

KAEDAH HIBRID ARAH CARIAN BAGI MASALAH  
PENGOPTIMUMAN TAK BERKEKANGAN

MUSTAFA BIN MAMAT

DOKTOR FALSAFAH  
UNIVERSITI MALAYSIA TERENGGANU

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Kaedah hibrid arah carian bagi masalah pengoptimuman tak  
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**HAK MILIK**  
PERPUSTAKAAN SULTANAH NUR ZAHIRAH UMT

KAEDAH HIBRID ARAH CARIAN BAGI MASALAH PENGOPTIMUMAN  
TAK BERKEKANGAN

MUSTAFA BIN MAMAT

JULAI 2007

Pengerusi: Profesor Ismail bin Mohd, F.A.S.

Pakar: Sarjana Teknologi

Oleh

**MUSTAFA BIN MAMAT**

Teis dikemukakan kepada Sekolah Siswazah, Universiti Malaysia Terengganu  
sebagai Memenuhi Sebahagian Keperluan untuk Ijazah Doktor Falsafah

Julai 2007

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Abstrak Tesis yang dikemukakan kepada Senat Universiti Malaysia Terengganu bagi memenuhi keperluan untuk Ijazah Doktor Falsafah.

**KAEDAH HIBRID ARAH CARIAN BAGI PENGOPTIMUMAN TAK  
BERKEKANGAN**

Oleh

**MUSTAFA BIN MAMAT**

**JULAI 2007**

**Pengerusi: Profesor Ismail bin Mohd, Ph.D.**

**Fakulti: Sains dan Teknologi**

Tumpuan utama kajian ini adalah untuk menentukan nilai minimum sesuatu fungsi bagi masalah pengoptimuman tak berkekangan. Terdapat banyak kaedah untuk menyelesaikan masalah seperti ini sehingga kini dan sebahagiannya ada dibincangkan. Dalam kajian ini kami bina suatu algoritma yang cukup efisien dengan menggunakan hibrid arah carian quasi-Newton dan penurunan tercuram. Dengan menggunakan hibrid arah carian ini, kami cuba mencari parameter yang sesuai dan seterusnya menguji ke atas beberapa masalah piawai menggunakan kaedah BFGS, kaedah Broyden, kaedah PSB dan kaedah SR1. Kami namakan kaedah baru yang menggunakan hibrid arah carian tersebut sebagai kaedah hibrid BFGS, kaedah hibrid Broyden, kaedah hibrid PSB dan kaedah hibrid SR1. Bagi menentukan efisiensi algoritma ini, kami cuba bandingkan keputusan berangka yang diperolehi bagi semua kaedah yang dinyatakan tadi.

Dalam kajian ini juga kami telah membuat modifikasi ke atas algoritma panjang langkah kaedah penurunan tercuram baru yang telah dicadangkan oleh Yuan (2006). Kami namakan algoritma baru Yuan ini sebagai ANSD<sup>r</sup>. Kemudian dibandingkan kecekapan algoritma ini dengan algoritma penurunan tercuram baru kami yang ditandakan sebagai ANSD<sup>m,r</sup> dan keputusan berangka kedua-dua kaedah ini bagi masalah tak linear banyak pembolehubah dipaparkan.

#### ABSTRAK

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The aim of this research is to study the performance of gradient descent method for unconstrained optimization. One aim, decrease the number of iterations to solve the class of problems but just more of them will be discussed. In literature we have used as well as hybrid algorithms which is hybrid method consists of gradient descent and step-size descent. Following this hybrid method, we are trying to find an efficient method problem by using FFS, FSD and FS methods. We compare the new method which used hybrid search direction as hybrid FFS, hybrid FSD, hybrid FSD and hybrid FS methods. In determination of the efficiency of the algorithm, we discuss the numerical results for all these methods.

In this research we compare the performance of new step-size algorithm of gradient descent which is proposed by Yuan (2006). We compare the Yuan's new method as ANSD<sup>r</sup>. Then we compare the efficiency algorithm which is proposed by Yuan (2006) which we denote as ANSD<sup>m,r</sup> and compare the numerical results of the unconstrained problems for both methods.

Abstract of thesis presented to the Senat Universiti Malaysia Terengganu in fulfilment of the requirement for the degree of Doctor Philosophy.

**HYBRID SEARCH DIRECTION METHODS FOR UNCONSTRAINED  
OPTIMIZATION**

By

**MUSTAFA BIN MAMAT**

**JULAI 2007**

**Chairman: Professor Ismail bin Mohd, Ph.D.**

**Faculty: Science and Technology**

The aim of this research is to focus on determining the minimum values of function for unconstrained optimization. Until now, there are various of methods to solve that kinds of problems but just some of them will be discussed. In this study we have tried to built an algorithm which is using hybrid search direction of quasi-Newton and steepest descent. By using this hybrid search direction, we are trying to test on several standard problems by using BFGS, Broyden, PSB and SR1 methods. We called that new method which used hybrid search direction as hybrid BFGS, hybrid Broyden, hybrid PSB and hybrid SR1 methods. In determination of the efficiency of this algorithm, we compared numerical results for all those methods.

In this research we also made some modification on new stepsize algorithm of steepest descent which is proposed by Yuan (2006). We denoted this Yuan's new method as  $ANSD^y$ . Then we compared the efficiency algorithm with new steepest descent which we denoted as  $ANSD^m$  and presented the numerical results of nonlinear problems for both methods.