PROCEEDINGS of
The 15th International Conference of
International Academy Physical Sciences

CONIAPS XV
December 9-13, 2012
Rajamangala University of Technology Thanyaburi, THAILAND

An International Conference on Recent Advances in Physical Sciences and Technology
The 15th International Conference of International Academy Physical Sciences (CONIAPS XV)
Dec 9 - 13, 2012, Rajamangala University of Technology Thanyaburi, Thailand

Organized by
Rajamangala University of Technology Thanyaburi, Pathumthani, Thailand
Asian Institute of Technology, Pathumthani, Thailand
Inverts University, Bareilly, India
International Academy of Physical Sciences, Allahabad, India

List of Reviewers

1. Prof. P. N. Pandey, Allahabad, India
2. Prof. D. K. Bhattacharya, Kolkata, India
3. Prof. D. Pandey, Meerut, India
4. Prof. D. K. Gupta, Allahabad, India
5. Prof. Anoop Chaturvedi, Allahabad, India
6. Prof. P. R. Sharma, Jaipur, India
7. Dr. Ravindra Dhar, Allahabad, India
8. Prof. Lalben Mishra, Varanasi, India
9. Prof. P. K. Bajpai, Bilaspur, India
10. Prof. H. S. Dhami, Almora, India
11. Prof. C. S. Bagewadi, Kuempu, India
12. Prof. R. P. Pant, Nainital, India
13. Prof. Dr. Kate Grudpan
14. Prof. Dr. Sompong Dhompongsa
15. Prof. Dr. Somyot Plubtieng
16. Prof. Dr. Suthep Suantai
17. Assoc. Prof. Dr. Suwarin Pattamavorakun
18. Assoc. Prof. Wachara Rodsumrid
19. Asst. Prof. Dr. Burasakorn Yoosooka
20. Asst. Prof. Dr. Chaturat Saridara
21. Asst. Prof. Dr. Lertnarong Sripanom
22. Asst. Prof. Dr. Nattawan Kuppithaynant
23. Asst. Prof. Dr. Nittaya Ngowattana
24. Asst. Prof. Dr. Sarun Wongwai
25. Asst. Prof. Dr. Sirinun Aemprapa
26. Asst. Prof. Dr. Somporn Pleanjai
27. Asst. Prof. Dr. Sukhan Rattanaloednusorn
28. Asst. Prof. Dr. Uraiwan Inyaem
29. Asst. Prof. Supat Phaopongthai
30. Asst. Prof. Thitaya Sornkwan
31. Asst. Prof. Yuree Worawichaiyan
32. Dr. Akapon Phunpueok
33. Dr. Dolnpa Kaewpa
34. Dr. Moragote Buddhakala
35. Dr. Naris Barnthip
36. Dr. Nithiwat Choosakul
37. Dr. Saovapak Suktrakoolvait
38. Dr. Sarawut Jaiyen
39. Dr. Singto Sakulkhaemruethai
40. Dr. Surarit Pepore
41. Dr. Unchalee Tonggumnrad
42. Dr. Voranuch Thongpool
43. Dr. Wanipa Kaklada
44. Dr. Wasu Pathom-aree
The 15th International Conference of International Academy Physical Sciences (CONIAPS XV)
Dec 9 - 13, 2012, Rajamangala University of Technology Thanyaburi, Thailand

Organized by
Rajamangala University of Technology Thanyaburi, Pathumthani, Thailand
Asian Institute of Technology, Pathumthani, Thailand
Invertis University, Bareilly, India
International Academy of Physical Sciences, Allahabad, India

List of Reviewers

1. Prof. P. N. Pandey, Allahabad, India
2. Prof. D. K. Bhattacharya, Kolkata, India
3. Prof. D. Pandey, Meerut, India
4. Prof. D. K. Gupta, Allahabad, India
5. Prof. Anoop Chaturvedi, Allahabad, India
6. Prof. P. R. Sharma, Jaipur, India
7. Dr. Ravindra Dhar, Allahabad, India
8. Prof. Lallen Mishra, Varanasi, India
9. Prof. P. K. Bajpai, Bilaspur, India
10. Prof. H. S. Dhami, Almora, India
11. Prof. C. S. Bagewadi, Kuempu, India
12. Prof. R. P. Pant, Nainital, India
13. Prof. Dr. Kate Grudpan
14. Prof. Dr. Sompong Dhompongsag
15. Prof. Dr. Somyot Plubtieng
16. Prof. Dr. Suthep Suantai
17. Assoc. Prof. Dr. Suwarin Pattamavorakun
18. Assoc. Prof. Wachara Rodsumrid
19. Asst. Prof. Dr. Burasakorn Yoosooka
20. Asst. Prof. Dr. Chutarat Saridara
21. Asst. Prof. Dr. Lertnarong Sripinom
22. Asst. Prof. Dr. Nattawan Kuppithaynant
23. Asst. Prof. Dr. Nittaya Ngowattanna
24. Asst. Prof. Dr. Sarun Wongwai
25. Asst. Prof. Dr. Sirinun Aemprapa
26. Asst. Prof. Dr. Somporn Pleanjai
27. Asst. Prof. Dr. Sukhan Rattanaloednusorn
28. Asst. Prof. Dr. Uraiwan Inyaem
29. Asst. Prof. Dr. Supat Phaopongthai
30. Asst. Prof. Thitaya Sornkwan
31. Asst. Prof. Yuree Worwichaiyan
32. Dr. Akapong Phunpueok
33. Dr. Dolnapa Kaewpa
34. Dr. Moragote Buddhakala
35. Dr. Naris Barnthip
36. Dr. Nithiwat Choosakul
37. Dr. Saovapak Suktrakoolvait
38. Dr. Sarawut Jaiyen
39. Dr. Singto Sakulkhaemruethai
40. Dr. Surarit Pepore
41. Dr. Unchalee Tonggumnrad
42. Dr. Voranuch Thongpool
43. Dr. Wanipa Kaklada
44. Dr. Wasu Pathom-aree
# Contents

Comparison of Photofraction for LuYAP:Ce, LYSO:Ce and BGO Crystals in Gamma Ray Detecation  
*Akapan Phumpeok, Weerapong Cheawpraditkul, Voranuch Thongpool*  
1

Similarity Solution for MHD Plane Free Jet as Boundary Layer Flow Induced by Impermeable Stretching Plane  
*Anuj Kumar Jhankal and Manoj Kumar*  
7

Automatic Adaptive Retrieval of Learning Objects Based on Learner Characteristics  
*Burasakorn Yoosooka*  
11

On the Diophantine Equation \( p^x + p^y = z^2 \)  
*Mongkol Tatong and Alongkot Suvannamani*  
17

Hybrid Dhage’s Fixed Point Theorem for Abstract Measure Integro-Differential Equations  
*Sidheshwar S. Bellale*  
21

Information System of Personalization Thai Health Food Menu for Elderly Persons  
*Sawarin Pattamavorakun, Jaturapith Krohkaew*  
27

Experimental Set for Measuring the Planck’s Constant using LED  
*Jitlada Sunu, Siriya Satsanapitak, Khamrutai Thamaphat, Chutima Oopathump, Piyarat Bharmanee and Pichet Limsumwan*  
33

Tasks Management Algorithm for Distributed System  
*Avanish Kumar*  
37

Effects of Variable Viscosity and Thermal Conductivity of Unsteady Mixed Convection Flow at the Stagnation Point and an Applied Magnetic Field  
*Jattindra Lahkar*  
45

Differential Inequalities for a Finite System of Hybrid Fractional Differential Equations  
*Bapurao C. Dhage and Pradeep V. Mugale*  
55

Jump-Diffusion with Stochastic Volatility and Intensity  
*Montakan Thongpan, Sarun Wongwai and Nonthiya Makate*  
61

Growth of Hydroxyapatite on Sericin Coated Silk Fibers Using Simulated Body Fluid at Various Time  
*Onanong Sukjai, Piyapong Asanithi, Pichet Limsumwan and Supanee Limsumwan*  
69

A Novel Method for Measurement of Equivalent Circuit Component of Piezoelectric Material by using Impedance Spectroscopy  
*Pramod Chaitanya and Lakshman Pandey*  
73

Quantum Mechanical Study of Some Atomic Properties  
*Prabhat Ranjan and Tanmoy Chakraborty*  
81
<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preparation of Mesa Structural Near-Infrared $n$-Type Nanocrystalline-FeSi/p-Type Si Heterojunction Photodiodes Nathaporn Promros, Ryūhei Iwasaki, Suguru Funasaki, Kyohei Yamashita, and Tsuyoshi Yoshitake</td>
<td>95</td>
</tr>
<tr>
<td>A Job Recruitment System using Semantic Web Technology Pongpon Nilaphruek</td>
<td>101</td>
</tr>
<tr>
<td>A Novel Method for Measurement of Equivalent Circuit Component of Piezoelectric Material by using Impedance Spectroscopy Pramod Chaitanya and Lakshman Pandey</td>
<td>107</td>
</tr>
<tr>
<td>On Generalised B-Manifolds S.K. Srivastava, Virendra Nath Pathak</td>
<td>115</td>
</tr>
<tr>
<td>The Propagation of Flare Generated Shockwaves in Self-Gravitating Solar Atmosphere S. N. Ojha</td>
<td>119</td>
</tr>
<tr>
<td>New Circuit Model of Small-Signal Amplifier Developed by Using MOSFETs in Triple Darlington Configuration Sachchida Nand Shukla, Susmita Srivastava and Beena Pandey</td>
<td>125</td>
</tr>
<tr>
<td>Effect of Ca$^{2+}$ ions on Swelling Behavior of Silk Fibroin Hydrogel T. Leeteera, P. Asanithi, P. Limsuwan, S. Limsuwan</td>
<td>133</td>
</tr>
<tr>
<td>Preparation of Alumina – Graphene Composites by Long Pulsed Laser Ablation Voramich Thongpool, Akapong Phunpueok, Veeradate Piriyawong, Supanee Limsuwan, Veeradate Piriyawong and Pichet Limsuwan</td>
<td>139</td>
</tr>
<tr>
<td>Y-Combinator based Continuation-Passing Style Technique in Python Programming Songphon Klabwong</td>
<td>145</td>
</tr>
</tbody>
</table>
Y-Combinator based Continuation-Passing Style Technique in Python Programming

Songphon Klabwong
songphon@rmuth.ac.th
Faculty of Science and Technology
Rajamangala University of Technology Thanyaburi
Thailand

ABSTRACT

Lambda calculus has the equivalent expressive power compared to the Turing model. It is the origin of the functional programming approach. One of the most important concepts is Y-Combinator. It enables the way to perform recursion by anonymous function. In this study, we proposed the study on Y-Combinator of typed-lambda calculus based on python language. The study shows the way implementing tail-call recursion. It employs the Continuation-Passing Style (CPS) technique to send the context of execution along with the call. As a result, the code written using CPS is guaranteed to be side-effect free. Consequently, it is efficient to be executed on concurrency environment.

Keywords: Y-Combinator, Continuation, Python, Lambda Calculus, Anonymous Recursion

INTRODUCTION

In recent years, concurrent processing environments dominate computing world by two main factors: the proliferation of multicore CPUs and asynchronous environment of internet. As a result, the programming environments of traditional approaches are no longer suitable for many applications especially on the concurrent execution environment where several processes perform their tasks separately but need of synchronization among them. Concurrent programming is one of approaches to deal with the need of concurrent environment. It comprises several programming technique. Functional programming is one of the programming techniques which employ the notion of mathematical function. One important concept of the mathematical function is that it has no side-effect on the computation i.e. whenever the input of an individual function is the same; the result is always the same.

In this study, we employ and combine two programming techniques: Y-Combinator and Continuation Passing Technique to create a general form function in Python programming language.

METHOD

Continuation-Passing Style (CPS) is the way to control the program flow via a function context. The flow of program is passed through function parameter. However, CPS needs the predefined function to work with. This imposes the limitation of usage since we could not perform the
anonymous recursion. The anonymous function definition and invocation are pervasive concept in functional programming. At this point, Y-Combinator is introduced to our study. Y-Combinator is one of the technique is functional programming that enables anonymous recursion.

We start with the Y-combinator definition. Because python programming language is call-by-

\[
\lambda f.(\lambda x.x(x))(\lambda y.f(\lambda a.y(y)(a)))
\]

In the Python form we can write down as:

```python
(lambda f: lambda x(x))(lambda y:f(lambda *a: y(y)(*a))))
```

Note that the star symbol is to indicate the list parameter in python since we might need multiple parameters function. At this point we introduce the continuation by defining the closure function to capture an execution context. The result is:

```python
(lambda f: lambda x(x))(lambda y:f(lambda *a: y(y)(*a))))(lambda f: lambda n,c:f(n,c))
```

Finally we need the seed value to start the execution of function. It can be defined as a zero-parameter function and can be written down in Python form as:

```python
(lambda f: lambda x(x))(lambda y:f(lambda *a: y(y)(*a))))
    (lambda f: lambda n,c:f(n,c))(k,lambda i:i)
```

where k is zero-parameter function and lambda i:i represent the identify function.

RESULT

The function of Y-Combinator based CPS is guaranteed to be side-effect free, hence, can be separated to multiple small pieces of task and concurrently process over the computing network or cluster. It also enables the anonymous way to perform task which gain more flexibility of CPS.

DISCUSSION

Even though, the study shows the flexibility of using CPS over Y-Combinator. One might concerns about its performance. We believe that the real question is that: can the multiple-concurrent processing yields the better performance compares to the overhead of task separation.

REFERENCES

