

DAFTAR PUSTAKA

1. Chapter II (<http://repository.usu.ac.id/bitstream/123456789/26544/4/Chapter%20II.pdf>, diakses 14 Mei 2012).
2. Rahmat Purbaningrat. *Perancangan dan Pembuatan Perangkat Keras Steel Ball Magnetic Levitation*, Institut Teknologi Bandung, 2008.
3. Raymond A. Serway and John W. Jewett, Jr. *Physics for Scientists and Engineers with Modern Physics*, seventh edition, United States Of America, 2000.
4. Sintanyehu Challa. *Magnetic Levitation on A Steel Ball*, Addis Ababa University, 2007.
5. Lance Williams. *Electromagnetic Levitation Thesis*, 2005.
6. Khaled A. M. Ali. *Modeling and Parameters Identification of A Magnetic Levitation Model*, The Islamic University of Gaza, 2009.
7. Eng. Khalid Abdelhafiz Ali. *Modelling, Identification of Amagnetic Levitation CE152*, Al-Aqsa University, 2010.
8. Shafayet Hossain. *Design of a Robust Controller for a Magnetic Levitation System*, Wichita State University.
9. Stephen C. Paschall II. *Design, Fabrication, and Control of A Single Actuator Magnetic Levitation System*, Texas A&M University, 2002.
10. Katsuhiko Ogata. *Teknik Kontrol Automatik*, jilid I, Edisi kedua, Erlangga.
11. Muhamad Ali. *Pembelajaran Perancangan Sistem Kontrol Pid Dengan Software Matlab*, Universitas Negeri Yogyakarta, Jurnal Edukasi@Elektro Vol. 1, No. 1, Oktober 2004, hlm. 1–8.
12. Mohd Hafiz Bin Shamshuddin. *Development of Simple Magnetic Levitation System*, Universiti Teknologi Malaysia, 2008.
13. Earns Haw, S., “On the Nature of the Molecular Forces which Regulate the Constitution of The Luminiferous Ether”, *Trans. Camb., Phil. Spc.*, 7, pp. 97-112, 1842

14. Naumovic, Milica B., "*Magnetic Levitation System in Control Engineering Education*", Department of Automatic Control, University of Nis, Faculty of Electronic Engineering, Serbia, 2008
15. Yuniyanto, Bambang, "*Kajian Permasalahan Lingkungan dan Sosial Ekonomi Rencana Penambangan dan Pengolahan Pasir Besi di Pantai Selatan Kulon Progo – Yogyakarta*", Puslitbang Teknologi Mineral dan Batubara, Bandung, Januari 2009
16. Digital To Analog Converter (DAC) (<http://rizqidiaz.blogspot.com/2012/05/digital-to-analog-converter-dac.html> diakses 01 Agustus 2012).
17. ADC/DAC (Analog to Digital Converter) (<http://belajar-elektronika.com/digital/adc-dac/dasar-teori-dac-digital-analog-converter/> diakses 14 Mei 2012).
18. Mengenal Jenis Bearing (http://nha_fadillah.mywapblog.com/mengenal-jenis-bearing.xhtml diakses 14 Mei 2012).
19. Levitasi Superkonduktor untuk Kendaraan Masa Depan (<http://www.all-indonesia.com/levitasi-superkonduktor-untuk-kendaraan-masa-depan> diakses 14 Mei 2012).
20. Diamagnetic, Paramagnetik, dan ferromagnetic material (<http://penjagahati-zone.blogspot.com/2011/01/diamagnetic-paramagnetik-dan.html>, diakses 14 Mei 2012).

LAMPIRAN

```

% SCRIPT PEMODELAN DAN SISTEM CONTROL MAGNETIC %
% LEVITATION BALL %

```

```

clear all
kam= 100;
Rc=3.5;
Rs=0.25;
Ks=13.33;
Lc=0.03;
m=18.4e-3;
x0=0.0083;
x00=0.0032;
i=0.7;
g=9.81;
uMU= 1;
u0=0;
Ai=0.0022;
u0=1.2560e-006;

```

```

%konstanta gaya magnet
Fm1= m*g;
k=Fm1*(x0-x00)^2/i^2;
%lilitn
N=sqrt(k*4/(u0*Ai));

```

```

%rumus power amplifire
ki=kam/((Rc+Rs)+kam*Ks*Rs);
Ta=Lc/((Rc+Rs)+kam*Ks*Rs);

```

```

%%Rumus state equations yang sudah linear
kFV=0.02;
kDA=5;
kAD=0.2;
kx=612.3;
Fg=(-2*i^2*k)/m*(x00-x0)^3;
Fd=-kFV/m;
Fm=2*i*k/m*(x00-x0)^2;
h=-1/Ta;
j=ki*kDA/Ta;
l=kx*kAD;

```

```

% MATRIX STATE SPACE
A=[0 1 0;Fg Fd Fm;0 0 h];
B=[0;0;j];
C=[1 0 0];
D=[0];
Ts=0.001;
[num,den]=ss2tf(A,B,C,D);
Hs=tf(num,den);
Hz=c2d(Hs,Ts,'zoh');

```

```

s = tf('s');
zero1=-166.6667;
zero2=-3.3e-8;

```

```

Hc=(s-zero1)*(s-zero2);
[num,den] = tfdata(Hc,'v');
num_Hc_baru=num/num(2);
Hc_baru=tf(num_Hc_baru,[1 0]);
HcH=Hc_baru*Hs;

% [num_HcH,den_HcH]=tfdata(HcH,'v');
% HcH_b=tf([num_HcH(3) num_HcH(4) num_HcH(5)], [den_HcH]);
HcH_z=c2d(HcH,Ts,'zoh');

rlocus(HcH_z);

K=input('nilai K = ');

Kp=K;
Kd=num_Hc_baru(1)*Kp;
Ki=num_Hc_baru(3)*Kp;

```