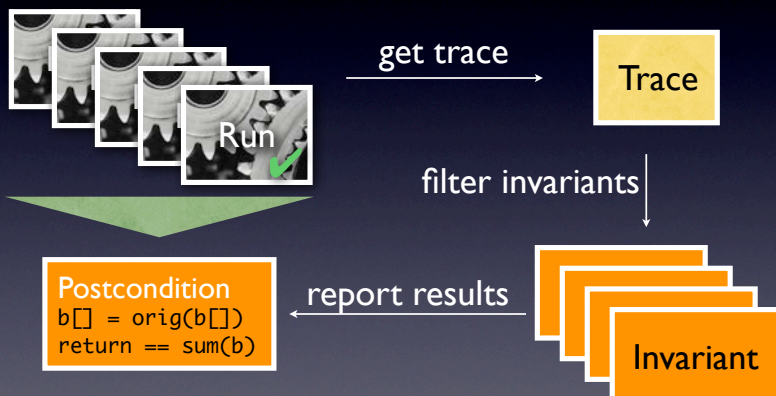
Outlines

- Don't use talk outlines *at the beginning*
- Don't use talk outlines *in between*
- Actually, don't use talk outlines *at all*
- Better: Use a diagram after 5 minutes
- Think of this diagram as a *memorable image*

Detecting Anomalies



Daikon

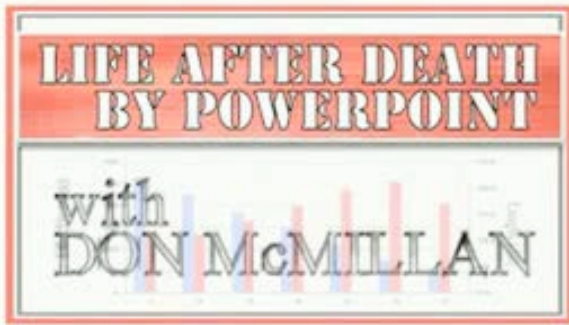


Slide Contents

- Concentrate on the bare necessities (e.g. at most 5 bullets per slide)
- Do not present full sentences on a slide, because these are far too long and hard to read; also, they may tempt you in reading the

Read full sentence aloud

Death by Powerpoint



Source: <http://www.youtube.com/watch?v=cagxPIVqrtM>

Mutation Testing

with Javalanche

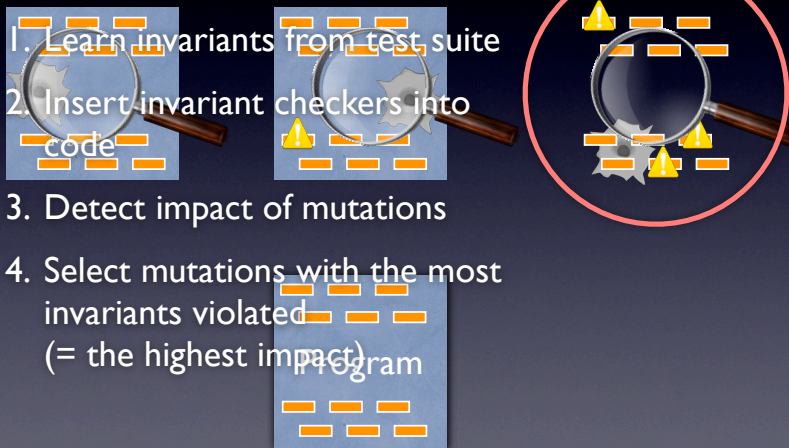
1. Learn invariants from test suite

2. Insert invariant checkers into code

3. Detect impact of mutations

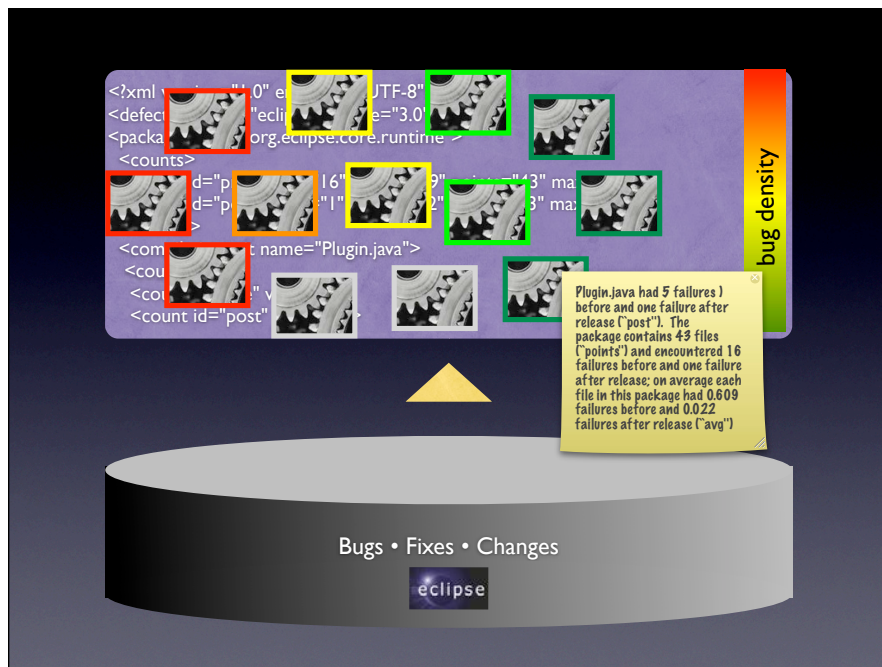
4. Select mutations with the most invariants violated
(= the highest impact)

Program



Make Slides Invisible

- Focus on *clarity*
- Avoid all that distracts from the message
- Slides should *support* your (spoken) word
- Always prefer diagrams over text
- Avoid bullet lists (like this one)



Maths

$$\begin{aligned}
 f_{h,\varepsilon}(x, y) &= \varepsilon \mathbf{E}_{x,y} \int_0^{t_\varepsilon} L_{x,y_\varepsilon(\varepsilon u)} \varphi(x) du \\
 &= h \int L_{x,z} \varphi(x) \rho_x(dz) \\
 &\quad + h \left[\frac{1}{t_\varepsilon} \left(\mathbf{E}_y \int_0^{t_\varepsilon} L_{x,y^x(s)} \varphi(x) ds - t_\varepsilon \int L_{x,z} \varphi(x) \rho_x(dz) \right) \right. \\
 &\quad \left. + \frac{1}{t_\varepsilon} \left(\mathbf{E}_y \int_0^{t_\varepsilon} L_{x,y^x(s)} \varphi(x) ds - \mathbf{E}_{x,y} \int_0^{t_\varepsilon} L_{x,y_\varepsilon(\varepsilon s)} \varphi(x) ds \right) \right] \\
 &= h \hat{L}_x \varphi(x) + h \theta_\varepsilon(x, y)
 \end{aligned}$$

Formal Background

Concrete state $v \in V$ with $v = (x_1, x_2, \dots, x_n)$

x_i – Return value of an inspector

Trace $t = [(v_1, m_1, v'_1), (v_2, m_2, v'_2), \dots]$

with $v_i \in V$ and m_i – name of a mutator

State abstraction $abs: V \rightarrow S$

Model with transitions $s \xrightarrow{m} s'$ and states $s, s' \in S$

Transition condition $s \xrightarrow{m} s'$ with $s, s' \in S$ iff

$\exists (v, m, v') \in t \cdot abs(v) = s \wedge abs(v') = s'$

Maths

- Avoid maths.
 - Formulae are for papers, not slides
 - Few people can read + understand complex formulae in 30 seconds
- Demonstrate that the formal foundation can be presented on demand

Examples

- Examples are more important than maths
- Have one example throughout your talk to illustrate the key idea
- Use additional examples for specifics
- Your audience will get excited by the example – and read your paper for the full foundations

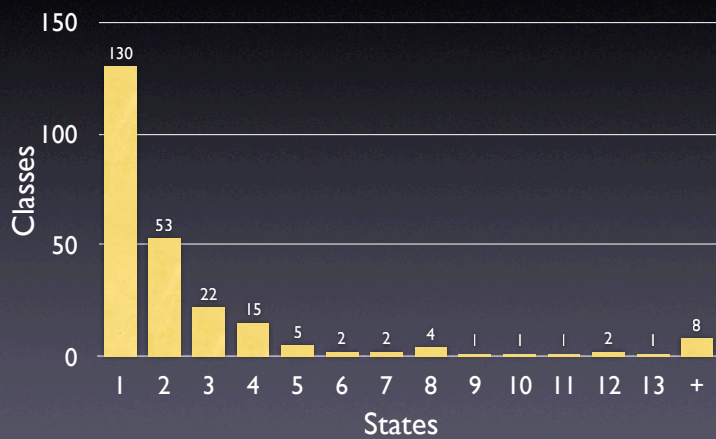
Bug 173602

```
public void resolve(ClassScope upperScope) {  
> // Fix from source repository  
> if (binding == null)  
>     ignoreFurtherInvestigation = true;  
> // Fix generated by PACHIKA  
> if (binding == null)  
>     return;  
    if (munger == null)  
        ignoreFurtherInvestigation = true;  
    if (ignoreFurtherInvestigation) return;  
    ...  
}  
}
```

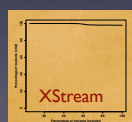
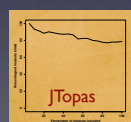
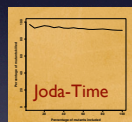
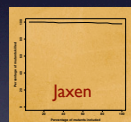
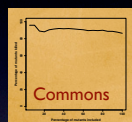
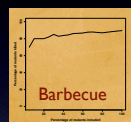
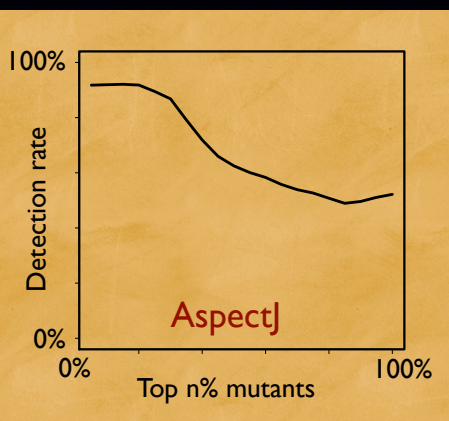
Diagrams

- Use simple, clear diagrams
- Convey exactly *one* message per diagram

Model Sizes



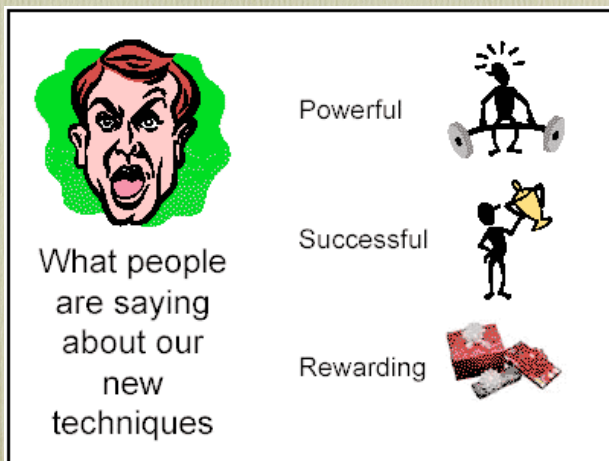
Detection Rates



Visuals and Animation

- Visuals and animations are ok in *diagrams*
- Every other use should be well motivated
- Do not use them as decorations
- Do not use them as distractions
- Avoid overused graphic clichés

What's Wrong?



<http://www.indezine.com/articles/slidesfromhell2.html>

Death by Powerpoint



<http://www.youtube.com/watch?v=Rp8dugDbf4w>

Strive for Simplicity

- Simple *messages* get across easier
- Simple *examples* fit on one slide
- Simple *slides* make the audience listen
- Simple *claims* tend to be general, too
- Simple = Hard!

The Talk

- Do not *read your slides* (from paper or slides)
- Speak slowly, loudly and clearly
- Speak *personally* (Use “I”, not “one”)
- Change your *tone* – and use *pauses*

The Jelly Factor

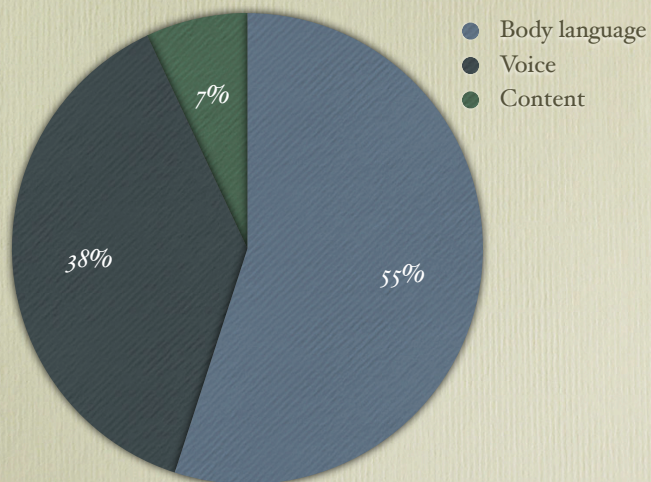
- Every presenter is nervous (and so am I)
 - Legs start shaking
 - Need for air
 - Brain goes into stand-by mode
- ... but nobody will notice, let alone worry

The Jelly Factor

Before the talk:

- Wash your hands
- Sit down
- Go through your slides
- Memorize the first sentences
(no brain required)

Your Impression



Connect to the Audience

- Tell a *story*
- Talk *directly* to the audience
- Ask *rhetorical questions*
(“*What should the poor peasants do?*”)
- Search *eye contact* to audience
(not to slides, not to professor)
- Convey your own *enthusiasm and excitement!*

Some Great Presenters

Steve Jobs



Everything is precisely choreographed in here. Note the slide design, focusing on the very essential.
Source: Apple

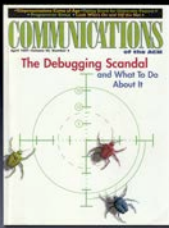
Lawrence Lessig



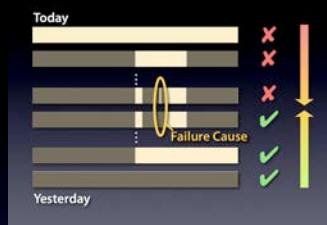
Look how Lessig's words are in sync with his talk.
Source: <http://www.presentationzen.com/presentationzen/2008/03/larry-lessigs-1.html>

Concluding the Talk

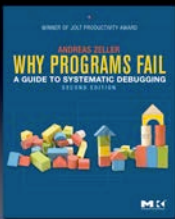
- Refer to the beginning
...and they lived in peace henceforth
- Summarize
...and the key point is:
- Open issues
...but there are more dragons that loom in the dark
- Consequences
If you ever see a dragon, ...



Tracking Debugging



Simplifying Debugging



Automating Debugging

It's the process
that matters.

Fixing Debugging

Any Questions?

- Good research raises lots of questions!
- Questions are great to connect to the audience and to direct and shape own work
- The worst embarrassment is
to have no questions at all

Dealing with Hard Questions

- Repeat question (helpful for audience + gives time for preparing an answer)
- In doubt: “I don’t know, but I’ll look into it”
- Or: “Let’s just take this offline”
- Be respectful to the audience – no punching in the lecture room

The Purpose of your Talk

- Make the audience read your paper (*and talk about it*)
- Give them an *intuitive feel* for your idea
- Engage, excite, provoke them
- Make them glad they came

Make Slides Invisible

- Focus on *clarity*
- Avoid all that distracts from the message
- Slides should *support* your (spoken) word
- Always prefer diagrams over text
- Avoid bullet lists (like this one)

Summary

Examples

- Examples are more important than maths
- Have one example throughout your talk to illustrate the key idea
- Use additional examples for specifics
- Your audience will get excited by the example – and read your paper for the full foundations

Connect to the Audience

- Tell a *story*
- Talk *directly* to the audience
- Ask *rhetorical questions* (“*What should the poor peasants do?*”)
- Search *eye contact* to audience (not to slides, not to professor)
- Convey your own *enthusiasm and excitement!*





The Purpose of your Talk

- Make the audience read your paper
(and talk about it)
- Give them an *intuitive feel for your idea*
- Engage, excite, provoke them
- Make them glad they came

Make Slides Invisible

- Focus on *clarity*
- Avoid all that distracts from the message
- Slides should *support*, your (spoken) word
- Always prefer diagrams over text
- Avoid bullet lists (like this one)

Summary

Examples

- Examples are more important than maths
- Have one example throughout your talk to illustrate the key idea
- Use additional examples for specifics
- Your audience will get excited by the example – and read your paper for the full foundations

Connect to the Audience

- Tell a *story*
- Talk *directly* to the audience
- Ask *rhetorical questions*
(“What should the poor peasants do?”)
- Search *eye contact* to audience
(not to slides, not to professor)
- Convey your own *enthusiasm and excitement!*