

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قال الله تعالى:

﴿هُوَ الَّذِي جَعَلَ الشَّمْسُ ضِيَاءً وَالْقَمَرَ نُورًا وَقَدَرَهُ مَنَازِلَ لِتَعْلَمُوا عَدَدَ
السِّنِينَ وَالْحِسَابَ مَا خَلَقَ اللَّهُ ذَلِكَ إِلَّا بِالْحَقِّ يُفَصِّلُ الْآيَاتِ لِقَوْمٍ يَعْلَمُونَ﴾

صدق الله العظيم

صورة يونس الآية (٥)

Dedication

This research is dedicated to my parents for their continues support, encouragement, and their understanding throughout the period of my studies.

To my colleagues and other family members who assisted and encouraged us in various ways.

To School of Electrical and Nuclear Engineering staff who allowed me to further my studies.

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Abstract

The power system is a dynamic system and it is constantly being subjected to disturbances. It is important that these disturbances do not drive the system to unstable conditions. For this purpose, additional signal derived from deviation, excitation deviation and accelerating power are injected into voltage regulators. The device to provide these signals is referred as power system stabilizer.

The use of power system stabilizer has become very common in operation of large electric power systems. The conventional PSS which uses lead-lag compensation, where gain setting designed for specific operating conditions, is giving poor performance under different loading conditions. Therefore, it is very difficult to design a stabilizer that could present good performance in all operating points of electric power systems. In an attempt to cover a wide range of operating conditions, Fuzzy logic control has been suggested as a possible solution to overcome this problem, thereby using linguist information and avoiding a complex system mathematical model, while giving good performance under different operating conditions. Using Matlab program.

المستخلص

من المعلوم ان نظام القوي الكهربائىة هو نظام ديناميكى يعمل باستمرار و قد تتعرض لاضطرابات فمن المهم أن هذه الاضطرابات قد لا تدفع النظام إلى الظروف غير المستقرة و لكن قد تقلل من كمية القوي المنتجة بواسطة النظام. و لهذا الغرض، يتم حقن إشارة إضافية بنفس قيمة الانحراف مستمدة من نظام الإثارة لتسريع القوي في منظمات الجهد الذاتية. و الجهاز المسئول عن توفير هذه الإشارات هو جهاز مثبت نظام القوي. حيث أصبح استخدام جهاز مثبت نظام القوي شائع جدا في تشغيل نظم القوي الكهربائىة الكبيرة. حيث يقوم ذلك الجهاز بإعطاء ضعف الأداء لنظام القوي تحت ظروف التحميل المختلفة كما يمكن أن يقدم أداء جيد في جميع نقاط التشغيل لنظم القوي الكهربائىة. و في محاولة لتغطية مجموعة واسعة من ظروف التشغيل، تم استخدام نظام تحكم منطقي غامض مع مثبت نظام القوي كحل ممكن للتغلب على هذه الإضطرابات التي تواجه نظام القوي الكهربائىة. تم تمثيل منظومة التحكم باستخدام برنامج ماتلاب.

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List of Abbreviation

Abbreviation	Name
FLC	Fuzzy logic controller
PSS	Power system stabilizer
AVR	Automatic voltage regulator
SMIB	Single machine infinite bus bar
CPSS	Conversional power system stabilizer
FLPSS	Fuzzy logic controller based power system stabilizer
MISO	Mute Input and a Single Output
δ	Rotor angle of synchronous generator in radians
$\Delta\omega$	Rotor speed deviation in rad/sec
ω_o	Starting Rotor speed
H	Inertia constant
D	Damping coefficient
T_m	Mechanical power input in p.u.
T_e	Electrical power output in p.u.
E_{fd}	Excitation system voltage in p.u.
V_{PSS}	Power system stabilizer voltage in p.u.
V_t	Terminal voltage
T_{do}	Open circuit d-axis time constant in sec
T_{qo}	Open circuit q-axis time constant in sec
x_d	d-axis synchronous reactance in p.u.
x_q	q-axis synchronous reactance in p.u.
NB	Negative Big
I_d	d-axis current
I_q	q-axis current
NM	Negative Medium
NS	Negative Small
ZE	Zero
PS	Positive Small
PM	Positive Medium
PB	Positive Big
K_{PSS}	Power system stabilizer gain
T_w	Washout time constant
$T_{1,2}$	phase compensation time constant
FIS	Fuzzy Inference Systems