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ANALYZATION THE ACCEPTED AND REJECTEDDISTURBANCES BY USING VSS TECHNIQUES

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ABSTRACT

In this research the values of rejected and accepted (programmed) are compared to the variable control systems (VCS) by drawing curves and determine the values of the voltage switching surface system (VSS), which is working under the external effects and connect in the parts of control structure (S1, S2).The analysis presented here in treating the question of changing the structure when a deterministic disturbance acts anywhere in the control system using (Mat lab programs).

An adaptive model reference algorithm in established to make the control system respond satisfactory or not there is a disturbance. In this system best responses are achieve by noting many information and factors like steady state error (S.S.E), order of control system, type of switching and also notes the logarithmic structure for VSS voltages in case of input reference sources model to get best performance.

تحليل الاضطرابات المقبولة و المرفوضة باستخدام تقنيات الفولتيات المتغيرة للمنظومات

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الملخص

تم في هذا البحث مقارنة قيم الاضطرابات المرفوضة والمقبولة (المبرمجة) لمنظومات السيطرة المتغيرة والتي تعمل بوجود التأثيرات (VSS) المتغيرة من خلال رسم المنحنيات وتحديد قيم تقنية الفولتيات المتغيرة للمنظومة الخارجية، كذلك قمنا بتعشيق تراكيب أجزاء السيطرة (S1,S2).ومن خلال البرامج التي كتبت بالمصفوفات المختبرية فان التحليل المقترح سوف يعالج المشاكل التي تظهر خلال تغير التراكيب في المنظومة عندما يدخل اضطراب منتظم في مواقع مختلفة من منظومة السيطرة.

كما شمل الاختبارصنف محدد من الاضطرابات العشوائية المرغوب فيها والغير مرغوب بها والتي من خلالها تم الحصول على افضل النتائج المستجابة لها المنظومة باستخدام التعشيق بين وظائف المنظومة ذات الفولتيات المتغيرة (VSS) ووظيفة نظام السيطرة باستخدام تغذية مرجعية.

لتحقيق أفضل استجابة للمنظومة يجب مراعاة عدة معلومات وعوامل منها نسبة حالة الخطأ (S.S.E)، نوع نظام السيطرة ،درجة الدالة ،نوع المفاتيح المستخدمة مع ملاحظة التصميم اللوغارتميللفولتيات VSS في حالة نموذج مصدر الإدخال للسيطرة (p/ isource referenceodelm)لغرض زيادة أدائها ومعالجة الاضطرابات الغير مرغوب بها والتوافقيات(Harmonics) في مثل هكذا منظومات .

1- INTRODUCTION.

The involvement of voltage switching surface system (VSS) in order to stabilize control system of second and higher order system has been investigated [**Buja, G.S, 1993**].The theory of (VSS), widely studied and directly applied to the design of MRAC system [**Ambrosino,G,1982**]. The advantage of this approach is that the transient response of the error during sliding motion can be prescribed in advance, but the controller structure requires the use of difference by using variable filter in the controller structure and introduce the so called (argument error signal) to derive the parameter adaptation law assuring the convergence of the error to zero [**Ambrosino, G, 1982, Rebiai, S.E, 1998**].

However more complete design method stability proof is associated with an (error model) in which the integral parameter adaptation law is used. The VSS on the present with adaptive pole assignment control in the presence of uncertain non-minimum phase system affected by bonded disturbances; the control scheme proposed is characterized by a simple first-order fixed compensator introduced in parallel to the plant; with a set of a tunable state variable filters [**Bartolini,G, 2002**]. The insensitive sliding mode offered by a VSS makes it a well-known solution to the problem of deterministic control of parameter uncertainties and rejects external disturbances [**Banks, S.P, 2008**].

Static VSS algorithm can reject completely the disturbance only if the amplitude of the switching term; in the control (i/p) is larger than the amplitude of disturbance itself, and shows how it is possible by adding an integral term in the VSS control algorithm to reach and remain in the sliding mode if the amplitude of the switching term is smaller than the amplitude of the disturbance [**Itkis, U, 1978**]

2- THEORY

The main advantages of VSS are the robustness to parameter variations and the in variance VSS approaches may possess distinguished characteristics of disturbance rejection therefore; in the present work we are going to examine and illustrate the performance of one (VSS) algorithm approach which has been presented in [**Yaz, E, 2003**].When (VSC) algorithms with chattering reduction for the control of fractional armature controlled d.c motor with gear coupling.

There are three altitudes a designer can adopt in regard to accommodating (coupling with) disturbances that arise in general control problems. In that case; disturbances are optimally accommodated when the controller is designed to exactly can out all effects of disturbances on system behavior. This is called (disturbance-absorbing); in fact be achieved by clever application of modern optimal control theory and leads to a verity of controller which is called (disturbance-utilization). In practical applications; the given design specifications might dictate the use of a combination of the varieties of disturbances accommodating controllers; this leads to another variety of controller which is called (multi-mode disturbances accommodating controller) [**Johnson, C.D, 1997**].

The kind of disturbances W (t) encounters in realistic control system designs can be classified into two broad categories: noise-type disturbances and disturbances with waveform structure.

Disturbance W (t) which possesses (waveform structure) exhibiting distinguishable waveforms patterns; can be mathematically model by semi-deterministic analytically expressions (linear equation) of the form:

$$W\,(t) = C_1 f_1(t) + C_2 f_2(t) + \cdots\cdots\cdots + C_m f_m(t) \qquad (1)$$

According to the equation (1) the (unknown) disturbance W(t) can be expressed at any moment (t), as some weighted linear combination of the known basis function $f_1(t)$ having unknown weighting coefficients $C_1(t)$ (where C_1 may jump in value from time to time in a random piecewise constant fashion) [**White, R.M, 2011**]. Several VSS control algorithms have been proposed and studied in the literatures, the main idea of these algorithms is to use a feed forward action to compensate the known part of the system and then introduce a switching term in the control (i/p) in order to eliminate the undesired unknown disturbances. The application of external disturbances to the system gives rise to a study-state error (s.s.e) or (under damped self-sustained oscillations).

In what follows the disturbances rejection capability of variable structure control system VSS designed according to minimizing certain control area criterion will be analyzed whether the switching circuit designed with respect to certain reference control input responds adequately with respect to certain disturbance input or not [**Young, K.S, 2009**].

3-SIMULATION, RESULTS AND CALCULATIONS

The problem of robust stabilization of uncertain system can be solved by using several control approaches; adaptive control, optimal control and VSS; VSS approach allows total rejection of external disturbances. The search and application in the field of variable structure system (VSC) through VSS has been maintained at a high level and dedicated to sliding mode control which matter reflects the interest of control theorists and practicing engineers.

There are several commonly used system configuration by control system performance in **Figures 1-a, b** and **Figures 2-a, b** [**M.D.Desai, 2012**].

Control system performance may be improved by feeding back the state variables through constant gain. In fact the majority of the design techniques in modern control theory are based on the state negative feedback (-F.B) configuration with PID control and rate negative feedback (-F.B) control are all special cases of the state feedback control with and without any factor disturbances.

If n(t) has to be in the input (i/p) of the system then $G_{(S)1}=1$; at (o/p) then $G_{(S)2}=1$;note the negative sign [n(t)] which is used for the simplicity of the mathematical derivation.

The closed loop transfer function between the error signal e(t) and the disturbance signal n(t)is:[**Banks, S.P, 2008**].

$$\frac{E_{(s)}}{N_{(s)}} = \frac{G_{2(s)}}{1 + G_{1(s)}G_{2(s)}D_{(s)}} \qquad (2)$$

Variable structure control (VSC) for a second order control system is shown in **Figure 3**

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The occurrence of disturbance in certain locations in the control plant causes mainly the partitioning of the system; so the control plant may require certain sequence of switching which is not the same as it is required for normal (i/p) control.

Consider the second order VSS control system by using variation with disturbance for types of two structures VSS as shown in **Figure 4**.

The main effect of external disturbances is to impose a steady state error (S.S.E); theoretically VSS represents one of the powerful control tools to eliminate disturbance effects on the system. In fact, the simulation cases show that a complete rejection of disturbance effects cannot be achieved through the proposed VSS design, this happens if the structure being connected is under damped characteristics and no switching conditions are satisfied; see Figures 5 (a) & (b) represented a computer simulation by (MATLAB Lang) To illustrate the VSS capabilities to eliminate the stochastic disturbance effects when error against time through many variables by card interference control system.

We must pay attention to the selection of the controller parameter, such that to obtain non sluggish over damped structure and achieve increased number of switching through validating switching function. Simulation results summarize that the (S.S.E) for the following cases:

1-disturbance at input when $G_{(S)\,1}$=1.

2-disturbance at output state FB.

3-selection of switching conditions and sequence mode are not matched.

The results of investigating the effect of external disturbances imposed on the (o/p state F.B) in first and second derivatives are displayed in **Figures 6 & 7**.

It can be seen that VSS can not eliminate the types of rejection disturbances and the error response follows one structure and switching does not take place even when switching occurs; unacceptable performance results.

When both reference (i/p) and disturbance are present in a linear system, each can be treated independently and the outputs corresponding to each are added to give the complete (o/p), examining the effect of the disturbance N(s)assume that the system is at rest initially, then calculate the error response E_N(s) to the disturbance only. This response can be found from

$$\frac{E_N(s)}{N(s)} = \frac{G2}{1 + K_o G - G \sum K_i S^i} \qquad (3)$$

On the other hand, in considering the response to the reference input R(s), assume that disturbance is zero. Then the error response E_R(s)to the reference input R(s) can be obtained from:

$$\frac{E_R(s)}{R(s)} = \frac{1 - G \sum K_i S^i}{1 + K_o G - G \sum K_i S^i} \qquad (4)$$

The response to the simultaneous application of the reference (i/p) and disturbance can be obtained by adding the two individual responses, in other words the response E(s) due to effect application of the reference (i/p) R(s)and disturbance N(s)is given by

$$E(s) = EN(s) + ER(s)$$

$$E(s) = \frac{G_2 N(s) + \left(1 - G \sum K_i S^i\right) R(s)}{1 + K_o G - G \sum K_i S^i} \qquad (5)$$

4-CONCLUSIONS

These points summarize the following conclusions

1-Investigating VSS ability to stands stochastic disturbance of defined statistical c/cs by two structure design.

2-It is shown that VSS cannot eliminate the (S.S.E) in certain cases of deterministic disturbance in similar nature as that in normal control operation

3-Analysis and mathematical formulation improve output state feedback by a logarithmic response against disturbance.

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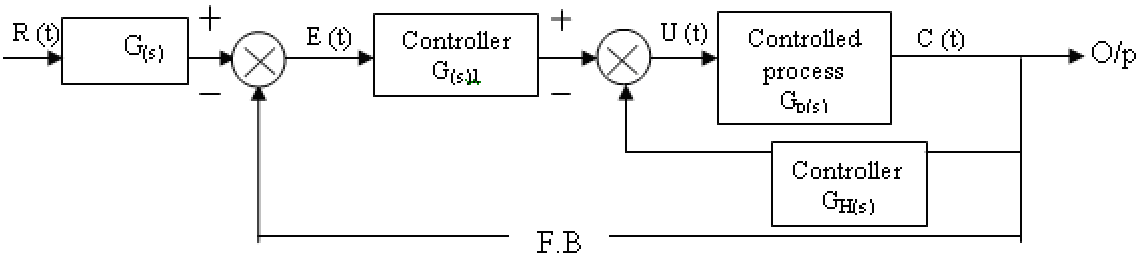


Figure 1 (a) Series feedback compensation

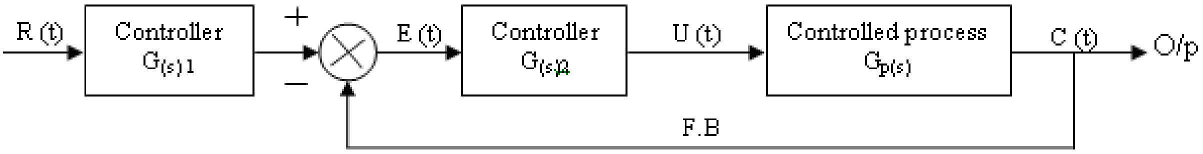


Figure 1 (b) Feed forward

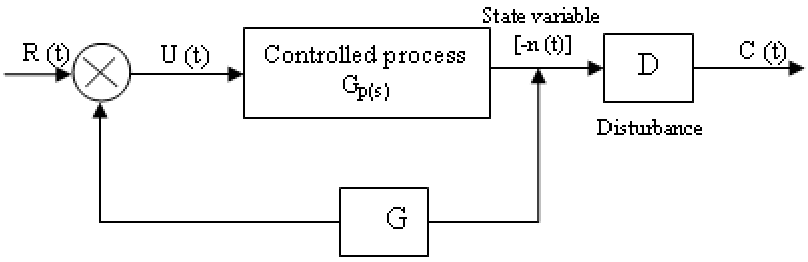


Figure 2 (a) state feedback compensation scheme

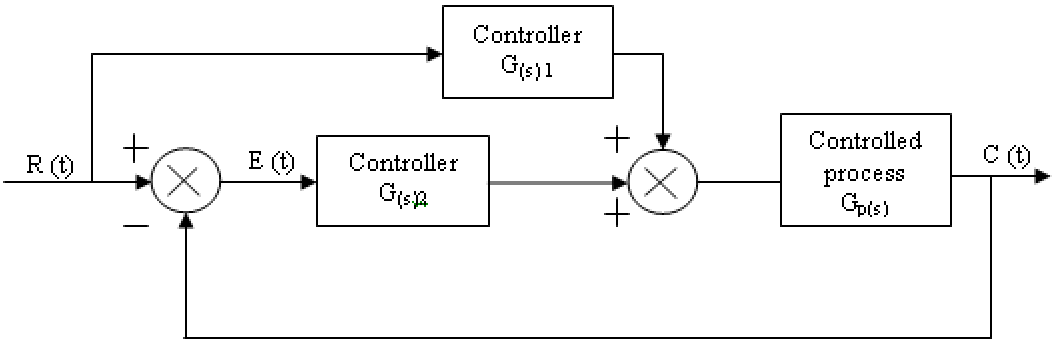


Figure 2(b) i/p series and parallel feed forward compensation

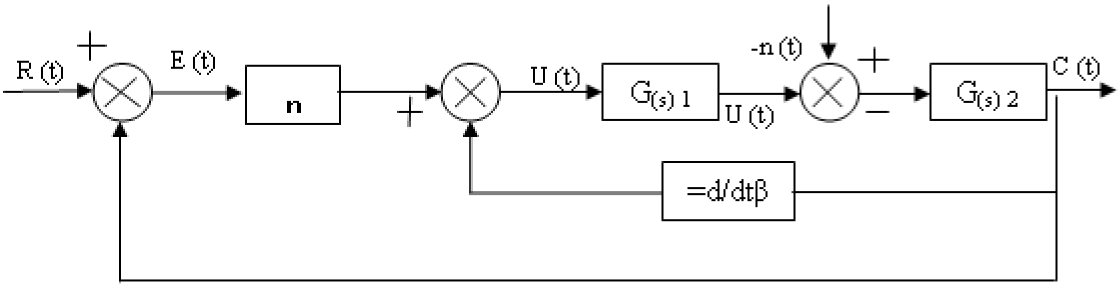


Figure 3 VSS under disturbance

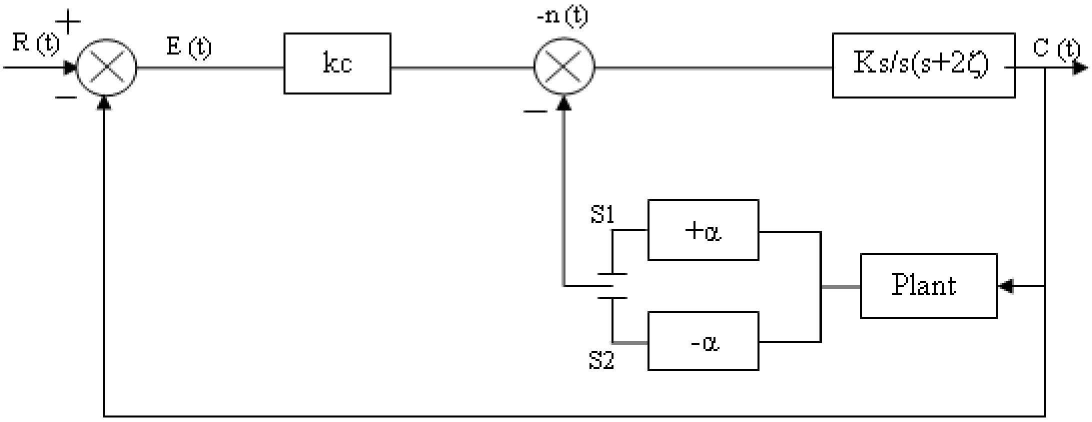
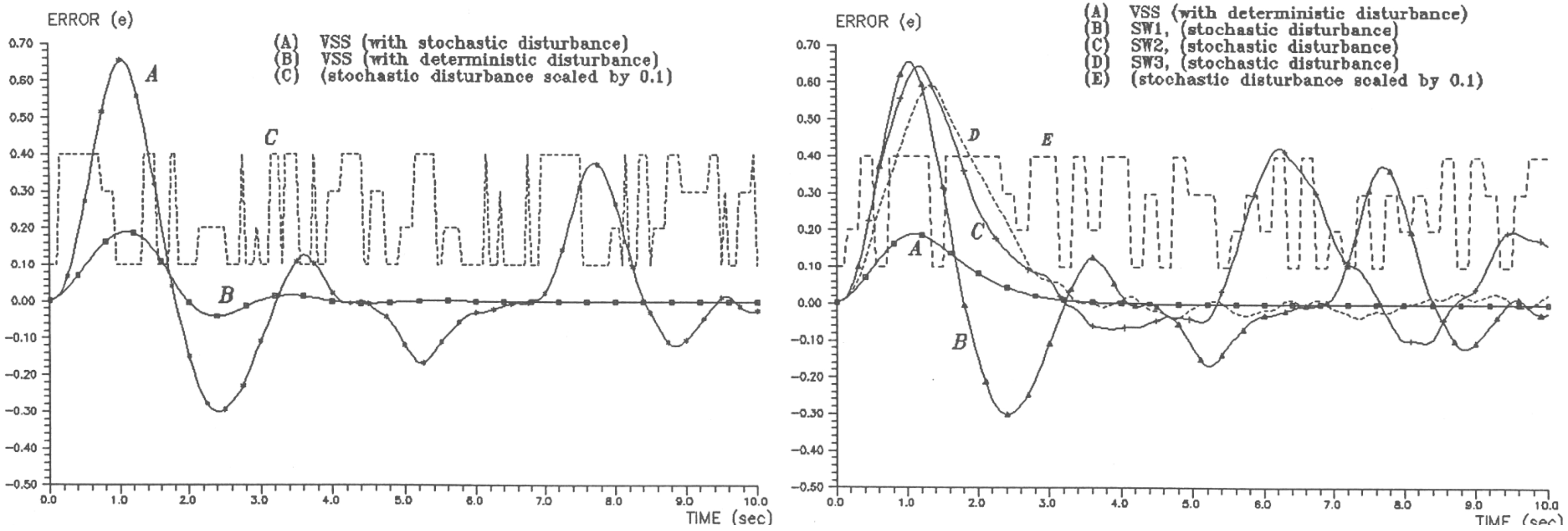


Figure 4 adaptive VSS by using 2structuer with factor disturbances [**Espana, M.D, 2010**]



(a)

(b)

Figure 5 (a) and (b) compare VSS performance with stochastic disturbance

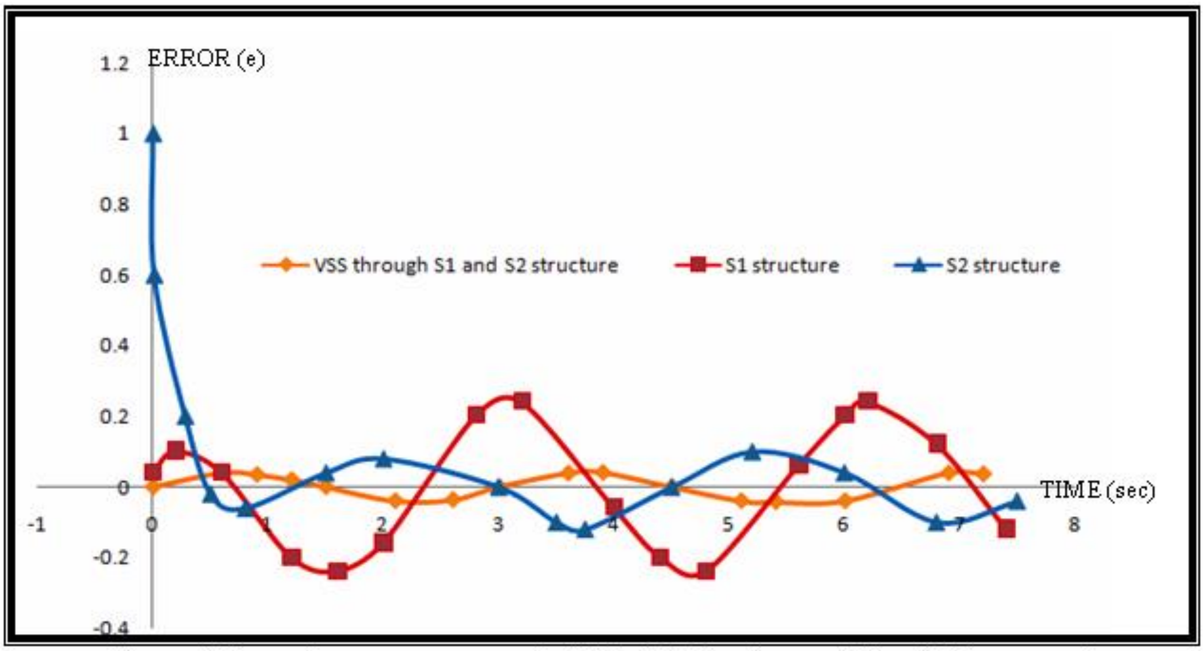


Figure 6 Chattering error response in VSS with disturbance (S1 and S2 structure)

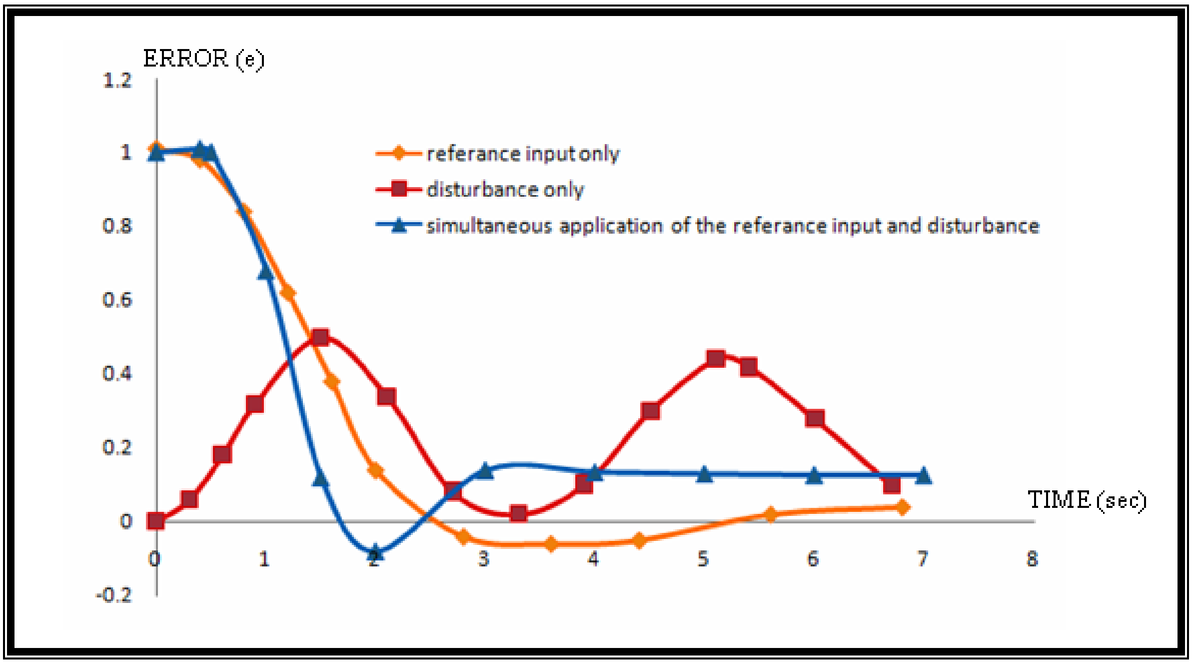


Figure 7 VSS error response performance with simultaneously effect of reference input and disturbance