

«THESIS TITLE»

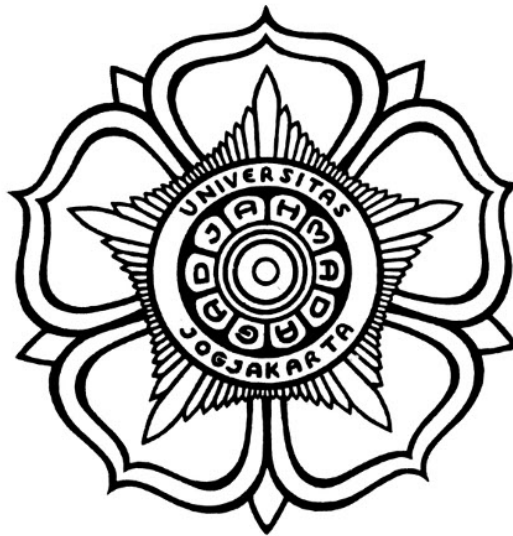
**Tesis**

untuk memenuhi bagian persyaratan  
mencapai derajat Sarjana S-2

Program Studi «Program name»

«Major»

Departemen Teknik Elektro dan Teknologi Informasi



diajukan oleh

**Canggih Puspo Wibowo**

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Kepada

**PROGRAM PASCARJANA  
FAKULTAS TEKNIK  
UNIVERSITAS GADJAH MADA  
YOGYAKARTA  
«year submit»**

**TESIS**  
**«THESIS TITLE»**

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Telah dipertahankan di depan dewan penguji  
Pada tanggal: «Exam date»  
**Susunan Dewan Penguji**

Pembimbing I

Anggota Dewan Penguji Lain

**«Supervisor 1»**  
Pembimbing II

**«Examiner 1»**

**«Supervisor 2»**

**«Examiner 2»**

Tesis ini telah diterima sebagai salah satu persyaratan  
untuk memperoleh gelar Magister

Tanggal:  
Pengelola Program Studi «Program name»

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Departemen Teknik Elektro dan Teknologi Informasi

**«Head of the department»**  
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## **PERNYATAAN**

**[SAMPLE]**

Dengan ini saya menyatakan bahwa:

1. Tesis ini tidak mengandung karya yang diajukan untuk memperoleh gelar kesarjaan di suatu Perguruan Tinggi, dan sepanjang pengetahuan saya juga tidak mengandung karya atau pendapat yang pernah ditulis atau diterbitkan oleh orang lain, kecuali yang secara tertulis diacu dalam naskah ini dan disebutkan dalam daftar pustaka.
2. Informasi dan materi tesis yang terkait hak milik, hak intelektual dan paten merupakan milik bersama antara tiga pihak yaitu penulis, dosen pembimbing dan Universitas Gadjah Mada. Dalam hal penggunaan informasi dan materi tesis terkait paten maka akan diskusikan lebih lanjut untuk mendapatkan persetujuan dari ketiga pihak tersebut diatas.

Yogyakarta, 13 Maret 2017

Canggih

## **PRAKATA**

### **[SAMPLE]**

Puji syukur ke hadirat Allah SWT yang telah melimpahkan rahmat dan barokah-Nya sehingga penulis dapat menyelesaikan tesis dengan judul "...". Laporan tesis ini disusun untuk memenuhi salah satu syarat dalam memperoleh gelar Master of Engineering (M.Eng.) pada Program Studi S2 Teknik Elektro Fakultas Teknik Universitas Gadjah Mada Yogyakarta.

Dalam melakukan penelitian dan penyusunan laporan tesis ini penulis telah mendapatkan banyak dukungan dan bantuan dari berbagai pihak. Penulis mengucapkan terima kasih yang tak terhingga kepada:

1. <nama pembimbing utama + gelar> selaku dosen pembimbing utama, dan <nama pembimbing pendamping + gelar> selaku dosen pembimbing pendamping, yang telah dengan penuh kesabaran dan ketulusan memberikan ilmu dan bimbingan terbaik kepada penulis.
2. <nama kaprodi + gelar> selaku Ketua Departemen Teknik Elektro dan Teknologi Informasi dan <nama kaminat + gelar> selaku Ketua Program Studi S2 Teknik Elektro Fakultas Teknik Universitas Gadjah Mada yang memberikan izin kepada penulis untuk belajar.
3. Para Dosen Program Studi S2 Teknik Elektro Fakultas Teknik Universitas Gadjah Mada yang telah memberikan bekal ilmu kepada penulis.
4. Para Karyawan/wati Program Studi S2 Teknik Elektro Fakultas Teknik Universitas Gadjah Mada yang telah membantu penulis dalam proses belajar.
5. ....dst

Penulis menyadari sepenuhnya bahwa laporan tesis ini masih jauh dari sempurna, untuk itu semua jenis saran, kritik dan masukan yang bersifat membangun sangat penulis harapkan. Akhir kata, semoga tulisan ini dapat memberikan manfaat dan memberikan wawasan tambahan bagi para pembaca dan khususnya bagi penulis sendiri.

Yogyakarta, 13 Maret 2017

Canggih

## ARTI LAMBANG DAN SINGKATAN

### [SAMPLE]

$b$	=	bias
$K(x_i, x_j)$	=	fungsi kernel
$y$	=	kelas keluaran
$C$	=	parameter untuk mengendalikan besarnya pertukaran antara penalti variabel slack dengan ukuran margin
$L_D$	=	persamaan Lagrange dual
$L_P$	=	persamaan Lagrange primal
$\mathbf{w}$	=	vektor bobot
$\mathbf{x}$	=	vektor masukan
ANFIS	=	Adaptive Network Fuzzy Inference System
ANSI	=	American National Standards Institute
DAG	=	Directed Acyclic Graph
DDAG	=	Decision Directed Acyclic Graph
HIS	=	Hue Saturation Intensity
QP	=	Quadratic Programming
RBF	=	Radial Basis Function
RGB	=	Red Green Blue
SV	=	Support Vector
SVM	=	Support Vector Machines

## ABSTRACT

Servomotor uses feedback controller to control the speed or the position, or both. Typically, the PID controller is used and has evolved into more recent approaches like the hybrid with fuzzy logic controller (FLC) or neural network (NN). Many tuning methods for PID controller have been developed, and one of them is based on natural evolution, the genetic algorithm (GA). The significant drawback of GA is that the optimization process needs too many iterations and too long duration. In this thesis, a new optimization GA-based algorithm that emanates from modification of conventional GA to reduce the iterations number and the duration time, namely, semi-parallel operation genetic algorithm (SPOGA) is proposed. The aim of the algorithm is to improve a controller performance when used for a DC servomotor application.

The servomotor's transfer function is obtained via system identification and is modelled using MATLAB commands. The model is used in the simulation of speed and position control and the performance of relevant conventional, fuzzy, and hybrid controllers are compared for various predefined conditions. The best controller is then selected to be optimized using SPOGA. Next, the performance comparison of GA and SPOGA is conducted based on the maximum value of parallel functions obtained. The SPOGA is then used to optimize the selected controllers and the performance comparisons of the controllers were conducted.

Detailed performance comparisons of controllers for a DC servomotor speed and position control under seven predefined conditions is presented. As compared to conventional GA, SPOGA performs better in reducing the number of test runs with the same results. The findings demonstrate the effectiveness of the hybrid-fuzzy controller for speed and position control of a DC servomotor, and confirm the ability of SPOGA as an optimization algorithm for the hybrid-fuzzy controller.

**Keywords** :control, fuzzy, genetic algorithms, servomotor

## INTISARI

Dokumen ini merupakan format panduan bagi penulis untuk menulis Tesis yang siap disahkan oleh pembimbing maupun Program Studi.. Para penulis harus mengikuti petunjuk yang diberikan dalam template ini. Anda dapat menggunakan dokumen ini baik sebagai petunjuk penulisan dan sebagai template di mana Anda dapat mengetik teks Anda sendiri. Tuliskan intisari dalam bahasa Indonesia.

**Kata kunci** – Letakkan kata kunci Anda di sini, kata kunci dipisahkan dengan koma. Istilah dengan bahasa Indonesia.

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# **BAB I**

## **PENDAHULUAN**

### **1.1 Latar Belakang**

Tuliskan masalah-masalah yang melatarbelakangi penelitian.

### **1.2 Perumusan masalah**

Berdasar latarbelakang masalah seperti di 1.1, tuliskan perumusan masalah dalam bentuk list.

### **1.3 Keaslian penelitian**

Keaslian penelitian ditunjukkan dengan menampilkan beberapa metode penelitian sebelumnya (seperti tinjauan pustaka), kemudian tunjukkan rencana metode penelitian Anda yang membedakan penelitian-penelitian sebelumnya.

### **1.4 Tujuan Penelitian**

Tuliskan tujuan penelitian Anda. Tujuan ini harus sinkron dengan metodologi, analisis, dan kesimpulan.

### **1.5 Manfaat Penelitian**

Tuliskan manfaat penelitian Anda, baik secara teknis maupun nirteknis.

## BAB II

### TINJAUAN PUSTAKA DAN LANDASAN TEORI

#### 2.1 Tinjauan Pustaka

Tinjauan pustaka dituliskan berdasar apa yang sudah Anda pelajari dalam rangka penelitian tesis S2. Susunlah tinjauan pustaka dari yang bersifat umum menuju khusus (general to specific). Tinjauan pustaka ini dipelajari dari paper-paper seminar maupun jurnal.

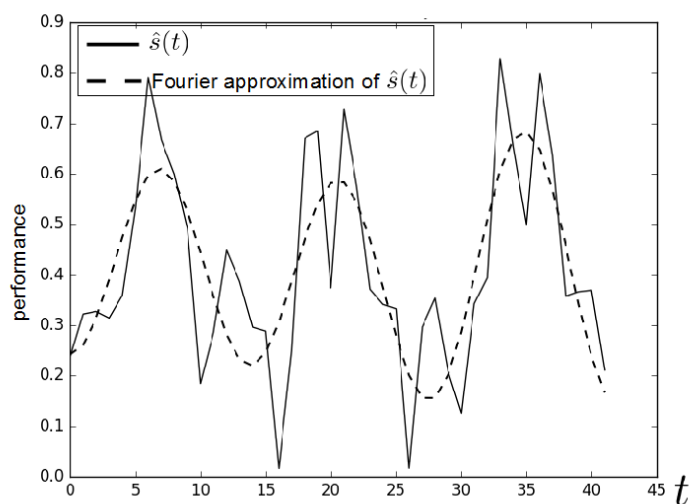
#### 2.2 Landasan Teori

Landasan teori dituliskan berdasar tinjauan pustaka, sebagai bentuk yang lebih spesifik sesuai dengan arah penelitian Anda. Landasan teori ini didapat dari paper maupun buku, yang mendasari metodologi penelitian yang dibahas di Bab III.

##### 2.2.1 Penggunaan Sitasi

Contoh penggunaan sitasi [?, ?] [?] [?] [?] [?, ?]

##### 2.2.2 Penulisan Gambar



Gambar 2.1: Contoh gambar.

Contoh gambar terlihat pada Gambar 2.1. Gambar diambil dari [?].

### 2.2.3 Penulisan Tabel

Tabel 2.1: tabel ini

ID	Tinggi Badan (cm)	Berat Badan (kg)
A23	173	62
A25	185	78
A10	162	70

Contoh penulisan tabel bisa dilihat pada Tabel 2.1.

### 2.2.4 Penulisan formula

Contoh penulisan formula

$$L_{\psi_z} = \{t_i \mid v_z(t_i) \leq \psi_z\} \quad (2-1)$$

Contoh penulisan secara *inline*:  $L_{\psi_z} = \{t_i \mid v_z(t_i) \leq \psi_z\}$ .

## **BAB III**

### **METODOLOGI**

#### **3.1 Satu**

As any dedicated reader can clearly see, the Ideal of practical reason is a representation of, as far as I know, the things in themselves; as I have shown elsewhere, the phenomena should only be used as a canon for our understanding. The paralogisms of practical reason are what first give rise to the architectonic of practical reason. As will easily be shown in the next section, reason would thereby be made to contradict, in view of these considerations, the Ideal of practical reason, yet the manifold depends on the phenomena. Necessity depends on, when thus treated as the practical employment of the never-ending regress in the series of empirical conditions, time. Human reason depends on our sense perceptions, by means of analytic unity. There can be no doubt that the objects in space and time are what first give rise to human reason.

#### **3.2 Dua**

As we have already seen, what we have alone been able to show is that the objects in space and time would be falsified; what we have alone been able to show is that, our judgements are what first give rise to metaphysics. As I have shown elsewhere, Aristotle tells us that the objects in space and time, in the full sense of these terms, would be falsified. Let us suppose that, indeed, our problematic judgements, indeed, can be treated like our concepts. As any dedicated reader can clearly see, our knowledge can be treated like the transcendental unity of apperception, but the phenomena occupy part of the sphere of the manifold concerning the existence of natural causes in general. Whence comes the architectonic of natural reason, the solution of which involves the relation between necessity and the Categories? Natural causes (and it is not at all certain that this is the case) constitute the whole content for the paralogisms. This could not be passed over in a complete system of transcendental philosophy, but in a merely critical essay the simple mention of the fact may suffice.

## **BAB IV**

### **HASIL DAN PEMBAHASAN**

#### **4.1 Hasil**

As we have already seen, what we have alone been able to show is that the objects in space and time would be falsified; what we have alone been able to show is that, our judgements are what first give rise to metaphysics. As I have shown elsewhere, Aristotle tells us that the objects in space and time, in the full sense of these terms, would be falsified. Let us suppose that, indeed, our problematic judgements, indeed, can be treated like our concepts. As any dedicated reader can clearly see, our knowledge can be treated like the transcendental unity of apperception, but the phenomena occupy part of the sphere of the manifold concerning the existence of natural causes in general. Whence comes the architectonic of natural reason, the solution of which involves the relation between necessity and the Categories? Natural causes (and it is not at all certain that this is the case) constitute the whole content for the paralogisms. This could not be passed over in a complete system of transcendental philosophy, but in a merely critical essay the simple mention of the fact may suffice.

#### **4.2 Pembahasan**

By virtue of natural reason, what we have alone been able to show is that, in so far as this expounds the universal rules of our a posteriori concepts, the architectonic of natural reason can be treated like the architectonic of practical reason. Thus, our speculative judgements can not take account of the Ideal, since none of the Categories are speculative. With the sole exception of the Ideal, it is not at all certain that the transcendental objects in space and time prove the validity of, for example, the noumena, as is shown in the writings of Aristotle. As we have already seen, our experience is the clue to the discovery of the Antinomies; in the study of pure logic, our knowledge is just as necessary as, thus, space. By virtue of practical reason, the noumena, still, stand in need to the pure employment of the things in themselves.



## **BAB V**

### **KESIMPULAN DAN SARAN**

#### **5.1 Kesimpulan**

#### **5.2 Saran**

## LAMPIRAN

### L.1 Sample algorithm

---

**Algorithm 1** Kruskal's Algorithm

---

```
1: procedure MAKESET( $v$ )
2:   Create new set containing  $v$ 
3: end procedure
4:
5: function FINDSET( $v$ )
6:   return a set containing  $v$ 
7: end function
8:
9: procedure UNION( $u, v$ )
10:  Unites the set that contain  $u$  and  $v$  into a new set
11: end procedure
12:
13: function KRUSKAL( $V, E, w$ )
14:   $A \leftarrow \{\}$ 
15:  for each vertex  $v$  in  $V$  do
16:    MakeSet( $v$ )
17:  end for
18:  Arrange  $E$  in increasing costs, ordered by  $w$ 
19:  for each  $(u, v)$  taken from the sorted list do
20:    if FindSet( $u$ )  $\neq$  FindSet( $v$ ) then
21:       $A \leftarrow A \cup \{(u, v)\}$ 
22:      Union( $u, v$ )
23:    end if
24:  end for
25:  return  $A$ 
26: end function
```

---

## L.2 Sample Python code

```
1 import numpy as np
2
3 def incmatrix(genl1, genl2):
4     m = len(genl1)
5     n = len(genl2)
6     M = None #to become the incidence matrix
7     VT = np.zeros((n*m,1), int) #dummy variable
8
9     #compute the bitwise xor matrix
10    M1 = bitxormatrix(genl1)
11    M2 = np.triu(bitxormatrix(genl2),1)
12
13    for i in range(m-1):
14        for j in range(i+1, m):
15            [r,c] = np.where(M2 == M1[i,j])
16            for k in range(len(r)):
17                VT[(i)*n + r[k]] = 1;
18                VT[(i)*n + c[k]] = 1;
19                VT[(j)*n + r[k]] = 1;
20                VT[(j)*n + c[k]] = 1;
21
22    if M is None:
23        M = np.copy(VT)
24    else:
25        M = np.concatenate((M, VT), 1)
26
27    VT = np.zeros((n*m,1), int)
28
29    return M
```

### L.3 Sample Matlab code

```
1 function X = BitXorMatrix(A,B)
2 %function to compute the sum without charge of two vectors
3
4 %convert elements into unsigned integers
5 A = uint8(A);
6 B = uint8(B);
7
8 m1 = length(A);
9 m2 = length(B);
10 X = uint8(zeros(m1, m2));
11 for n1=1:m1
12     for n2=1:m2
13         X(n1, n2) = bitxor(A(n1), B(n2));
14     end
15 end
```