Proposal:
A CoLogNET/FME Symposium:
On Teaching Formal Methods
2004

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Abstract

It is suggested that CoLogNET, FME, ACM and IEEE CS[1] jointly sponsor a three day working symposium On Teaching Formal Methods sometime in 2004. The present document sketches some very initial thoughts. The document will be distributed via an E–Mail list in the period bwteen mid march and mid May 2003 — in preparation for an FME meeting on the FME Course Page and related matters at Univ. of Minho, Braga, Portugal, Thursday–Friday, May 22–23, 2003.

Contents

[1]ACM and IEEE CS have yet to be contacted. The proposer is a more than fourty year member of both these professional societies.

1 Introduction

Some basics:

- I am aiming at a symposium that will draw some 350 people world–wide.
- I am aiming at a symposium that will set a standard: After the symposium, all participants will "go home", able to convince their colleagues, that it won't work with serious academic education in Software Engineering without proper uses of formal techniques — throughout !
- I am aiming at a symposium that will lead to other, undoubtedly smaller symposia, but these will lead to increased pressures on university departments to adopt a 'formal techniques' agenda that will permeate all serious courses.
- I am aiming at a symposium that will also open the eyes of publishers as well as of industry managers: Namely that formal techniques are here to stay and that
  - university curricula and supporting text books better be aligned,
  - and industry better be prepared for a different breed of future software engineers cum programmers.

2 Background

2.1 On Methods and Formal Methods

By a formal method we shall here understand a set of principles for analysing problems and synthesising (hardware and/or software) solutions using a number of techniques and tools — where a significant set of these techniques and tools are based on mathematics, in particular mathematical logic. Among tools we typically list formal specification languages, and theorem provers, model checkers and other software packages for the support of the use of these specification languages.

We use the term 'formal method' because it has become established.

We probably should instead have propagated the term 'formal techniques' as these techniques can indeed be said to be formal — whereas the principles (of a method) cannot possible all be formalised as they are very much principles that need be adopted and selected by humans.

2.2 A "Trichotomy"

It seems there can be said to be the following "tri"lemma:

- On one hand there is a growing number of university staff interested in researching formal techniques and in teaching these.
- On the other hand an increasing number of students de–select formal techniques courses — claiming that the big IT industry does not use formal techniques.
- And, on the "third hand" an increasing number of small to medium–sized IT companies are emerging which provide design and consultancy services to oftentimes large scale IT consumers or IT producers where these designs and services are primarily based on the use of formal techniques !

We need resolve this seeming trichotomy.

2.3 Informatics

But the formal techniques that are and were "discovered & invented" in the context and (hardware &) software development go beyond computing.

Analysis of application domains, in the form of even large scale bith informal and formal descriptions of such infrastructure components as transportation, financial services, health–care, logistics, "the market", etc., have shown usefulness in business process engineering and re–engineering without necessarily implying computing.

And recent, exciting work by ClearSy, has shown the immense uesfullness of (in this case B) specifications of "What is a Peugot Automobile" for the purposes of structuring and giving unambiguous contents to service & repair manuals for automobiles.

2.4 "Formal Methods": Courses & Chapters

Many lecturers — amonst them great scientists — often approach me to ask the question: What kind of course should they give on 'Formal Methods' ? When I then answer them: "None", they are miffed. Then I tell them, that in my mind 'formal techniques' are part and parcel of every under– and graduate course at any respectable university, they, of course, otherwise they wouldn't be thosee 'great scientists' would they ?

Many text books in so–called Software Engineering contain a chapter, "tucked away" in some hap–hazard place, on 'Formal Methods'.

In my mind, as in all other engineering courses, the use of mathematics cum formal techniques, is indispensable in any academic course.

3 Aims & Objectives

3.1 Aims

- The proposed symposium aims at bringing a large spectrum of university lecturers together: Both those active in using one or more formal techniques as a basis for their lectures, and those, currently passive, but curious about doing, or planning to do so.

- The proposed symposium also aims at bringing, hopefully, some leading chairmen of software engineering cum computer science departments to witness a trend, and/or to comment on problems, such as they may see them.
- The proposed symposium finally aims at presenting as wide a variety of material on actual course curricula and lectures: experience, novel ways of "putting things together", etc., all around the Formal Methods horizon.

3.2 Objectives

- The proposed symposium objectives are to help ensure a worldwide focus on teaching formal techniques.
- The proposed symposium objectives are also to clarify means and ways in which formal techniques can be taught and trained.
- The proposed symposium objectives are finally to possibly create a tighter community of lecturers of formal techniques: Of propagating successful lecture material, etc.

4 Proposed Call for Papers, etc., and Participation

We both need to ensure a widest possible Call for Papers as well as, from the very beginning, ie., now, a widest possible Call for Participation.

4.1 Call for [Solicitation of] Papers

It is strongly suggested that we do a rather focused, specific person–identified, solicitation of papers and presentatiosn by lecturers cum text book authors. And it is suggested that we try avoid presentations that hail one particular, named method over another: No religiousnees, but, of course, we are interested also in lectures centered on specific methods (P, Q, or R). However: It is suggested that we should aim at large and successfull educational projects, less method–driven, more experience and project course–driven.

- Prerequisites:
  - Discrete "Math" — a Myth ?
  - Mathematical Logic — How Much, How Little ?
  - Algebra — Do we really need to go all the way to Category Theory ?
- The Real Issues:
  - Mathematical Maturity — How Much, How Little ?
  - Abstraction — and how difficcult is it after C, C++, Java and C# ?
  - Modelling
- Whither Courses in 'Formal Methods' or the Full Integration ?

  - Singular Courses in 'Formal Methods'
    vs.
  - Use of 'Formal Methods' in $\forall$ Courses

- The Didactics of 'Formal Methods':
  - 'Formal Methods' in Programming: Algorithms & Data Structures
  - 'Formal Methods' in Database Courses
  - 'Formal Methods' in Operating System Courses
  - 'Formal Methods' in Business Processing
  - 'Formal Methods' in Embedded, Real–time Systems
  - 'Formal Methods' in Distributed Systems
  - 'Formal Methods' and "UML"
  - *&c.*

- Course Plans and Teaching Experience for Lectures:
  - Action Systems
  - ASM
  - B
  - CSP
  - Petri Nets
  - Pi–Calculus
  - Refinement Calculus
  - RAISE
  - VDM
  - Z

- Course Projects — Balance between:
  - Lectures,
  - Tool Sessions,
  - Project ("Hands–on") Work, and
  - Reporting (ie., proper documentation).

- The Use of Tools in Teaching and Course Projects:
  - Coq
  - DisCo
  - Esterel
  - EVES
  - HOL
  - Isabelle

  - Nqthm
  - PVS
  - Statemate
  - SPIN
  - STeP
  - UppAAl
- *&c.*

4.2 Call for Panels

I believe we should leave it up to potential, active participants to suggest a maximum of, say six accepted panels.

4.3 Call for Workshops

And I believe we should leave it up to potential, active participants to suggest pre/post symposium workshops — possibly "touting" their favourite method !

4.4 Call for Participation

The following "Formal Methods" Communities must be engaged:

1. **Action Semantics:** http://www.brics.dk/Projects/AS/
2. **Action Systems:** http://www.abo.fi/˜Kaisa.Sere/distributed.html
3. **ASM:** http://www.eecs.umich.edu/gasm/
4. **B:** http://www.afm.sbu.ac.uk/b/
5. **CafeOBJ:** http://www.ldl.jaist.ac.jp/cafeobj/
6. **CASL/CoFI:** http://www.brics.dk/Projects/CoFI/
7. **CommUnity:** http://www.fiadeiro.org/jose/CommUnity/
8. **Coq:** http://coq.inria.fr/
9. **CSP:** http://www.afm.sbu.ac.uk/csp/
10. **DC: Duration Calculi:** http://www.iist.unu.edu/dc/
11. **DisCo:** http://disco.cs.tut.fi/
12. **Estelle:** http://www.estelle.org/
13. **Esterel:** http://www.esterel.org/
14. **EVES:** http://www.ora.on.ca/eves.html
15. **HOL:** http://www.afm.sbu.ac.uk/hol/

16. **HyTech:** http://www-cad.eecs.berkeley.edu/~tah/HyTech/
17. **Isabelle:** http://www.cl.cam.ac.uk/Research/HVG/Isabelle/
18. **LOTOS:** http://www.cs.stir.ac.uk/~kjt/research/well/
19. **Maude:** http://maude.cs.uiuc.edu/
20. **Nqthm:** http://www.cs.utexas.edu/users/boyer/ftp/nqthm/
21. **Petri Nets:** http://www.daimi.au.dk/PetriNets/
22. **Pi–Calculus:** Calculi for Mobile Processes http://lampwww.epfl.ch/mobility/
23. **PVS:** http://pvs.csl.sri.com/
24. **Refinement Calculus:** http://www.ecs.soton.ac.uk/~mjb/refcalc-tut/home.html
25. **RAISE:** http://www.iist.unu.edu/raise/
26. **SDL:** http://www.sdl-forum.org/
27. **SPIN:** http://spinroot.com/spin/
28. **Statechart:** (Statemate) http://www.ilogix.com/
29. **STeP:** http://www-step.stanford.edu/
30. **TLA+:** http://research.microsoft.com/users/lamport/tla/tla.html
31. **TRIO:** http://www.elet.polimi.it/res/TRIO/
32. **"UML":**
33. **UppAAl:** http://www.docs.uu.se/docs/rtmv/uppaal/
34. **VDM:** http://www.csr.ncl.ac.uk/vdm/
35. **Z:** http://www.zuser.org/z/

5 Publications

5.1 Proceedings

There shall, obviously, be a proceedings. As usual, I suggest Springer–Verlag ?

5.2 Journal: Special Issue

But I also suggest that we single out 6–8 papers, "the best" in whatever sense, and have them re–edited and further referred published in a special issue of some respectable journal of which one or more of us is an editor — or to which we have "easy" access. Which journal:

1. Some ACM journal ?
2. CAI: Computer and Informatics, Slovak Academy

3. Some IEEE CS journal ?
4. Software and Systems, Springer–Verlag
5. *&c.*

Any suggestions !

5.3 Publisher Exhibitions

At a symposium like this, the active, physical presence of many and relevant text books and monographs from as wide a variety of publishers is “a must”. I suggest that at least the following publishers be contacted from a very early beginning, ie., as soon as we have agreed on there actually being such a symposium:

1. Academic Press: See Elsevier Science Ltd. item 5
2. Addison Wesley Longman: See also Pearson Education item 11 on page 10 `www.awl.com`
3. CUP: Cambridge University Press:

```
Maxine Gross
Exhibitions Controller
UK Sales
Cambridge University Press
The Edinburgh Building
Shaftesbury Road
Cambridge CB2 2RU
Tel: 00 44 (0) 1223 325056
Fax: 00 44 (0) 1223 325891
http://www.cambridge.org
mgross@cambridge.org
amarsh@sun1.cup.cam.ac.uk
dtranah@cambridge.org
```

4. CRC Press:

```
Bridget Fahey / Elizabeth Katz
Vice President Proceedings Division
CRC Press Proceedings
345 Park Avenue South, 10th Floor
New York, NY 1001
P: 212-845-4025
F: 212-845-4011
bfahey@informationholdings.com
```

5. Elsevier Science Ltd.:

```
j.rijk@elsevier.nl
http://www.elsevier.com/
```

6. Kluwer Academic Press:


```
Yolanda Riet
Van Godewijckstraat 30
P.O. Box 989
3311 GZ Dordrecht
3300 AZ Dordrecht
The Netherlands
tel: +31 (0)78 657 6000
+31 (0)78 657 61 21
+31 (0)78 657 6323 direct
http://www.wkap.nl
Yolanda.Riet@wkap.nl
```


7. McGraw–Hill:


```
jackie_harbor@mcgraw-hill.com
```


8. The MIT Press:


```
Judith Bullent
Promotion Manager
The MIT Press
Fitzroy House
11 Chenies Street
London WC1E 7EY
UK
Phone: +44 (020) 7306 0603
Fax: +44 (020) 7306 0604
http://mitpress.mit.edu
jbullent@hup-mitpress.co.uk
```


9. Morgan Kaufmann Press:

10. OUP: Oxford University Press:


```
Jane Kirby
Press and Promotions Manager
Popular Science Trade Books
Kirbyj@oup.co.uk
Chris Hall
Exhibitions Co-ordinator
Academic Division
Oxford University Press
Great Clarendon Street
Oxford
OX2 6DP
```

England
tel: +44 01865 267 769
fax: +44 01865 267 568
e-mail: hallc@oup.co.uk

11. Pearson Education:

    http://www.pearsoneduc.com
    Abigail.Woodman@pearsoned-ema.com
    Sami.Taalas@pearsoned-ema.com
    Fiona.Sharples@pearsoned-ema.com
    bookenquiries@palgrave.com

12. A.K.Peters:

    rebecca@akpeters.com

13. Prentice Hall: Also see Pearson Education item 11

    Upper Saddle River
    New Jersey 07458
    USA
    www.prenhall.com
    http://vig.prenhall.com/

14. Springer–Verlag:

    Ingeborg Mayer
    Associate Editor
    Computer Science Editorial
    Springer-Verlag
    Tiergartenstr. 17
    69121 Heidelberg
    Germany
    Tel./Fax +49 6221 487-8404/-8588
    i.mayer@springer.de
    http://www.springer.de/comp/contact/mayer.html

15. Wiley:

    Graham Woodward
    Marketing Executive
    John Wiley & Sons Ltd
    Baffins Lane
    CHICHESTER
    West Sussex
    PO19 1UD
    UK
    Tel :+44 (0) 1243 770583
    Fax: +44 (0) 1243 770154
    GWoodwar@wiley.co.uk

6 Next Actions: March–May 2003

1. Circulation of this document: March 16 onwards.
2. Feedback of comments: March 16 onwards.
3. Editing of this document based on comments: March–April.
4. Meeting of the FME Course Group, Braga, Portugal, 22–23 May

I do not at present believe we can sort all these things out before Braga. But we need have a flying start at Braga.

At Braga I can foresee the following ADDITIONAL discussion points, IF IT IS DECIDED TO GO AHEAD:

- Fixing an approximate Date for Symposium
- Fixing a Venue for Symposium
- Discussing possible OC and PC Hairs
- Discussing posible PC Committee Members
- That is: Fixing, appraximately, a next sequence of actions