Design and Implementation of a Vehicular Controller Area Network Bus System with an Application of Active Noise Control for Engine Exhaust System

Jian-Da Wu,[1] Chipan Hwang[2] and Yun-Sheng Ku[3]

[1] Institute of Vehicle and Rail Technology, National Changhua University of Education, 1 jin-De Rd., Changhua City, Changhua 500, Taiwan, ROC E-mail address: jdwu@cc.ncue.edu.tw

[2] Department of Electronic Engineering, National Changhua University of Education, 1 jin-De Rd., Changhua City, Changhua, 500 Taiwan, ROC.

[3] Department of Mechanical and Automation Engineering, Da-Yeh University, Da-Tseun, Changhua, 515 Taiwan, ROC

This paper describes the design of a vehicular controller area network (CAN) bus system with an application of active noise control (ANC) for engine exhaust systems. The work includes two parts: the first part is the design and implementation of a CAN bus platform system; the second is an application of ANC to an engine exhaust system which utilizes the CAN network implementation. The proposed ANC uses the adaptive control algorithm with engine speed as a reference. Most of the conventional methods for ANC involve primarily an adaptive filter with the least-mean-square (LMS) error algorithm. Unfortunately, convergence speed is often limited when a sound source or a filtering plant varies, because the learning process of the adaptive algorithm fails to respond quickly to the changing operational conditions. In this study, a variable step-size affine-projection algorithm (VSS-APA) is proposed. The proposed VSS-APA filtering algorithm is a combination of the variable step-size convergence algorithm and the affine-projection algorithm (APA). The controller is implemented on the proposed CAN bus system. Experiments are carried out to evaluate the noise attenuation performance at various engine speeds. The experimental results indicated that the ANC system achieved the noise attenuation in an engine exhaust system by using the proposed CAN bus system.

1 INTRODUCTION

With advances in electrical technology, network interconnections in vehicles are beginning to achieve breakthroughs for practical applications. Various communication protocols had been developed and some of them have been standardized through ISO and SAE such as J1850 and CAN [1,2]. In this study, a concentrated control system using CAN bus technology is proposed. The CAN was developed for data exchange between multiple electronic control units in a vehicle [3-7]. The structure of the proposed CAN bus system consists of two parts, namely a “softwarized distributive control system” platform and an “embedded hardware system” [8, 9]. The hardware fabrication of the CAN bus includes a microprocessor and A/D interface function for communicating with the environment [10, 12]. Then it develops an operation interface with the database to connect the experimental platform, and the experimental platform will achieve the function to design, produce and complete the CAN bus system. The microprocessor technology that developed on the CAN bus software is used in the experiments, thus accomplishing the effective development consistency data of a CAN bus system.

In general, there are two approaches to achieve noise control in a system, i.e., passive and active noise control. Passive control technique has various

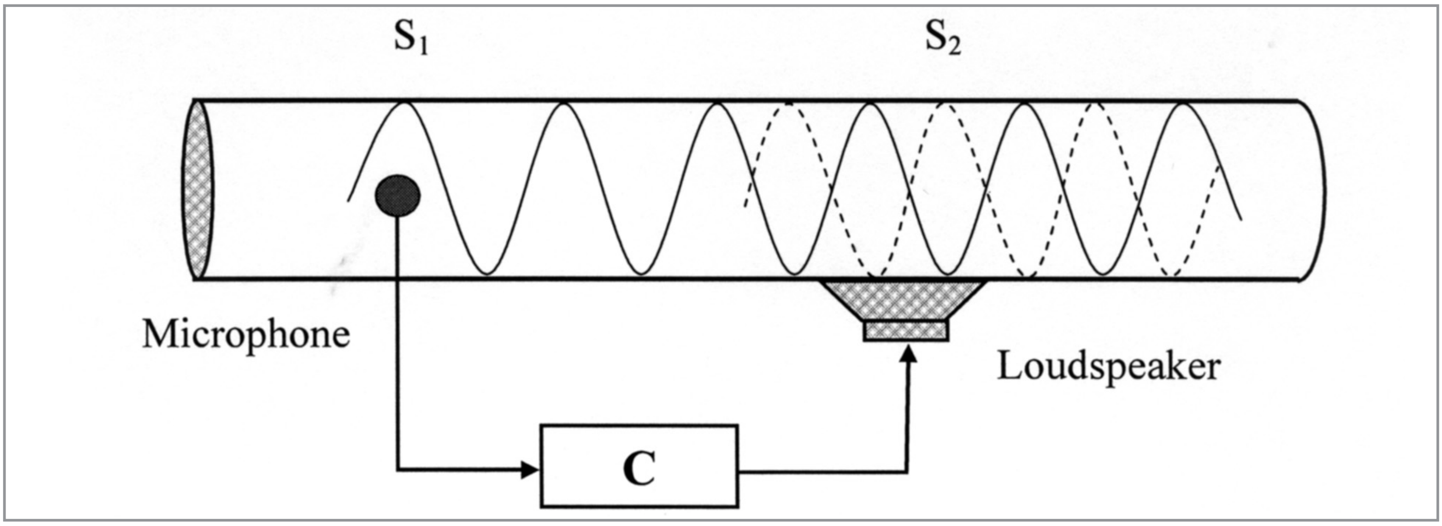

Figure 1. Sketch of Lueg's patent in 1936.

applications that reduce undesired noise in industries and environments, these include enclosures, barriers, and silencers [13, 15]. However, ANC serves as a promising alternative to conventional passive control in that it provides advantages such as improving the undesired back pressure and the performance in low frequency and time varying systems. Since Lueg file his patent in 1936 [16], research interest in ANC has been growing. The significant diagram of the ANC patent by Lueg is illustrated in Figure 1. The concept of ANC involves the principle of superposition, that is the generation of an anti-noise of equal amplitude and opposite phase to the primary noise. Then they are both combined to obtain noise cancellation.

In the ANC implementation of the present study, three adaptive algorithms are compared. In order to verify the effect of the proposed VSS-APA in an ANC system, two conventional adaptive filtering algorithms that included the filtered-x least-mean-squares (FXLMS) and new variable step-size least-mean-squares (NVSS-LMS) algorithms are compared with the proposed VSS-APA. The FXLMS is a well-known adaptive algorithm for active noise and vibration control [17, 18]. The most significant feature of the FXLMS is its adaptive property which is important in practical applications because the environment is usually time-varying and the undesired noise is nonstationary. Implemental problems often arises in practical applications when a fixed step-size is used in the FXLMS algorithm, because the convergence factor m not only controls the convergence rate, but also determines the excess of mean square error (MSE). Furthermore, μ is inversely proportional to convergence time. In general, a large μ guarantees the tracking capability of the algorithm; however, this capability is reduced when MSE is exceedingly large. By contrast, a small μ will affect the tracking capability and the convergence speed. Therefore, some of the improved algorithms were investigated, for example, in 2001, Sristi et al. [19] proposed a NVSS-LMS algorithm for an ANC system. This method provides less misadjustment and faster tracking than the pure LMS algorithm. However this study proposes a VSS-APA algorithm, incorporating the advantages of both the APA [20] and the NVSS-LMS algorithms. The following section will describe the specification of conformance tests and a corresponding test implementation with the application of an ANC system to the CAN communication protocol in the practical exhaust system.

2 DESIGN OF A VEHICULAR CAN BUS SYSTEM

The proposed CAN bus system can be divided into three parts, including embedded hardware structure, embedded software structure and an application system development platform. The structure of the proposed CAN bus system is described as follows.

2.1 EMBEDDED HARDWARE STRUCTURE

The proposed embedded hardware structure is a plug-and-play design providing easy maintenance. The hardware structure can be divided into three layers: a physical I/O interface layer, an interconnect interface layer and a processing core layer. The physical I/O interface layer is used for communication with the environment. This implementation uses an A/D chip, a step-down circuit, a D/A chip, a photo-coupler and power relay as the signal exchange interface, using a photo-coupler to separate electric noise between the microprocessor and the drive circuit to prevent voltage signals from interfering. The interconnecting interface layer controls the nodes of exchange messages. It is usually established in the network interface module of the vehicle. Figure 2 is the platform for estimating and proving the practicality and efficiency of the hardware. The I/O node uses a Siemens C505 controller of the CAN bus [10] and an analog device ADuC812[11] which is transferred from A/D and D/A (12 bits efficiency) as a handle core. The digital and analogy signal interfaces also match the personal computer and control software of Keil [12] to develop the environment for programming, compiling, loading and debugging. Further more, it utilizes a microchip MCP2510 chip to set up the network interface of the CAN bus which can be connected with the personal computer transmission interface.

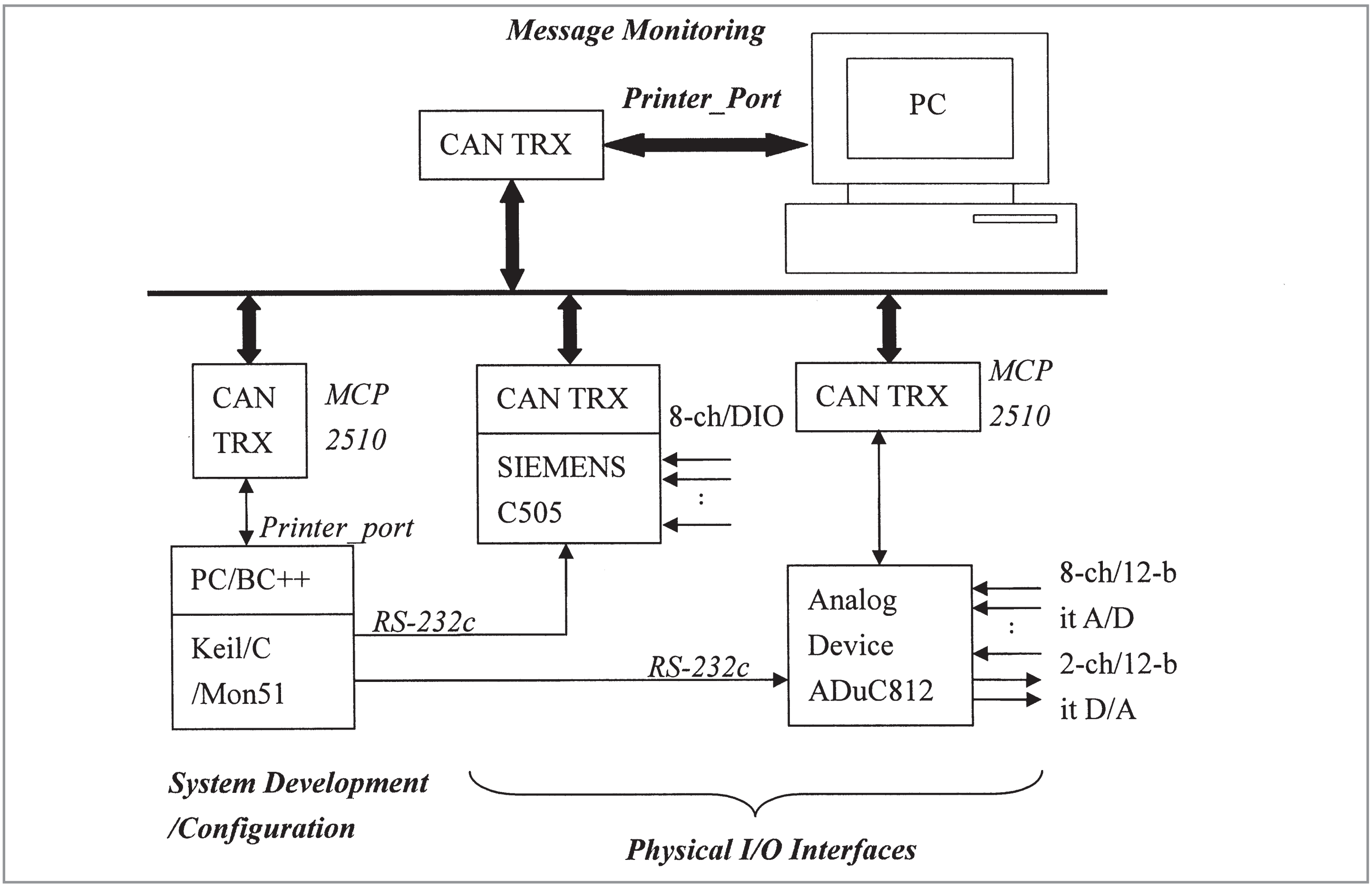

Figure 2. Hardware of platform

2.2. EMBEDDED SYSTEM SOFTWARE STRUCTURE

In this section, the development of the real-time operation system software is described. It can be divided into device driver, system kernel and system monitor. The device driver is combined by a monitor program of the sensor and driver. The main point of the layer is to execute low-level operations such as transferring, adjusting and handling for input/output messages. The monitor program of the sensor and driver is installed on each I/O node for the system responding in time. This part of the driver program system satisfies the particular user requirement and the other functions of the program can be modified by themselves. The system kernel layer not only includes the system memory management, device manager, event manager, timing handler which standard real time operation needs but also the setting message scheduler to adjust the flow of messages in the vehicular network and sequence to avoid any bottleneck in the network. The system manager layer includes the processes scheduler, scheduler, threads scheduler, communication protocol translator and semaphore manager. The goals of real-time control give the whole system the capability to perform the program according to the users requirement, order of input program, sending time and priority. The semaphore managers use it during the procedure. Sending messages during the procedure and the stage step are concurrent. It can improve control program accuracy and harmony to operate during the perform period. The communication protocol translator is used to analyse network message packs and set up the channel between the control program of simulation messages and low-level devices.

2.3 APPLICATION SYSTEM OF THE EXPERIMENTAL PLATFORM

In the section, an ANC system is developed on the proposed CAN bus platform. The hardware is matched with the definition of CAN bus message space and sets up simulation single I/O nodes for achieving the required I/O channels. In the CAN bus communication agreement, the message space is subdivided into standard identifier space and extended identifier space. The whole dispersed control system is divided into system message, configuration message and data message in the distributed control system. The planning system message occupies 0x0~0xf spaces which total sixteen spaces in extended message space. The 0x00 space is emergency message that is used in the highest priority. The 0x01 space is the halt message; 0x02 space is the resume message; 0x03 space is the system reset message; 0x04 space is the system activating message and 0x05 space is the attention message, others spaces 0.6~0xf will be reserved to extend the message.

3. ADAPTIVE CONTROL ALGORITHMS

The purpose of this work is to design and implement adaptive control algorithms for engine exhaust noise control on a CAN bus system. The practical ANC system in an engine exhaust system usually uses an engine ignition signal for reference input. In this study, the voltage signal was picked up from engine ignition circuit to obtain the engine revolutions, and then generated the synthetic narrowband reference signal for the control algorithms. The control algorithms used in this study are the FXLMS, NVSS-LMS and VSS-APA, described as follows.

3.1 FILTERED-X LEAST MEAN SQUARES CONTROL ALGORITHM

Figure 3 shows the block diagram of the adaptive filtering algorithm of the ANC system. In the figure, x(n) is the reference input signal, d(n) is the primary input signal, w(n) expresses the primary noise source, u'(n) is the digital filter output signal. The e(n) is the residual signal for d(n) and u'(n), that can be expressed as:

$$e(n) = d(n) - u'(n) = d(n) - s(n)*u(n) = d(n) - s(n)*[c^T(n)x(n)], \quad (1)$$

Where s (n) is the response of secondary-path; $c(n)$ is the coefficient vector of C (z) at time n, $c(n) = [c_0(n)c_1(n)......c_{L-1}(n)]^T$; $x(n)$ is the signal vector, $x(n) = [x(n)x(n-1)...x(n-L+1)]^T$. The secondary path function in the practical implementation includes the characteristics of the loudspeaker system, the microphone system and the path from loudspeaker to error microphone. For broadband input signals, $w(n)$ must represent the impulse response of the transfer function $C(z)$, $C(z) = H(z)/S(z)$, but for narrowband input signals, $c(n)$ must cover a substantial fraction of the input signal period. The objective of the adaptive filter is to minimize the instantaneous mean square error (MSE), $\xi = e^2(n)$ and then the updating formula for FXLMS algorithm is formed as

$$c(n+1) = c(n) + \mu x'(n)e(n). \quad (2)$$

This result shows that both the transfer function $S(z)$ and the wanted control signal emerged as the cancelling error. Therefore the transfer function $S(z)$ must be placed in the weighted update path. Namely, the reference signal input $x(n)$ is filtered by $\hat{S}(z)$ to give the optimal noise attenuation result. However in practical ANC applications, S^(z) is unknown and must be estimated by an additional filter, S(z). Therefore, the filtered reference is generated by passing the reference signal through this estimate of the secondary path, and hence in Eq. (2), except with

$$x'(n) = \hat{s}(n) * x(n), \quad (3)$$

where $\hat{s}(n)$ is the estimated impulse response of the secondary path, $S(z)$.

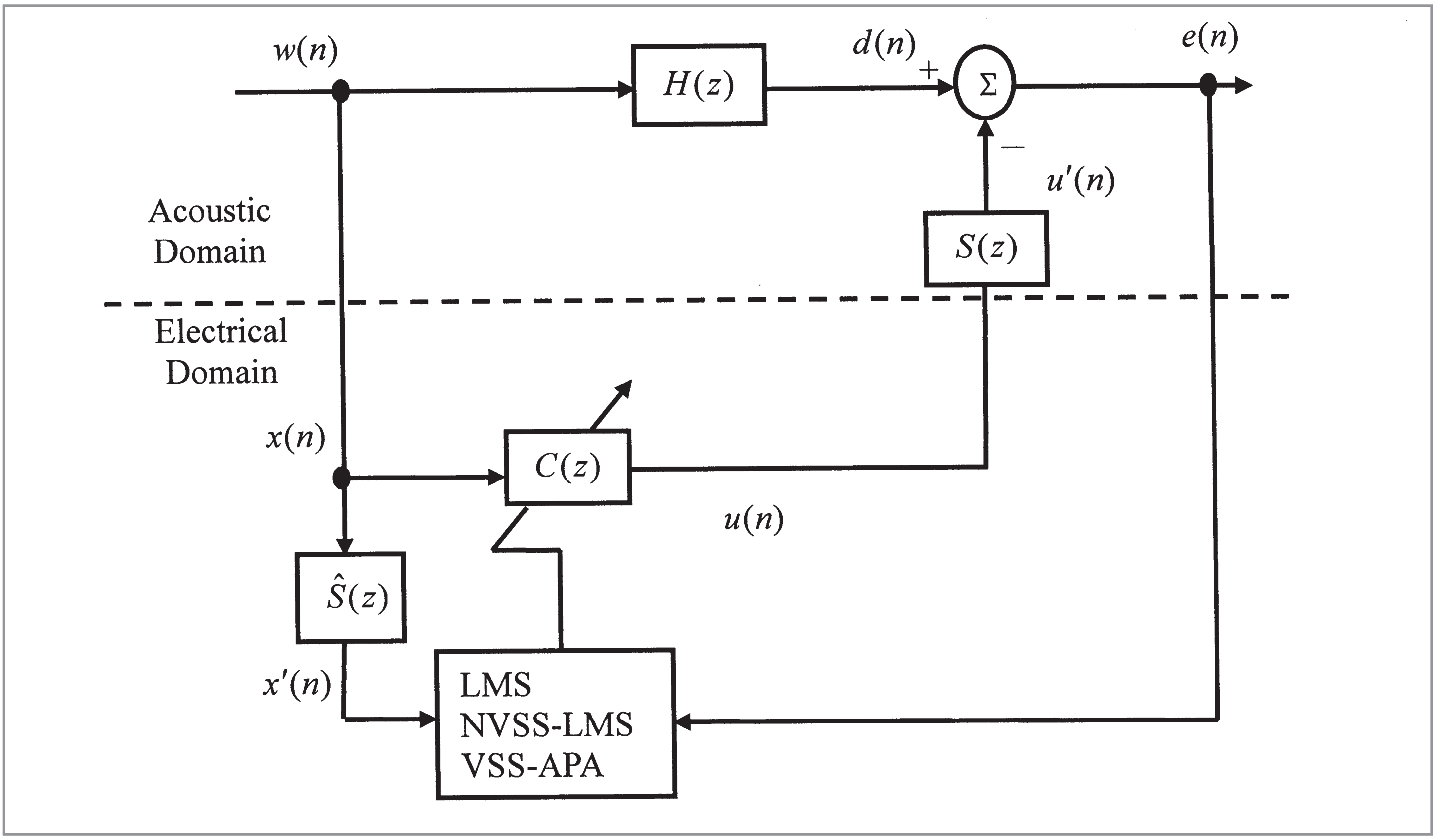

Figure 3. Block diagram of adaptive ANC system

3.2 NEW VARIABLE STEP-SIZE LEAST MEAN SQUARES ALGORITHM

The adaptive filter of variable step-size had been developed for many years; most of them are designed basically by LMS. In LMS algorithm, μ is chosen as a constant, however, the coefficient μ of the LMS algorithm will affect the convergence speed and performance of the ANC system. Therefore, the use of the variable coefficient μ in an adaptive filter is necessary. The principle of the NVSS algorithm is summarized as follows:

$$c(n+1) = c(n) + m(n)e(n)x(n). \quad (4)$$

$$\mu(n+1) = \alpha\mu(n) + \gamma e^2(n), \quad (5)$$

$$p(n) = \beta p(n\text{-}1) + (1\text{-}\beta)\ \{e(n)[e(n\text{-}1) + e(n)]\}, \quad (6)$$

where $p(n)$ is the inverse of the correlation vector of $e(n)$. The coefficients α , β and γ are fixed, respectively. The coefficient of $\mu(n)$ is a variable step-size parameter, $\mu(0) = \mu_{\max}$, $p(0) = \mu(0)$ and

$$\mu(n+1) = \begin{cases} \mu_{\max} & \text{if } \mu(n+1) > \mu_{\max} \\ \mu_{\min} & \text{if } \mu(n+1) < \mu_{\min} \\ \mu(n+1) & \text{otherwise} \end{cases} \quad (7)$$

There are two objectives in using $p(n)$ and $\mu(n)$ in the adaptive filter. First, the error auto-correlation is a good way to identify the proximity of the optimum. Second, it can effectively eliminate the uncorrelated noise in the process of the step-size update. When approaching the optimum, the error autocorrelation is close to zero, therefore a smaller step-size is needed. In order to obtain a fast convergence speed in a zero-mean independent disturbance environment, it is necessary to have a larger $\mu(n)$ at the beginning. When approaching the optimum, the misadjustment and the coefficient $\mu(n)$ ate small. However, the initial value of $\mu(n)$ should be not too large; otherwise the system will diverge. If $\mu(n)$ is too small, it will cost extra time in convergence.

In a stationary environment, it is easier for the adaptive filter to determine its proximity to the optimal one. In such cases, only a small $e(n)$ is required for feedback. Therefore, the coefficient of β is an exponential weighting parameter that dominates the averaging time constant. In non-stationary environments, it is more difficult to determine an accurate measurement of the adaptation state. Therefore, a larger $e(n)$ is required for feedback, and the coefficient of β must be smaller than 1.

3.3 VARIABLE STEP-SIZE AFFINE-PROJECTION ALGORITHM

In this section, an ANC technique using VSS-APA is described. The input signal X^T of VSS-APA is a matrix, can be expressed as

$$X^T = [x(n), x(n\text{-}1), \ldots\ldots\ldots, x(n - N + 1)], \quad (8)$$

the weight update recursion given by

$$c\ (n+1) = c\ (n) + \mu X^T(n)(X(n)X^T(n))^{-1}e(n). \quad (9)$$

The coefficient μ in the APA not only controls the convergence rate of the filter coefficients but also determines the excess MSE. Since the convergence time is inversely proportional to μ , a large μ is selected for fast convergence in applications with nonstationary input signals. This selection, however, results in increased excess MSE. In this selection, a modified version of the APA will be introduced that implements a variable step size μ for each filter weight in an adaptive transversal filter. The value of each step size varies according to an estimate of the distance to the minimum MSE, thereby providing more rapid convergence. Summing up, the setup of an initial $\mu_{\max}$ value is essential. Therefore, this study combines the NVSS-LMS algorithm [22] and the APA [20] to obtain fast convergence and performance. The input signal *x(n)* changes from vector to matrix and uses the error signal e(n) to adjust the feedback signal. The step-size can obtain optimum results with lower MSE and faster convergence rate. The output error signal is described by the equation

$$e(n) = d(n) - c(n)x(n), \quad (10)$$

where the desired signal *d(n)* is given by

$$d(n) = X^{T}\bar{c}(n) + v(n), \quad (11)$$

where $\bar{c}$ is a time-varying optimal weight vector and *v(n)* is the zero-mean independent disturbance. In simulation, Figure 4 shows the comparison of convergence speeds and MSE in different adaptive filters of LMS, NVSS-LMS and VSS-APA under the same condition. From the result, the proposed VSS-APA demonstrates the quickest convergence speed, converging at the iteration number of 1100. The NVSS-LMS converges at 2800, and LMS converges at 4000.

4. EXPERIMENTAL INVESTIGATION OF ANC IN AN ENGINE EXHAUST SYSTEM

In the experimental investigation, the adaptive controller and CAN bus system of the ANC system is proposed for reducing the engine exhaust noise. The experimental setup is shown as Figure 5. The exhaust pipe is made of steel with a length of 110 cm and a diameter of 6 cm. The locations of the control loudspeaker and reference sensor are indicated in the figure. The backward facing control loudspeaker is located downstream of the exhaust pipe. In the experiment, the reference signal is picked up from the engine ignition signal. The advantage of the engine ignition signal circuit is that it can accurately measure the ignition signals fluctuating instantaneously. The control system is

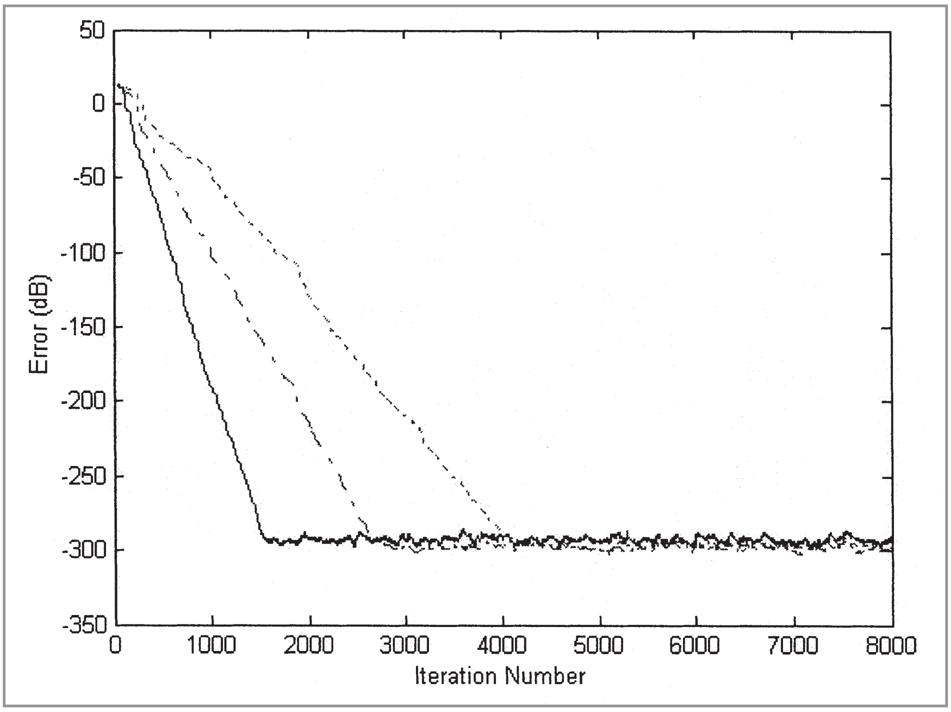

Figure 4. Comparison of convergence speeds and estimation errors in various adaptive filters. A solid line depicts convergence speed of VSS-APA; a dash-dot line depicts convergence speed of NVSS-LMS; A dotted line depicts convergence speed of LMS.

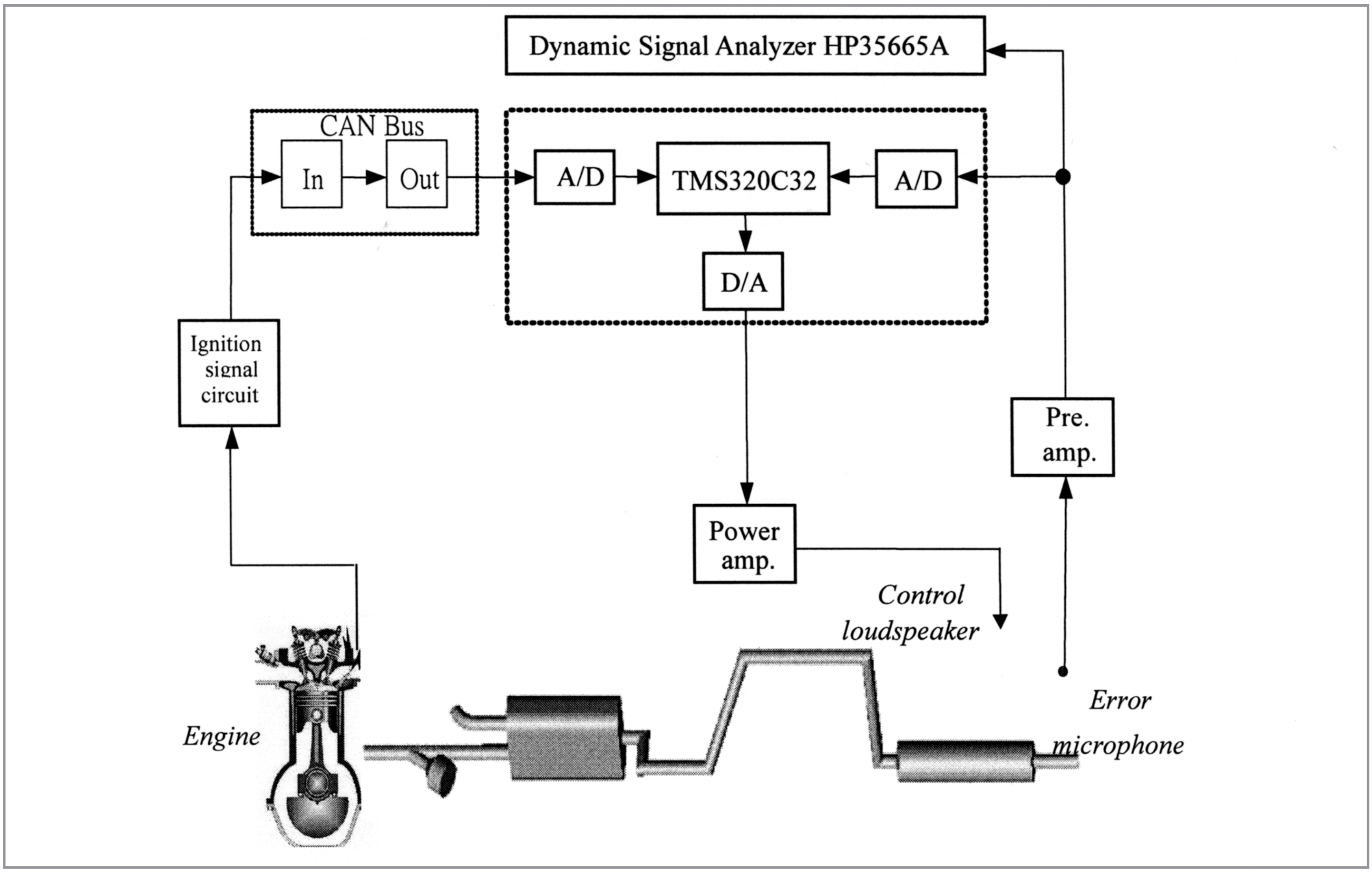

Figure 5. Experimental arrangement of ANC for engine exhaust system.

implemented by using a 60 MHz floating-point TMS320C32 digital signal processor equipped with two 16-bit analog I/O channels, using the FXLMS algorithm, NVSS-LMS algorithm and VSS-APA. The sampling rate is chosen at 4 KHz.

The objective of the CAN bus in this application is to obtain the engine ignition signal for a reference input signal in the adaptive filtering algorithms. The CAN bus circuit is composed of the engine ignition signal, operational amplifiers and some basic electronic parts. Figure 6 shows the engine ignition signal circuit. The CAN bus circuit includes A/D, D/A converter, I/O signal interface and signal interface. The input signal of the CAN bus circuit is the impulse references signal from the engine ignition signal. Figure 7 shows the input signal from engine ignition signal and the output signal of CAN bus signal in the time domain. The output signal of the CAN bus circuit is harmonically related to the reference signal and exhibits the same relative characteristics.

In order to demonstrate the proposed ANC system, the noise source was generated by a six cylinder, four-stroke, 2.0-liter internal combustion engine. The experimental arrangement for a practical engine exhaust system is shown in Figure 5. The engine exhaust noise generally contains tones at the fundamental frequency and its harmonics. The engine ignition signal circuit is utilized to detect the reference signal that is related to the engine exhaust noise. The reference signal of the ANC system is supplied by using a CAN bus system. The experimental results are shown in Figure 8 to Figure 10, the engine speeds are 800 rpm, 1000 rpm, and 1500 rpm. The results demonstrated that the noise attenuation is obtained at the fundamental frequency and its harmonics by 5-10 dB, and the experimental results are summarized in Table I. The three algorithms of ANC have different characteristics, also summarized in Table II. The proposed VSS APA algorithm has the best performance and convergence speed in implementation of the proposed CAN bus ANC system.

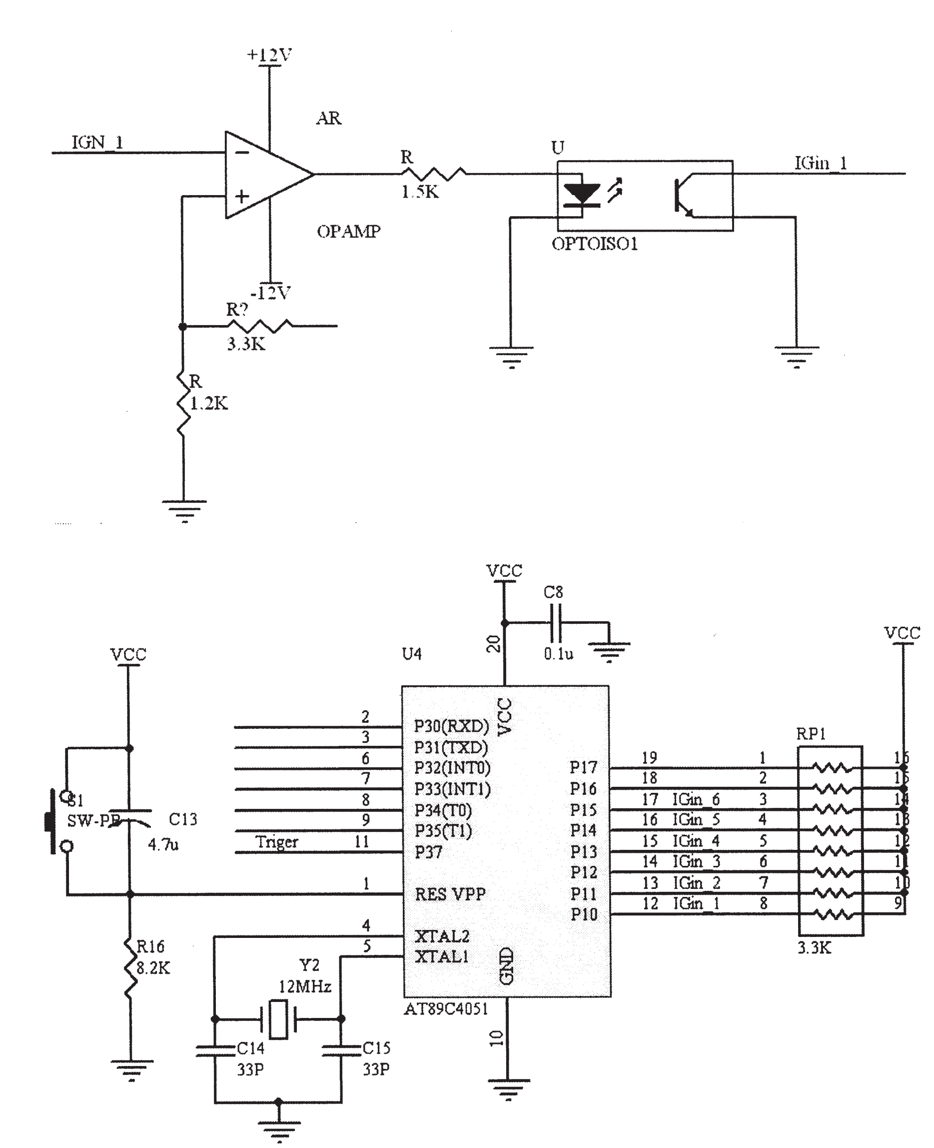

Figure 6. Engine ignition signal circuit.

NO NOISE COMPLAINTS, NOW, OR FOR THE NEXT 200 YEARS

Disgruntled residents on Napier's Bluff Hill (New Zealand) are being asked to sign a document that will gag them and future residents from making noise complaints about the Port of Napier for the next 200 years. The Port Company is being notified of building consent applications for properties closest to the port and given the chance to object or impose conditions on residential development. Conditions include banning noise complaints and barring property owners from joining the residents' group fighting the district plan provisions.

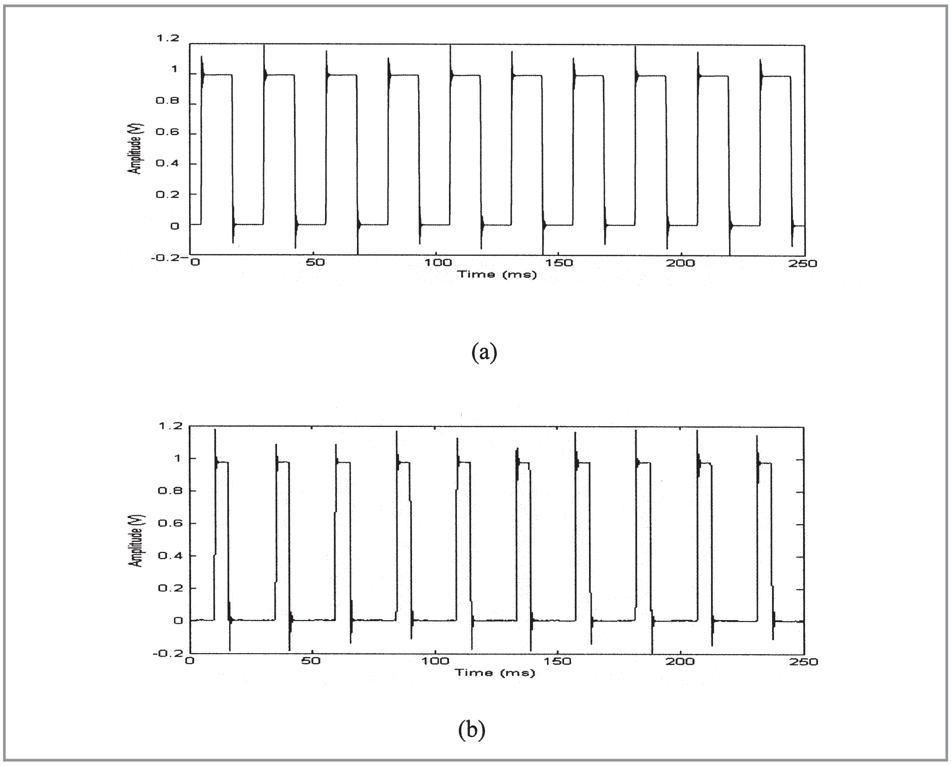

Figure 7. Signal of Engine ignition signal and CAN bus in time domain. (a) Measurement of engine ignition signal circuit; (b) Output signal of CAN bus circuit.

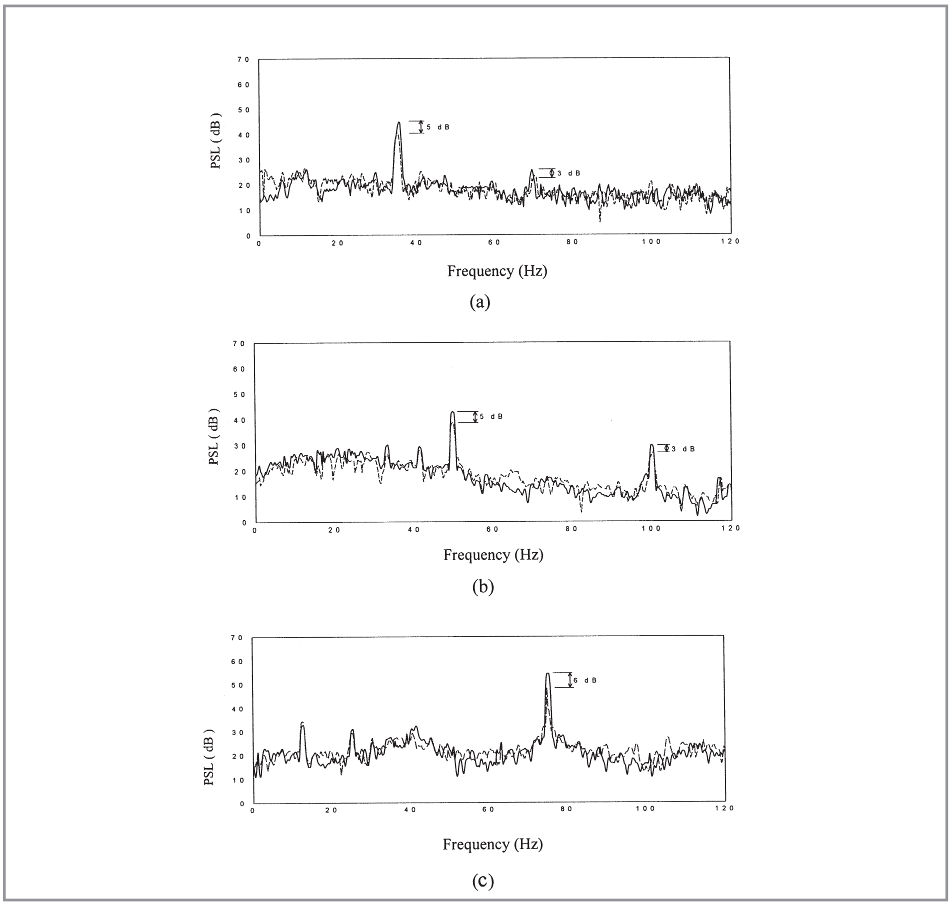

Figure 8. Experimental results of the ANC system with FXLMS algorithm. (a) 800 rpm, (b) 1000 rpm, (c) 1500 rpm. solid line: control off; dotted line: control on.

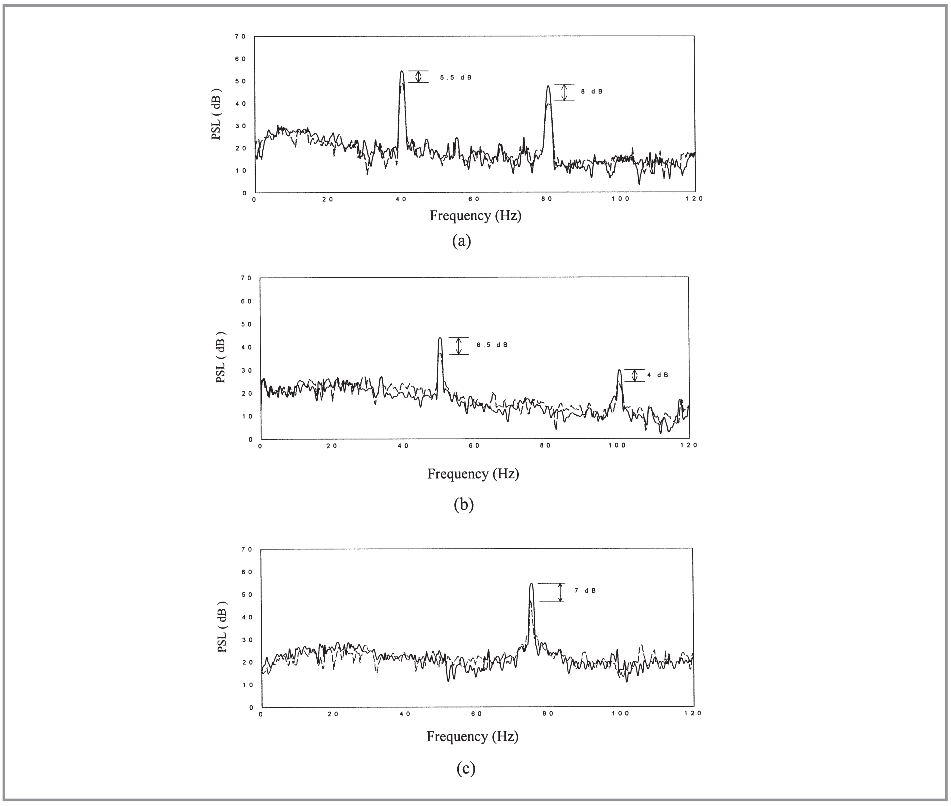

Figure 9. Experimental results of the ANC system with NVSS-LMS. (a) 800 rpm, (b) 1000 rpm, (c) 1500 rpm. solid line: control off; dotted line: control on.

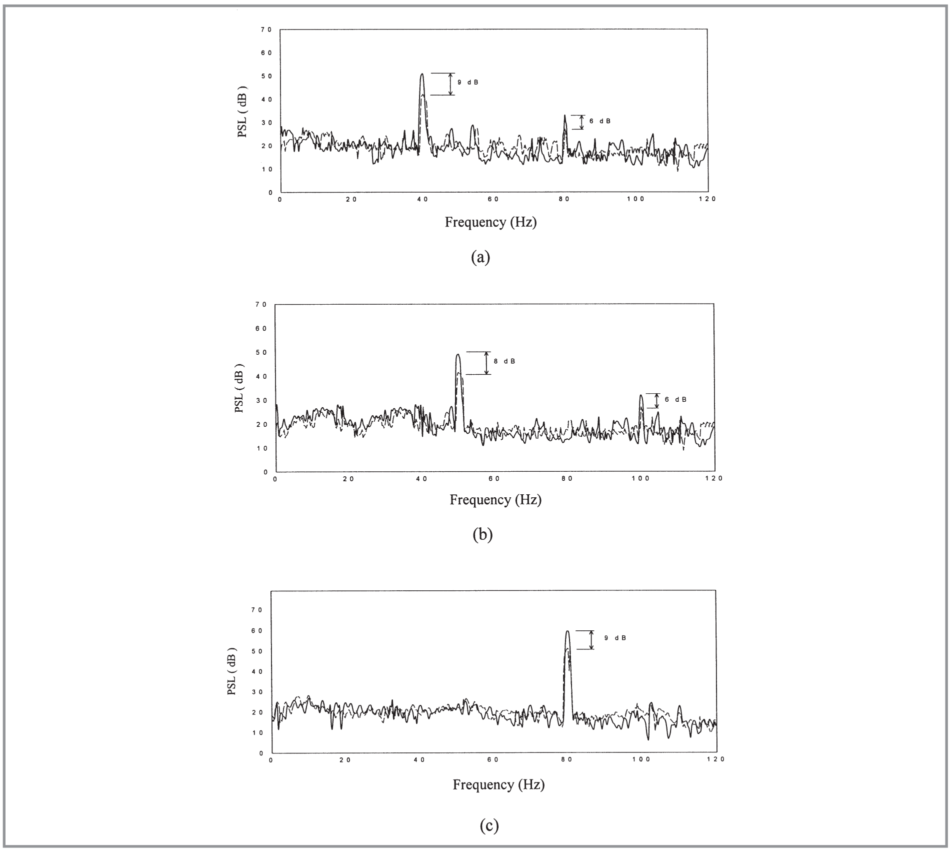

Figure 10. Experimental results of the ANC system with VSS-APAs. (a) 800 rpm, (b) 1000 rpm, (c) 1500 rpm. solid line: control off; dotted line: control on.

Table I. Total band attenuation of practical engine exhaust system

Engine speed (rpm)	800	1000	1500	Average
FXLMS algorithm	5 dB	5 dB	6 dB	5.5 dB
NVSS-LMS algorithm	5.5 dB	6.5 dB	7 dB	6.3 dB
VSS-APA algorithm	9 dB	8 dB	9 dB	8.5 dB

Table II. Comparison of FXLMS, NVSS-LMS and VSS-APA algorithms

Controller Performances	FXLMS	NVSS-LMS	VSS-APA
Convergence time	Moderate	Short	Short
Adaptability	Yes	Yes	Yes
Environment effect	Low	Low	Low
Microphone space	Limit	Limit	Limit
Filter order	Low	Low	High
Computation	Less	Less	Much
Performance	Low	Moderate	High

CONCLUSIONS

In this study, a vehicular CAN bus system is design and implemented. Three active control algorithms for reducing undesired noise in an engine exhaust system have been investigated on the proposed CAN bus system. The principles, characteristics and experimental investigations of the adaptive controllers on the CAN bus platform have been presented. The experimental results indicate that the proposed VSS-APA structure consisting of a combination of APA and variable step-size improve the convergence rate and stability of the controller. The experimental results also indicated that the proposed CAN Bus signal provides useful information of engine operation condition for the ANC system. Future design research should focus on developments to improve the broadband noise control performance of the proposed system.

ACKNOWLEDGEMENT

The study was supported by the National Science Council of Taiwan, the Republic of China, under project number NSC-91-2745-P-212-003.

REFERENCES

1. Road vehicles. Interchange of digital information, Controller Area Network (CAN) for high speed communication, International Standard ISO 11898, ISO reference no. ISO 11898:1993(E), first edition 1993-11-15.

2. Road Vehicles. Low Speed Serial Data Communication, International Standard ISO 11519, ISO reference no. ISO 11519:1994(E), first edition 1994-06-15

3. Robert Bosch GmbH. CAN Specification, 1991, Postfach 50, D-7000 Stuttgart 1.

4. OSEK Inc. OSEK/VDX Communication Version 2.2.2, OSEK, Inc, 18th December 2000.

5. Microchip Technology Inc. MCP2510 Stand-Alone CAN Controller with SPIth Interface, Microchip Technology Inc, 1999.

6. John Oliver, D. Implementing the J1850 Protocol, Intel Corporation.

7. Robert Bosch. CAN Specification, Bosch, 1991.

8. Farsi, M., Ratcliff, K., Doran, J. and Crocker, M. A CANopen motion controller implementation issues, *IEE Colloquium on, 1998.*

9. Gruhler, G. CANopen based distributed control systems, *IEE Colloquium on*, 1998.

10. Siemens. C505CA 8-bit Microcontroller Manual, *Siemens AG*, 1997.

11. Analog Device. ADuC812 Microcontroller Manual, *Analog Device USA*, 2001.

12. Keil Software Inc. uVision2 and Cx51 Compiler, *Keil Software Inc.* USA, 2001

13. Munjal, M. L. Acoustics of Ducts and Mufflers with Application to Exhaust and Ventilation System Design. New York: John Wiley and Sons, 1986.

14. Huang, L. A theory of reactive control of low-frequency duct noise, *Journal of Sound and Vibration*, 2000, Vol.238, 575-594.

15. Selamet, A. and Ji, Z. L. Acoustic attenuation performance of expansion chambers with two end-inlets/one side-outlet, *Journal of Sound and Vibration*, 2000, Vol.231, 1159-1167.

16. Lueg, P. U. S. Patent 2043416, 1936.

17. Kuo, S. M. and Morgan, D. R. Active Noise Control Systems: Algorithms and DSP Implementations, New York: John Wiley and Sons, 1995.

18. Nelson, P. A. and Elliot, S. J. Active Control of Sound, London: Academic Press, 1992.

19. Sristi, P., Lu, W.S. and Antoniou, A. A new variable-step-size LMS algorithm and its application in subband adaptive filtering for echo cancellation, Proc. IEEE ISCAS 01 2 (2001) 721-724.

20. Sankaran, S. G. and Beex, A. A. Convergence behavior of affine projection algorithms, IEEE Trans. Signal Processing 48 (2000) 1086-1096.

21. Kwong, R.H. and Johnston, E.W A variable step size LMS algorithm. IEEE Trans. Signal Processing. 1992; 40: 1633-41

22. Sristi P, L. W. and Antoniou, A. A new variable-step-size LMS algorithm and its application in subband adaptive filtering for echo cancellation. Proc. IEEE ISCAS 01 2001; 2: 721-4.

MUNDY TWP. LACKS STANDING TO COMPLAIN ABOUT PLANT'S NOISE

In Michigan, Mundy township's legal fight to stop round-the-clock noise from an automotive parts packaging firm has just taken a major hit in court. Genesee Circuit Judge Archie L. Hayman denied a request for temporary relief from revving engines and radio music blasting at Ai-Flint, saying the township doesn't have legal standing to complain about outsiders violating its noise ordinances. The judge said he sympathised with Mundy Township residents, but noted that Ai-Flint is located in Flint Township and controlled by the city of Flint under the terms of an intergovernmental agreement. "Mundy Township residents don't have standing to complain about what Flint and Flint Township are doing. I don't have the authority to issue an injunction." said the judge. He advised township officials to "put pressure" on their counterparts in Flint and Flint Township to enforce their noise ordinances.

AMERICAN-INDIAN CASINO CAUSES INTERNATIONAL NOISE PROBLEMS

A casino, on land owned by the Seminole tribe in Florida, is causing noise problems for the residents of the adjacent town of Davie. Attempts are being made to resolve the problem amicably. However, while the town and the Seminole nation do have a mutual law enforcement agreement, that agreement does not extend to nuisance complaints, such as noise. Technically, tribal lands are not part of Florida, they are foreign countries so that state laws have no standing: the casino cannot be sued by private citizens for the noise it is making, nor can local authorities bring any action against the casino either, because its laws have no force in a 'foreign country'.

COURT HANDS ITHACA PREACHER VICTORY OVER NOISE ORDINANCE

A preacher found relief from a higher authority when an appeals court ruled that Ithaca selectively used its noise ordinance to silence him in violation of his rights to free speech, equal protection and freedom of religion. The 2nd U.S. Circuit Court of Appeals in Manhattan ordered a federal judge in Albany to declare victory for Kevin Deegan, saying it found the noise ordinance “cannot withstand constitutional scrutiny.” Deegan had sued Ithaca, its attorney and its chief of police in a bid to strike down the ordinance in the college town 45 miles south of Syracuse. The ordinance, which prohibits speech that can be heard 25 feet away, led the West Seneca, N.Y., resident to stop preaching on Oct. 9, 1999, after a police officer threatened to arrest him following a complaint by a local business employee. The appeals court noted that Deegan said he had heard a singing group 200 feet away and people talking more than 25 feet from him but they were left undisturbed. The appeals court said the Ithaca noise regulation does not give fair notice that speaking in a voice that can be heard 25 feet away constitutes “unreasonable noise.” It also said the decibel level of speech that would comply with the 25-foot rule was often lower than the decibel level generated by the steps of a person in high-heeled boots, conversation among several people, the opening and closing of a door, the sounds of a small child on a playground or the ring of a cell phone. “These facts so vividly illustrate that the regulations as applied restrict considerably more than is necessary to eliminate excessive noise that we need hardly say more,” the appeals court wrote. In court papers, Deegan said he felt a duty as a Christian to preach and had spoken for more than 20 years in a raised voice to passers-by in public areas such as parks, malls, streets and sidewalks. He said he cannot communicate properly if he cannot be heard from 25 feet away and compliance with the Ithaca ordinance effectively silenced him.

BLOW AWAY THE PESKY WOODPECKERS

Many homeowners are familiar with the damage woodpeckers cause to wood and stucco siding. But it’s more than just an annoyance – repairing woodpecker damage to a house can cost thousands of dollars. In some cases, homeowners have resorted to killing woodpeckers, which is illegal in all states in the USA. “We’ve invented a safe and cost-effective way for homeowners to combat troublesome woodpeckers,’ says Jim Tassano, creator of the Attack Spider. “We’ve found that the Attack Spider saves homeowners from costly repairs and the nuisance of woodpecker noise more effectively than fake owls, snakes and other scare devices. At first glance, it might seem unusual and even comical, but customer loyalty proves that it works.” The Attack Spider is a battery-operated device that scares away damage-causing woodpeckers and other birds. Activated by sound, the spider quickly drops down on an 18-inch string while making a loud noise. The spider then climbs back up the string, ready to attack again. The predator-like characteristics of the Attack Spider prove too much for woodpeckers to handle. The device, for instance, can drive a well- entrenched woodpecker off a nesting hole. It is also used by wildlife-control professionals in the field. For more information, see www.attackspider.com.