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Grha ITS, December 21-22, 2010

2nd APTECS 2010

International Seminar on Applied Technology, Science, and Arts

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PROCEEDING

2nd INTERNATIONAL SEMINAR ON APPLIED TECHNOLOGY, SCIENCE AND ARTS - APTECS 2010

THEME

EMPOWERING CREATIVITY THROUGH SCIENCE AND TECHNOLOGY TO ENHANCE NATIONS COMPETITIVENESS

GRAHA SEPULUH NOPEMBER, 21-22 December 2010

Organized by :
Institute of Research and Public Services (LPPM)
INSTITUT TEKNOLOGI SEPULUH NOPEMBER
2010

2nd INTERNATIONAL SEMINAR ON APPLIED TECHNOLOGY, SCIENCE, AND ARTS (APTECS 2010)

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OPENING SPEECH OF THE RECTOR OF ITS

Assalamu'alaikum Wr.Wb. Good Morning Ladies and Gentlemen, Let me, first, praise the Almighty God for the blessings and mercies that have made all we have today possible.

Distinguished guests, esteemed presenters and participants, I would like to extend the warmest welcome to all of you attending the 2nd ***Internasional Seminar on Applied Technology, Science and Arts*** **(APTECS)**. I would like to express my profound gratitude to Prof. KISHIDA Satoru for his willingness to join this seminar and to deliver his outstanding lecture on the Prospect of High-Tech Superconducting Oxides and their Surface Analysis Superconductivity, Surface Analysis, and Oxide as the Creative Industry for the Future. This speech would be very contributing to all attending this seminar.

Acknowledgement must also be given to all the attending plenary sessions, the Ministry of Marine Affairs and Fisheries Republic of Indonesia, Dr. Ir. H Fadel Muhammad Al-Haddar; the Chief Executive Officer, Mr. Dahlan Iskan; and Prof. Wayan Dibya who are willing to spend some of their time that I know they are quite compact in schedule**.** Thank you for featuring very inspiring experience and insightful notions that would be very contributing to all attending this seminar to build high comprehensive and up to date prior knowledge. Allow me to express my heartfelt gratitude to many sponsors for their generous financial support.

APTECS is an annual seminar hosted by the Institut Teknologi Sepuluh Nopember (ITS) as the forum of academic sharing focusing on various issues in science, technology and arts. As one of the reputable institutions in Indonesia, it is undeniable that active contributions of ITS would be one of the important considerations to deal with the Asean China Free Trade Agreement (ACFTA) that has been launched since the 1st January 2010. At the same time ceasing International competitions would become one of the agenda that must be done by enhancing as well as empowering the national competitiveness in all aspects including engineering, economy, social, and many others. In fact, regarless of the subsequently and surely diminished natural resources, people today need to be able to find brilliant ways to determine success in economy for the future of this beloved country, Indonesia. Dear Audience, the main point of my speech is that this country would take the global challenge only if we are able to develop dynamic cultures and traditions as a nation. And, ITS, in the Golden year anniversary, would become the leading institution to enliven the competition through the development of science, technology, and not to mention cultures and arts.

Now, dear audience, the seminar is all yours. I hope everyone will find the seminar inspiring and enriching, through presentations and discussions on empowering creativity through science and technology to enhance nation competitiveness. Finally, I wish to see you again in the coming 3rd APTECS seminar, December 2011. I wish great happiness, good health, and much success to each of you. Thank you.

Surabaya, 21 Desember 2010

Rector of ITS

Prof. Priyo Suprobo

OPENING SPEECH OF THE CHIEF OF INSTITUTE OF RESEARCH AND PUBLIC SERVICES

First of all, let us praise God whose blessings have enabled us to band together here in the 2nd International APTECS seminar that, this year, is hosted particularly to commemorate the golden year anniversary of the Institut Teknologi Sepuluh Nopember. It is a pleasure for LPPM to welcome you all the professional researchers either from abroad or all over Indonesia. This is the forum where we can meet colleagues from various specialty areas to develop knowledge, technology, and arts that would, of course, contribute to the lives of the mankind

In the attempt to foster the development of science and technology, basic and applied researches, and industrial researches as well are all the major activities need to be conducted to enhance industrial productivity and competitiveness and to advance our nations unchallenged supremacy; therefore, unless there were any publications and disseminations of research findings and discoveries, researches with high sophisticated findings and contributions would have completely no meaning.

In this global era, without ability to cope with advanced technology and to develop the creativity and innovation, industries would not be able to take part into rigorous competitions. For this reason, then APTECS raises the topic of *"**Empowering Creativity through Science and Technology to Enhance Nations Competitiveness".***

APTECS is forwarded to be one of the forums for researchers to disseminate and further discuss the results of researches; furthermore, this forum is promoted to enrich creative and innovative ideas that would be worth considering for further researches. Intensive communication as well as discussions in APTECS would continue the process of advancing science, technology, and arts as well. Moreover, further attempt of this form is to promote the implementation of the research finding to give positive contributions for our beloved country.

All researches and their findings are aimed to keep up and further develop our noble cultural values, arts, and human civilization so that, as a member of world societies, our nation would be much dignified among other nations on earth. By hosting this seminar LPPM-ITS is not only to gain the advancement of the science and technology throughout all the findings offered in this forum but at the same time, to encourage and to enhance the arts and cultural values of this country that would fruitfully signify our existence as a nation.

This academic forum meets annually at the end of the year, and next year we would welcome you to see us again in the 3rd APTECS International Seminar that would offer more laborious topics.

On behalf of LPPM-ITSI would like to express my deepest gratitude to all presenters and participants, and I wish a productive and inspiring seminar.

Surabaya, 21 Desember 2010

Prof. Ir. I Nyoman Sutantra MSc.PhD
The Chief of LPPM-ITS

OPENING SPEECH OF THE COMMITTEE CHAIRMAN

Rector of ITS,
Dr. Ir. H. Fadel Muhammad, Minister of the Ministry of Marine Affairs and Fisheries Ministry
Prof. KISHIDA Satoru from Tottory University Japan
Prof. Wayan Dibya fron Indonesian Arts Institute, Denpasar Bali
Mr. Dahlan Iskan, the Chief Executive Officer of PLN
Distinguished Presenters, all participants, and Colleagues

Assalamualaikum, Wr. Wb.

I am both honored and delighted to welcome you here in this remarkable conference hosted by Institut Teknologi Sepuluh Nopember (ITS) Surabaya in corporation with the Research Institute and Public Services (LPPM) ITS. The conference today takes the topic of "Empowering Creativity through Science and Technology to Enhance Nations Competitiveness".

On behalf of the committee, I would like to thank Prof. Priyo Suprobo, the Rector of ITS, whose full support has enabled all of this possible; Prof. I Nyoman Sutantra, M.Sc, PhD., the head of LPPM who has kept encouraging us in accomplishing all good preparation to welcome you here today until tomorrow; and the support of the board of committee of the golden year anniversary, whose financially support this event. Also, all the sponsors who keep rendering and make today's conference be more easily carried out.

Ladies and Gentlemen,

The interest of the international scientific community is clear, sharing enormous inspiring notions, research findings and innovations. This Conference has attracted 150 domestic and overseas presenters, it means that within two days we will hear 150 oral presentations. The subjects range from descriptions of recent technology, science both natural and social, and arts. So, it is marvelous, isn't it? Only in two days 150 brilliant ideas would have been disseminated and enriched our inventory of knowledge; furthermore, these 150 fresh and prolific ideas will enable this beloved country ready to face the challenge of ACFTA.

Ladies and Gentlemen,

In the middle of us, here we have four notable speakers who would overcome our desire for inputing the latest knowledge delivered in their presentations in the plenary sessions. Therefore, I would like to express my sincere gratitute and warm welcome to Prof. KISHIDA Satoru who comes far away from Tuttori University, Japan; I also feel grateful for the coming of important figures: our Minister, Dr. Ir. H Fadel Muhammad Al-Haddar; Prof. Wayan Dibya from Denpasar-Bali, and Mr. Dahlan Iskan who has been so popular among us, people of Surabaya.

Ladies and gentlemen,
Today's conference is born due to a hard work of all committee and staffs who have spent their time working day by day arranging every detail of the event, so allow me to congratulate their very keen and perfect job that makes me standing up here welcoming all the distinguished guests.

Last but not least, I would like to ask you all an apology for all incovenience that you might find prior, during, or after the conference; we are all just an ordinary man that won't be able to avoid making mistakes. Thank you and have extraordinarily inspiring seminar.

Wassalamu'alaikum Wr.Wb,

General Chairman of 2nd APTECS 2010
Dr. Bambang Sampurno

ACKNOWLEDGEMENTS

Special gratitude is extended to all of the followings:

RECTOR OF INSTITUT TEKNOLOGI SEPULUH NOPEMBER

INSTITUTE OF RESEARCH AND PUBLIC SERVICES – ITS

THE JOURNAL OF IPTEK ITS

MINISTRY OF MARINE AFFAIR AND FISHERIES

TOTTORI UNIVERSITY, JAPAN

PERUSAHAN LISTRIK NEGARA (PLN)

PT. TELEKOMUNIKASI INDONESIA, TBK

PT. TRUBA JAYA ENGINEERING

PT. NAHARADIA PRAKASA

HOUSE OF BEAUTY CLINIQUE

ELEKTRO BUDOYO – ITS

SMKN IX SURABAYA

for never ending supports that have made the 2nd APTECS 2010 held successfully

SCHEDULE
INTERNATIONAL SEMINAR ON APPLIED TECHNOLOGY, SCIENCE, AND ARTS
2nd APTECS 2010

Monday, 20 December 2010

Time	Activities
19.00 - 22.00	Welcome dinner for overseas participants, officially attended by the mayor, Ir. Tri Rismaharini, MT

Day I: Tuesday 21 December 2010

Time	Activities						
06.45 - 07.30	Registration						
07.30 - 07.40	Indonesian Traditional Musical Instruments- Elektro Budoyo : Ayak Talu						
07.40 - 07.50	Traditional Dancing : Jejer Gandrung Banyuwangi - SMKN 9 Surabaya						
07.50 - 08.00	Welcome to 2nd APTECS : Dr. Bambang Sampurno						
08.00 - 08.05	Ladrang APTECS : Elektro Budoyo						
08.05 - 08.15	Colossal Dancing Remo : Elektro Budoyo						
08.15 - 08.25	Speech from The Chief of Research and Public Services - ITS : Prof. I.N Sutantra						
08.25 - 08.30	Opening Term - Rector ITS : Prof. Priyo Suprobo						
	Theme I : The prospect of High - Superconducting Oxides and Their Surface Analysis Superconductivity, Surface Analysis, and Oxide and The Creative for The Future: by Prof. KISHIDA Satoru – Tottori University, Japan Theme II : Central Roles of The Electricity to Enhance the Quality of Nation Competitiveness: by Mr. Dahlan Iskan – PLN Moderator: Prof. Imam Robandi						
11.30 - 12.30	Break for Lunch and Pray						
	A	B	C	D	E	F	G
12.30 - 12.47	Eng-21	Art-1	Eng-65	Eng-87	Sci-1	Eng-51	Eng-105
12.47 - 13.04	Eng-22	Art-2	Eng-66	Eng-88	Sci-2	Eng-52	Eng-106
13.04 - 13.21	Eng-23	Art-3	Eng-67	Eng-89	Sci-3	Eng-53	Eng-107
13.21 - 13.38	Eng-24	Art-4	Eng-68	Eng-90	Sci-4	Eng-54	Eng-108
13.38 - 13.55	Eng-25	Art-5	Eng-69	Eng-91	Sci-5	Eng-55	Eng-109
13.55 - 14.12	Eng-26	Art-6	Eng-70	Eng-92	Eng-117	Eng-56	Eng-110
14.12 - 14.31	Eng-27	Gen-1	Eng-71	Eng-93	Eng-118	Eng-57	Eng-111
14.31 - 14.48	Eng-28	Gen-2	Eng-72	Eng-94	Eng-119	Eng-58	Eng-112
14.48 - 15.05	Eng-29	Gen-3	Eng-73	Eng-95	Eng-120	Eng-59	Eng-113
15.05 - 15.30	Break						
15.30 - 15.47	Eng-30	Gen-6	Eng-74	Eng-96	Gen-9	Eng-60	Eng-114
15.47 - 16.04	Eng-31	Gen-7	Eng-75	Eng-97	Gen-4	Eng-61	Eng-115
16.04 - 16.21	Eng-32	Gen-8	Eng-76	Eng-98	Gen-5	Eng-62	Eng-116

NOTE :

A : Room Argopuro 1
B : Room Argopuro 2
C : Room Kawi
D : Room Lawu
E : Room Semeru 1
F : Room Semeru 2
G : Room Utama

Day II: Wednesday, 22 December 2010

Time	Activities						
06.45 - 08.00	Registration						
08.00 - 08.10	Indonesian Traditional Musical Instrument- Elektro Budoyo : Ojo dipleroki & Kelinciku Ucul						
08.10 - 08.20	Traditional Dancing Pendet - TPKH ITS						
08.20 - 08.30	Indonesian Traditional Musical Instrument - Elektro Budoyo : Ketawang						
08.30 - 10.30	Keynote Speaker III and IV Panel : Theme III: Resilience of National Arts and Culture to Enhance Nation Competitiveness: By Prof. Wayan Dibia – Indonesian Arts Institute, Bali Theme IV : Empowering Marine Resources to Enhance Nation Competitiveness: Dr. Ir. H Fadel Muhammad Al-Haddar – Ministry of Marine Affairs and Fisheries Moderator: Prof. I Ketut Aria Pria Utama						
	A	B	C	D	E	F	G
10.30 - 10.47	Eng-1	Eng-9	Eng-17	Eng-46	Eng-39	Eng-78	Eng-33
10.47 - 11.04	Eng-2	Eng-10	Eng-18	Eng-47	Eng-40	Eng-79	Eng-34
11.04 - 11.21	Eng-3	Eng-11	Eng-19	Eng-48	Eng-41	Eng-80	Eng-50
11.21 - 11.38	Eng-4	Eng-12	Eng-20	Eng-49	Eng-63	Eng-81	Eng-100
11.38 - 11.55	Eng-5	Eng-13	Eng-42	Eng-35	Eng-64	Eng-82	Eng-101
11.55 - 12.12	Eng-6	Eng-14	Eng-43	Eng-36	Eng-85	Eng-83	Eng-102
12.12 - 12.39	Eng-7	Eng-15	Eng-44	Eng-37	Eng-86	Eng-84	Eng-103
12.39-12.58	Eng-8	Eng-16	Eng-45	Eng-38	Eng-77	Eng-99	Eng-104
12.58 - 13.45	Break for Lunch and pray						
13.45- 14.00	Closing Ceremony and Awarding Certificate						
14.00 - 14.30	Preparation for City Tour (Cancelled)						
14.30 - 17.30	City Tour (Cancelled)						
17.00 - ...	See you on 3rd APTECS						

NOTE :

A : Room Argopuro 1
B : Room Argopuro 2
C : Room Kawi
D : Room Lawu
E : Room Semeru 1
F : Room Semeru 2
G : Room Utama

Moderator Day I

A	Room : Argopuro 1	A: Prof. Ir. Noor Endah Mochtar, M.Sc., Ph.D.
B	Room : Argopuro II	B: Prof. Ir. Happy Ratna Sumartinah, M.Sc., Ph.D.
C	Room : Kawi	C: Prof. Dr. Ir. Mauridhi Hery Purnomo, M.Eng.
D	Room : Lawu	D: Prof. Ir. Gamantyo Hendrantono, M.Eng., Ph.D.
E	Room : Semeru 1	E: Prof. Dr. R. Y. Perry Burhan, M.Sc.
F	Room : Semeru 2	F: Prof. Dr. Ir. Suprapto, M.Sc.
G	Room : Utama	G: Dr. Maria Anityasari,ST.,ME.

Moderator Day II

A	Room : Argopuro 1	A: Dr. rer.nat Fredy Kurniawan, MSi
B	Room : Argopuro II	BDr. Ir. A. A. Masroeri, M.Eng.
C	Room : Kawi	C: Prof. Ir. Sutardi, M.Eng., Ph.D.
D	Room : Lawu	D: Prof. Ir. Djauhar Manfaat, M.Sc., Ph.D.
E	Room : Semeru 1	E: Prof. Dr. Ir. Adi Soeprijanto, M.T.
F	Room : Semeru 2	F: Prof. Dr. Ir. Dra. Danawati Hari Prajitno, SE,M.Pd.
G	Room : Utama	G: Dr. Ir. Ria Asih Soemitro, M.Eng., DEA.

Rules of Paper Presentation

1. The allotted time for presentation and question-answer session is 15 minutes for each presenter

2. To keep prompt presentation, bell would ring three times to remind the presenter's available time for presentation. It rings every eight minutes of the allotted time, ten minutes, and the last 15 minutes.

3. It is mandatory that the presenter promptly uses the time allotted.

4. The timekeeper would also strictly watch the time allotted to each presenter.

List of Abstracts:

Design of Optimal Dual Input Power System Stabilizers (DIPSS) and Capacitive Energy Storage (CES) using Particle Swarm Optimization (PSO)

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Abstract— **This paper discusses about the instability in electric power system and its importance in overcoming instability rapidly. This problem is generally solved using a stabilizer such as Conventional Power System Stabilizer (PSS). However, the use of PSS is limited to the retrieval speed signals that do not have the relatively large noise. Large noise will affect in the generator excitation system. Reducing of signal noise in the speed signal, so Dual Input Power System Stabilizer (DIPSS) is used to overcome this problem. DIPSS can reduce signal noise by taking another input signal in system model. It can increase or decrease level in value for input of excitation system, so the excitation system can avoid of mistakes in decision-reference signal. Deviation in electrical power (ΔPe) and deviation in speed (Δω) in generator is used as an input signal DIPSS. Improvement stability in power system usually using more than one device. CES (Capacive Energy Storage) is choosen become second device to handle this problem. CES usually used to overcome frequency oscilation. This equipment is added to reduce the little overshoot from DIPSS. Optimal coordination between two device is needed to obtain good results and does not exacerbate the addition of extra equipment. it needs the appropriate parameter value of each equipment in order to overcome problems quickly. Particle Swarm Optimization (PSO) is method in order to find value of time constant in block diagram parameter lead lag DIPSS and gain in CES. From the simulation result show that the use of CES DIPSS PSO can speed up settling time to 12.302 second better than uncontrolled, 9.612 second than PSS, and 0.563 second when using DIPSS PSO.**

Keywords— **Dual Input Power System Stabilizer (DIPSS), Particle Swarm Optimization (PSO), Power System Stabilizer (PSS), Capacitive Energy Storage (CES)**

I. INTRODUCTION

Stability in power system is very important. To maintain stability, it necessary select of appropriate control strategies. Furthermore, this control is necessary for power system reliable and can overcome the problems quickly when exposed to disturbances. The bad response caused load changes can lead to a long oscillation frequency. Oscillation frequency will affect the terminal voltage and will indirectly affect the power transfer performance if not corrected quickly.

Another thing that also must be considered in the operation of power systems is the instability. Instability is one of the problems of direct impact in load power system changes. This disturbance can be transients or dynamic instability. In dynamic instability changes in load can result in oscillations in the system and can bring the system into an unstable region. To overcome this problem we can use PSS equipment. However, PSS equipment can not reduce the noise that appears when getting speed signal which is used as input signal [1]. This noise can effect into excitation system, so the excitation system will increase. This can cause oscillations in the electric power system, so PSS is only limited to systems with small noise.

In this paper proposed the use of equipment which is the development of PSS to overcome the problems of power system instability. This Equipment is DIPSS which type of PSS can reduce signal noise from getting velocity signal. Noise signal along with speed signal will be reduced so that the excitation system to avoid mistakes in decision-reference signal. Development done on this DIPSS is the use of two input signals. The source of signal is electrical power deviation (ΔPe) and velocity deviation (Δω).

In operating DIPSS, The first amplitude value of speed deviation is high enough, so second device is used to overcome that problem. One of device is CES. CES is device can reduce frequency oscilation. In order to obtain optimal control, then DIPSS parameters and gain of CES should be optimized by the optimization method. Optimization method which is used in this paper is Particle Swarm Optimization (PSO). This algorithm is based on the pattern of foraging by a bird or fish. This algorithm was chosen because of the speed of computation to obtain the value of the optimized parameters [2].

II. FUNDAMENTAL THEORY

A. Power System Stability

The stability of power systems is abilities to keep the value of the system in case of disruption output [3]. This stability is classified into steady state stability and transient stability. The stability of steady state electric power system is ability to achieve a stable condition at the same new condition with initial conditions without interference. The analysis used in steady state stability is using linier model approach. While the transient stability of power system ability to achieve a new stable state after a system big disturbance.

B. Single Machine Infinite Bus (SMIB)

Single Machine Infinite Bus (SMIB) is model of system which transfers electric power to unlimited bus. Unlimited bus in this paper meaning that distance of machine and load is very far, so the voltage in unlimited bus is assumed not change. Generator is represented by single machine which represented one of electric power plan. Value of frequency and phase is assumed not change in this system. For this paper, SMIB Modeling here refers to the model transfer function of Heffron and Phillips [4]. In this model there are two block diagrams that linearized namely mechanical loop at the top and electric loop at the bottom. Linearized SMIB based here since only a low frequency oscillation analysis in operating conditions. This model there is two enhancer function into the model system for testing the mechanical torque deviation (ΔTm) and additional excitation (Ue) Signal (ΔVt) represent of generator voltage which have disturbance. Complete block diagram of SMIB is shown in Fig. 1

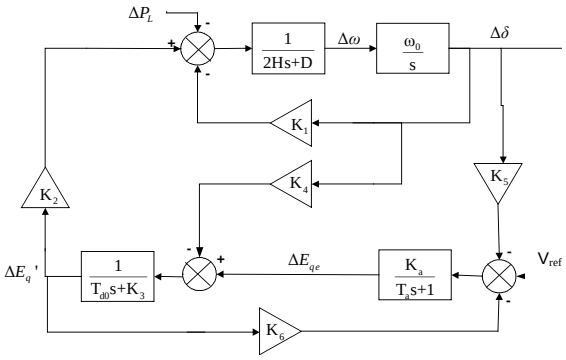
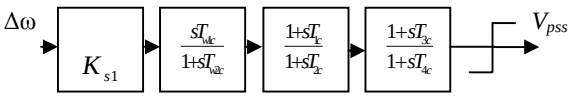


Fig. 1. Single machine infinite bus [4]

C. Conventional Power System Stabilizer (PSS)

Conventional Power System Stabilizer (PSS) is additional equipment which is used to produce components of damping by adjusting the excitation by way of electrical torque in accordance with the deviation in rotor speed. PSS design methods generally involve frequency response based on the concept of increasing the damping torque. The block diagram of PSS consists of washout, dynamic compensator, and filter torque diagram. Washout block diagram represent filter and is used to pass high frequency. Compensator block diagram is used to provide a phase lead and lag for the input signal. Input PSS is speed change and output is voltage signal, the voltage signal is used in the excitation system. Complete block diagram of PSS is shown in Fig. 2.



Gain washout block lead-lag block limiter

Fig. 2. Diagram block of PSS [5]

D. Dual Input Power System Stabilizer (DIPSS)

Dual input Power System Stabilizer (DIPSS) is one of the model PSS which is able to reduce the noise signal along with signals. Noise signal which is generally in conjunction with the speed signal and used as input PSS can be derived from the shaft motion component. This shaft motion component such as the lateral shaft run-out that causes excessive in modulation generator excitation system or oscillations torque resulting from changes in electrical torque[1]. The components of this noise will affect the excitation of the generator and cause an influence on the electrical torque variations. Complete block diagram of DIPSS is shown in Fig. 3. Input in this stabilizer is the deviation of rotor angular velocity and deviation electrical power. Each input has series of washout and transducer. Washout circuit serves to provide a continuous condition at output stabilizer while the transducer is used to change the input signal into voltage. Model of dual input power system stabilizer take from IEEE type PSS2B. Each input has two washout block diagram (Tw1-Tw2) and one transducer (T6-T7). Time constant of torque filter is signed T8 and T9.

E. Capacitive Energy Storage (CES)

Capacitive Energy Storage is device that can overcome frequency oscilation. The storage capacitor is connected to the AC grid. Equipment in CES device have inverter and rectifier with 12-pulse configuration, capacitance, and resistance connected in parallel that represent losses of capacitor bank. The workings of this equipment that is charged when the voltage is less than a full charge and discharge voltage when during peak load operation.

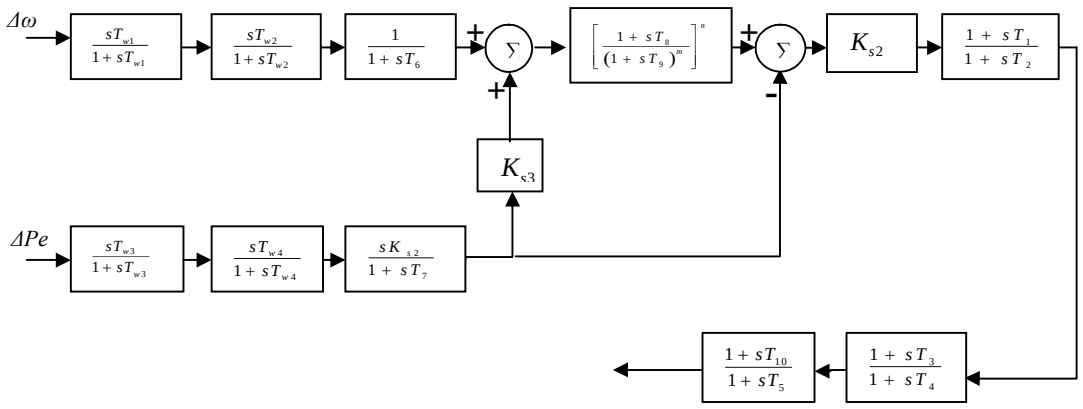


Fig. 3. Block diagram of dual input power system stabilizer (IEEE type PSS2B Model)

III. PARTICLE SWARM OPTIMIZATION (PSO)

Particle Swarm Optimization (PSO) is method used in DIPSS and CES optimization system parameter. PSO method was introduced by Kennedy and Eberhard in 1995 [2]. This method is one of the intelligence methods. These algorithms use population base as a method of finding a solution where each particle represents a solution. Each particle of the PSO method is moving with speed changes based on its own flying experience and flying experience of other particles. Each particle has a memory and can remember the location of the best I've visited. The best position associated with the best fitness value is symbolized with p_{best} whereas the best value of the entire population is symbolized by g_{best}. In PSO each particle moves in the search area with a speed that is based on previous experience from the best solution. Velocity (v_i) in PSO method has three parts, namely the momentum, cognitive, and social parts. The balance between these will be determining the performance of this PSO. Parameter c_1 and c_2 determine the value of taking p_{best} and g_{best}, while value of r_1 and r_2 help in getting variation value p_{best} and g_{best}. If a particle reaches the best position to produce the optimal value of the other particles will move directly toward the best position. Based on the concept of the PSO, the mathematical equations can be formulated as follows

update particle velocity:

$$v_i^{k+1} = v_i + c_1 r_1 \left(p_{best-i} - x_i^k \right) + c_2 r_2 \left(g_{best-i} - x_i^k \right) \qquad (1)$$

update particle velocity:

$$x_i^{k+1} = x_i + v_i^{k+1} \qquad (2)$$

k is the value of the iteration or generation of particles, whereas i indicates the ith particle of a collection of particles. To better know the PSO optimization method then created a flowchart shown in Fig. 4.

The reason of using algorithm is based on the problems related of using stabilizer in that own operating conditions. Another reason is that parameters very large in power systems and mathematical models of power system are not linear and not known in detail [6]. To overcome that problem above, manual tuning or using algorithm is used to get solution. The use of PSO method is to find the value of the parameter DIPSS and CES which is used to accelerate the acquisition value of the stabilizer parameters.

Parameters of DIPSS will be seek is time constant of the block circuit diagram lead-lag, while a constant value of the transducer circuit and tuned washout block diagram own until getting good grades. In CES device only Kces will be optimized by PSO.

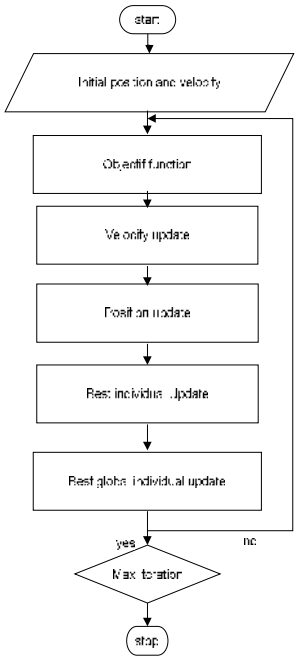


Fig. 4. Flowchart PSO

IV. SIMULATION AND RESULT

Single Machine Infinite Bus (SMIB) is used in system test. To test effectivity of CES DIPSS that have been optimized using PSO, then system is given disturbance. The disturbance in this system is load change at 0.03 p.u. Index performance which used to test stability system is Integral of Time multiplied Absolute Error (ITAE). ITAE defined as

$$ITAE = \int_0^{\infty} t\,|\Delta\omega(t)|\,dt \tag{3}$$

The simulation results only consider the overshoot and settling time of response changes in speed SMIB. The simulation was taken from the best with 20 times trials. Each simulations in this systems model only 20 seconds. Fig. 5 shows the graph of the convergence of all particles. Convergence is achieved at iteration 42. This shows that the minimum error is achieved or optimum value of DIPSS parameter is obtained in 42th iteration.

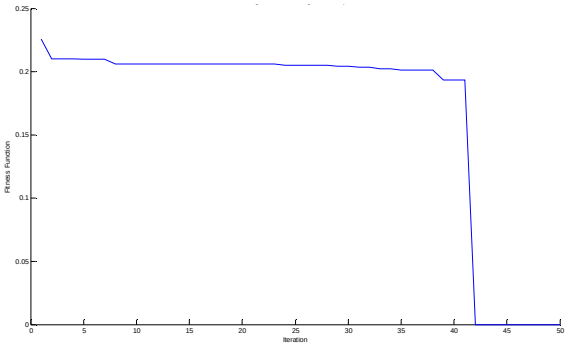


Fig. 5. Convergence of PSO graphic

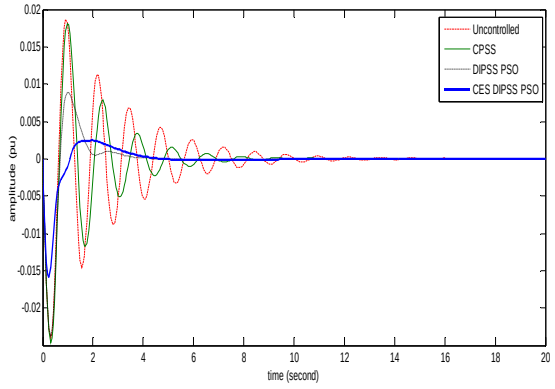


Fig. 6. Speed deviation

From Fig. 6 indicated that the response of changes in speed between using CES DIPSS PSO, DIPSS PSO, PSS and without control. The response of the system once installed CES DIPSS who tuned by PSO showed the best performance of the other. This can be seen from the overshoot and settling time for speed change system. Systems with uncontrolled has -0.02387 p.u in overshoot and has settling time in 16.37 seconds. Systems using PSS has - 0.02402 p.u overshoot and settling time in 13.68 seconds. Systems that use DIPSS which have been optimized using PSO showed a response overshoot and settling time that is equal to -0.02459 p.u and 4.631 seconds. While systems that use CES DIPSS which have been optimized using PSO showed a response overshoot and settling time that is equal to -0.01587 p.u and 4.068 seconds. Results of simulation for the overshoot and settling time of speed deviation shown in Table I

Table 1. Overshoot and Settling Time

System	Overshoot (pu)	Settling Time(s)
uncontrolled	-0.02405	16.37
PSS	-0.02458	13.68
DIPSS PSO	-0.02385	4.631
CES DIPSS PSO	-0.01587	4.068

V. CONCLUSION

Results obtained from the use of CES DIPSS which tuned using PSO in SMIB very effective and speed up the system stability. This can be seen from the overshoot and settling time of response to changes in speed. Application of CES DIPSS PSO to reduce the overshoot of 0.008 p.u when compared with uncontrolled and has 0.000798 p.u and when compared with the DIPSS PSO. Improvements to the settling time by using CES DIPSS PSO very good that is equal to 12.3 seconds faster with uncontrolled , 9.049 seconds with PSS, and 0.563 seconds with DIPSS PSO.

VI. REFERENCES

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APPENDIX

PSO parameter

Number of particle : 100
Number of variable :5
c_1= 2 ; c_2= 2 ; w = 0.9

SMIB parameter

K_1 = 0.5995; K_2 = 0.9263; K_3 = 0.5924 ; K_4= 0.4319 ; K_5= -0.087; K_6= 0.6004 ; H= 4 ; D= 0 ;T_{d0}= 5.044; T_a= 0.05; K_a=50

PSS parameter

T_{wc1}= 0.381 ; T_{wc2}= 0.5 ; T_{1c}= 0.05; T_{2c}= 0.35; K_{s1}=12; V_{max}= 0.15; V_{min}= -0.15

DIPSS parameter

T_1= 1; T_2= 1.1; T_3=0. 005; T_4= 0.037; T_6= 0.3; T_7= 7; T_8 = 0.05; T_9= 0.02;T_{W1}=T_{W2}=T_{W4}= 10; T_{W3} =0.9; K_{S2}=0.95; K_{S3}=0.05; n=1; m=5;

NUMENCLATURE

CES parameter
Kvd=0.1; Tdc=0.05;C=1; R=100; Edo=0.5; Ka=46.9613; Kces=58.9286 Particle swarm optimization (PSO)
vi = particle velocity in i
xi = particle position in i
r1, r2 = random constant
w = particle weight
pbest = local optimum in i
gbest = global optimum in i
c1 = cognitif accelerate coefficient
c2 = social accelerate coefficient

Dual input Power System Stabilizer (DIPSS)
T1,2,3,4,5,10 = time constant lead-lag circuit
ks3, ks2 = multiplied gain of DIPSS
n, m = value of grade filter torque