



**MESA (Mechatronics, Embedded Systems and Automation) Lab**  
**Presents**  
**A Research Seminar at The**  
**Applied Fractional Calculus (AFC) Workshop Series**

**Date/Time/Place:** 05/19/2014, 4-6PM, MESA Lab (Room 820), 4225 N. Hospital Rd., Atwater, CA 95301. T: 209-2598023

**Title:** Target Search

**Abstract:** Malaysia airlines MH370 had been missing for nearly two months and haven't found. This prompted us to study the new search methods and search techniques. Preliminary experiments show that the efficiency of traditional/enumeration search is bad, and rand search and Cuckoo search are roughly the same. The times of our search method process/Judge pictures is few. The results can be applied in the military.

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**Speaker's short biography:**



Zhigang Ph.D:2004~2007,School of Information Science and Engineering, East China University of Science and Technology; Post one-Ph.D:2007~2008;Post-doctorate position: Huazhong University of Science and Technology;Postdoctor workstation:KEDA INDUSTRIAL CO.,LTD; Post two-Ph.D:2010~2012;Post-doctorate position: Shanghai Jiao Tong University; Postdoctor workstation: Jiangnan Shipyard(Group),Co.,Ltd. He now is an Advance scholar in MESA Lab, UC Merced. His current study and research focuses on the intelligent algorithm, target search etc.

**Key references:**

[1] X.-S. Yang; S. Deb (December 2009). Cuckoo search via Lévy flights. World Congress on Nature & Biologically Inspired Computing (NaBIC 2009). IEEE Publications. pp. 210–214. arXiv:1003.1594v1.



Integer-Order Calculus



Fractional-Order Calculus

**Fractional Order Mechanics!**

Hooke's law:  $F = kx$   
Newton's fluid:  $F = kx'$   
Newton's 2<sup>nd</sup> law:  $F = kx''$   
 $\rightarrow F(t) = kx^{(\alpha)}(t)$

Going in-between: interpolation of operators:

$$\dots, \frac{d^{-2}f}{dt^{-2}}, \frac{d^{-1}f}{dt^{-1}}, f, \frac{df}{dt}, \frac{d^2f}{dt^2}, \dots$$