

# ICSE 2012

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## 目錄

- June 6
  - Keynote 1
  - Cost Estimation for Distributed Software Project
  - Characterizing Logging Practices in Open-Source Software
  - Combine Functional and Imperative Prgm for Multicore Sw: Scala & Java

- Sound Empirical Evidence in Software Testing
- Identifying Linux Bug Fixing Patch
- Active Refinement of Clone Anomaly Reports
- June7
  - Keynotes 2: Sustainability with Software - An Industrial Perspective
    - Green IT
    - What can we do?
    - Green by IT
  - On How Often code is cloned across repositories
  - Graph-based analysis and prediction for sw evolution
    - graph are everywhere
    - predictors
    - Conclusion
  - What make long term contributors: willingness and opportunity in OSS
    - approach
    - summeray
  - develop of auxiliary functions: should you be agile?
    - experiment
    - research questions
    - result
  - Static Detection of Resource Contention

## Problems in Server-side script

- Amplifying Tests to Validate Exception Handling Code
- A tactic-centric approach automating traceability of quality concerns

# June 6

## Keynote 1

沒怎麼聽懂，只記得講到了finance is not money但是沒聽懂這個和軟件有什麼關係。

## Cost Estimation for Distributed Software Project

講到他們試圖改善現有的模型去更精確地評估軟件開發的開銷。

他們會給PM建議之前的項目的歷史數據，然後對於新項目，他們建議歷史上已有的項目的數據，從而幫助PM得到更精確的評估。他們試圖儘量減少項目評估對PM的經驗的需求，從而幫助即使經驗很少的PM也能準確評估項目的開銷。

他們的觀點：

Context-specific solutions  
needed!

我們需要更上下文相關的解決方案！

Early user participation is key!

早期用戶的參與是關鍵

## Characterizing Logging Practices in Open-Source Software

Common mistakes in logging messages

在日誌記錄中容易犯的錯誤

他們學習了歷史上的log記錄，然後試圖找到重複修改的輸出log的語句，確定log中存在的問題。他們首先確定修改是事後修改。

通常的修改的比例（9027個修改）

45%	靜態文本
27%	打印出的變量
26%	調試等級verbosity
2%	日誌輸出的位置

他們發現有調試等級的變化，是因為安全漏洞之類的原因，或者在開銷和數據之間的權衡。

大多數對log的變量的修改都是為了增加一個參數。他們之前的LogEnhancer是為了解決這個問題而提出的，通過靜態檢查，提醒程序員是否忘記了某個參數

對text的修改是因為要改掉過時的代碼信息，避免誤導用戶。

他們的實驗是採用了基於code clone的技術，找到所有log語句，然後找不一致的clone，然後自動提出建議。

# Combine Functional and Imperative Pgrm for Multicore Sw: Scala & Java

趨勢：到處都是多核，但是併發程序呢？

他們研究的對象是Scala和Java，因為可以編譯後確認JVM字節碼的語義。

- **Java:**

- 共享內存
- 顯示創建的線程
- 手動同步
- Wait/Notify機制

- **Scala:**

- 高階函數
- Actors, 消息傳遞
- lists, filters, iterators
- while
- 共享狀態, OO
- import java.\* 能從java導入任何庫
- auto type inference 自動類型推導

實驗的參與者都經過4周的訓練，實驗項目是工業等級的開發項目

結果：

scala 的項目平均比java多花38%的時間，主要都是花在Test和debug上的時間。

程序員的經驗和總體時間相關，但是對test和debug沒有顯著影響。

scala的爲了讓編程更有效率的設計，導致debug更困難。比如類型推導，debug 的時候需要手動推導，來理解正在發生什麼。

scala的程序比java小，中位數2.6%，平均15.2%

- **性能比較：**

- 單核： scala的線性程序的性能比java好

- **4核：**

- scala 7s @ 4 threads

- java 4s @ 8 threads

- **median**

- 83s scala

- 98s java

- 32core: best scala 34s @ 64 threads

- **結論**

- java有更好的scalability

- **scala類型推導**

- 45%說對攜帶碼有幫助

- 85%說導致程序錯誤

- **調試**

- 23%認為scala簡單
- 77%認為java簡單

multi-paradigam are better

## Sound Empirical Evidence in Software Testing

Test data generation 測試數據自動生成

Large Empirical Studies - not always possible

For open source software - big enough

## Identifing Linux Bug Fixing Patch

- **current practice:**

- manual

- **Current research:**

- keywords in commits
- link bug reports in bugzilla



Try to solve classification problem

- **issue**

- pre-identified
- post-identified

- **data**

- from commit log

- **feature extraction**

- text pre-process stemmed non-stop words

- model learning

research questions

## Active Refinement of Clone Anomaly Reports

motivating

- code clones, clone groups
- clone used to detect bugs
- anomaly : inconsistent clone group many anomaly clone are not bug, high false positive

### **approach**

- reorder by sorted bug reports

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# June7

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## Keynotes 2: Sustainability with Software - An Industrial Perspective

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Sustainability

- **Classic View: Independent view with overlap**
  - Social
  - Environment
  - Economic
- **Nested view**
  - **Environment**
    - **Social**
      - Economic

**Triple bottom line**

- **economic**
  - global business, networks , global econ

- **env**

- natural res, climate change, population grow

- **social**

- awareness, connectivity, accountability

## Green IT

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- **reduce IT energy**

- more than 50% cooling - doing nothing

- **mini e-waste: not properly recycled**

- 80% in EU
- 75% in US

- foster dematerialization

In-Memory Technology: Expected Sustainable Benefits

## What can we do?

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- consider all software lifecycle phases in your design
- avoid energy expensive behavior in your codes
- design lean architectures

## Green by IT

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- 2% green IT
- 98% green IT

## On How Often code is cloned across repositories

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Line based hashing code clone detection

never do anything harder than sorting

hashing a window of 5 lines of normalized (tokenized) code, dropping 3/4 of the hashing

把ccfinder一個月的工作縮短到了3, 4天。沒有比較presion和recall。

14%	type1
16%	type2
17%	type3 (not really type2)

# Graph-based analysis and prediction for sw evolution

graph are everywhere

- internet topology
- social net
- chemistry
- biology

in sw - func call graph - module dependency graph

developer interaction graph - commit logs - bug reports

experiment 11 oss, 27~171 release, > 9 years

predictors

- **NodeRank**

- similar to pagerank of google
- measure relative importance of each node
- **func call graph with noderank**
  - compare rank with severity scale on bugzilla
- **correlation between noderank and BugSeverity**
  - func level 0.48 ~ 0.86 varies among projects.
  - model level > func level
- **ModularityRatio**
  - cohesion/coupling ratio:  
IntraDep(M)/InterDep(M)
  - forecast mantenance effort
  - **use for**
    - identify modules that need redesign or refactoring
- **EditDistance**
  - bug-based developer collaboration graphs
  - $ED(G1, G2) = |V1| + |V2| - 2|V1 \cap V2| + |E1| + |E2| - 2|E1 \cap E2|$
  - **use for**

- release planning
- resource allocation

graph metrics

- **graph diameter**
  - average node degree indicates reuse
- clustering coefficient
- assortativity
- num of cycles

## Conclusion

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"Actionable intelligence" from graph evolution

- studie 11 large long-live projs
- predictors
- identify pivotal moments in evolution

What make long term  
contributors: willingness and  
opportunity in OSS

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OSS don't work without contributors form community

mozilla (2000-2008)

$10^{2.2}$  LTC  $\leftarrow$  2 order  $\rightarrow$   $10^{4.2}$  new contributors  $\leftarrow$  3.5 order  $\rightarrow$   $10^{7.7}$  users

gnome (1999-2007)

$10^{2.5}$  LTC  $\leftarrow$  1.5 order  $\rightarrow$   $10^{4.0}$  new contributors  $\leftarrow$  3.5 order  $\rightarrow$   $10^{6.5}$  users

## approach

- read issues of 20 LTC and 20 non-LTC
- suvery 56 (36 non-LTC and 20 LTC)
- extract practices published on project web sites

## summeray

- Ability/Willingness distinguishes LTCs
- **Environment**
  - **macro-climate**
    - popularity
  - **micro-climate**
    - attention
    - bumber of peers



- performance of peers

regression model

newcomers to LTC conversion drops

## **actions in first month predicts LTCs**

- 24% recall
- 37% precision

## develop of auxiliary functions: should you be agile?

a empirical assessment of pair programming and  
test-first programming

can agile help auxiliary functions?

## experiment

- pair vs solo
- test-first vs test-last
- students vs professors

## research questions

- r1: can pair help obtain more correct impl
- r2: can test-first
- r3: dst test1 encourage the impl or more test cases?
- r4: does test1 course more coverage

## result

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- **test-first**
  - higher coverage
  - non change with correctness
- **pair**
  - improve on correctness
  - longer total programming time

# Static Detection of Resource Contention Problems in Server- side script

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Addressed the race condition of accessing  
database or filesystem of PHP

# Amplifying Tests to Validate Exception Handling Code

異常處理的代碼不但難寫，而且難以驗證。各種組合情況難以估計，尤其是手機系統上。

## A tactic-centric approach automating traceability of quality concerns

tactic traceability information models