VOICE RECOGNITION IGNITION SYSTEM

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SUPERVISOR DECLARATION

"I hereby declare that I have read this thesis and in my opinion this report is sufficient in term of scope and quality for the award of the degree of Bachelor of Mechanical Engineering (Automotive)

Signature: ……

Supervisor: ……..

Date: ……..

VOICE RECOGNITION IGNITION SYSTEM

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This Report is presented in partial fulfillment for

Bachelor of Mechanical Engineering (Automotive) with honours

Faculty of Mechanical Engineering

University Technical Malaysia Malacca

JUNE 2013

DECLARATION

"I hereby declare that this report entitled Voice Recognition Ignition System is the result of my own research except as cited in the references"

Signature : ……..……..

Author : ……..……..

Date : ……..……..

DEDICATION

I dedicate this report to my beloved parent

Fidelis Kensin

And

Ginuyah Rintingan

Ask and it will be given to you, seek and you will find, knock and the door will be opened to you

Matthew 7:7

ACKNOWLEDGEMENT

First of all, thanks to God on His grace and blessing that gave me the opportunity to complete this report. Special thanks to Proton for suggesting title of the project and gave me the opportunity to do research. In preparing this report, I was communicated with many people such as lecturer, technician, practitioners and other researcher. All of these people have enhanced and contributed towards my knowledge, understanding and thought. Therefore, I wish to express my sincere appreciation to all lectures that have contributed to the completion of this report, especially to my supervisor Dr Noreffendy Tamaldin. All of his encouragement, guidance critics and friendship had helped me a lot upon the completion of this report. I am also very thankful to Mr. Rahman Dwijotomo for his guidance and very useful tips and knowledge that been sharing while working in laboratory. Without their continuous help and support, this report would not been the same as presented here.

In additions, my entire fellow friends also deserve special thanks for their assistance in sharing information, advises, cooperation and knowledge along the research until the completion of this report.

Last but not least, I was very grateful to all my family members especially my parents for their continuous support, encouragement and motivation that always keep me up and try harder to do the best to complete this report.

ABSTRAK

Salah satu faktor yang membawa kepada berlakunya kes kecurian kenderaan di Malaysia adalah kelemahan sistem sekuriti yang sedia ada pada sesebuah kenderaan. Melalui penciptaan sistem pencucuhan melalui pengiktirafan suara, tahap keselamatan sesebuah kenderaan dapat ditingkatkan kerana teknologi ini menggunakan pengiktirafan suara bagi menghidupkan enjin kenderaan. Perbezaan frekuensi dan nada suara setiap orang adalah beberapa faktor yang mempengaruhi arahan suara dalam sistem pengecaman suara. Untuk memastikan fungsi dan kebolehpercayaan sistem ini, satu eksperimen berskala kecil yang melibatkan beberapa sampel suara telah dijalankan. Melalui eksperimen yang telah dijalankan, sistem ini didapati boleh berfungsi dengan baik dan berupaya membezakan suara yang berbeza frekuensi. Dapatan ini menunjukkan sistem pencucuhan melalui pengiktirafan suara ini mempunyai tahap sekuriti yang tinggi dan hanya akan beroperasi dalam julat frekuensi tertentu, berdasarkan suara pengguna sebenar yang telah diprogramkan di dalam sistem.

ABSTRACT

One of the factors that lead to vehicle stolen cases in Malaysia is the weakness of existing security system of vehicle. Through the invention of Voice Recognition Ignition System, the security level of a vehicle can be enhances since the device uses voice recognition detection in order to start a vehicle. Variation of pitch frequency and voice tone amongst people are few of the factors that affect the voice command in the voice recognition system. In order to verify the functionality and reliability of the system, a small scale experiment was conducted which involves several voice samples. Through the experiment, it is found that the voice recognition ignition system functioning well and capable to differentiate different frequency of voice. This showed that the security level of the Voice Recognition Ignition System is high which the system only operates within a specified frequency range, depending on the pre-programmed real user voice.

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INTRODUCTION

1.1 BACKGROUND

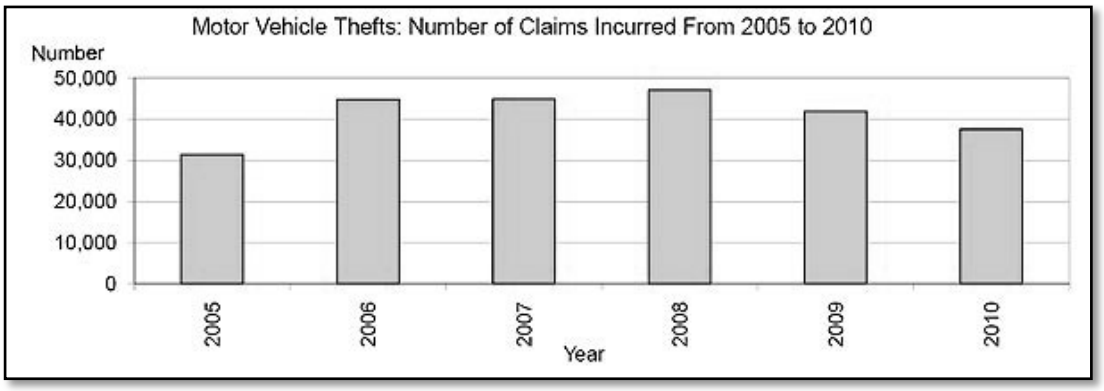

Figure 1.1: Statistic of Stolen Vehicle in Malaysia (Source: Persatuan Insurans Am Malaysia, PIAM website)

According to the statistic of stolen vehicle issued by the Persatuan Insurans Am Malaysia, the average number of stolen vehicle cases for six consecutive year starting from 2005 to 2010 was around 30 000 cases per year. The high number of stolen vehicle case causes losses of thousands dollar to the vehicle owner. Vehicle theft usually occurs in public parking such as supermarket and hotel which less people wandering. In order to avoid the occurrences of vehicle stolen cases, vehicle should equipped with anti theft devices which will increases the vehicle security or can act as alarm that will alert the surrounding people.

1.2 PROBLEM STATEMENT

It is known that one of the factors that lead to the vehicle stolen cases is weak security system of a vehicle. A good security system of a vehicle will reduced the probability of the vehicle from being hijacked by irresponsible person and directly will reduced the number of stolen vehicle cases. Hence, vehicles with good security system allow the driver to leave their car in public parking area without worry. Therefore, the development of voice recognition ignition system will enhance the security system of vehicles since the vehicle will only operate by the voice command of the vehicle user.

1.3 OBJECTIVE

The main objective of this research is to develop voice recognition system that can be implemented in vehicles for starting the engine of the vehicle. The voice recognition system must be able to differentiate different frequency of voice for security purpose.

1.4 WORK SCOPE

The scope of this research is reduced to small scale experiment to test the designed system in laboratory. It does not involve the real environment of the vehicle starting system due to limited cost or budget of project.

1.5 REPORT SUMMARY

The first section of this report is Chapter 1 which introduces the research background, problem statement, objective and the work scope.

Literature review is in Chapter 2 which about the study of the theoretical background of this research.

The next section is methodology in Chapter 3 which about the list of tools, materials and the procedures that been used along the research process.

Chapter 4 in this report showed the result and finding of this research.

Chapter 5 discusses and explains in detail about the results obtained. This section also discuss about the problem encountered and the solution along the research duration.

The last section of this report is Chapter 6 which concludes the overall research and some recommendation for future research.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Speech is the common method of communication between people. Due to various reasons, the research in automatic speech recognition by machine has attracted a great deal of attention over the past five year. Among the reason that lead to the research of speech recognition by machine is the technological curiosity about the mechanisms for mechanical realization of human speech capabilities and the desire to automate simple tasks inherently requiring human-machine interactions. (Özturk, N.; Ünözkan, U., 2010), (Juang, 2005)

2.2 Theory

The advance technology increases the importance of communication between human and machine. One of the current research for improving the interaction or communication efficiency between human and machine is the voice recognition system. Talking has advantages for interaction between human and machine since it can be done naturally, efficient, effective and flexible. Voice recognition enables people to communicate and control robot. Industrial equipments or motor also can be controlled without the use of hand. In addition, a powerful voice recognition system can provide many benefits for paralysis patients. In other word, voice recognition system can be used in wide range of industry such as home appliances, automotive industry, system with phone and emergency system operating by giving voice command. (Polur, 2005)

In voice recognition system, there are many factors that affect the voice command such as the different pitch and tone of various people. In addition, the emotion, pressure, health status and other environmental changes such as noise also affect the quality of voice command perception. Previous research on conventional voice recognition system found that there are six basic structures in a typical voice recognition system. Among structures including recording, signal endpoint detection, amplification, voice feature extraction and voice model comparison. All of these components enable a system or a machine to interpret the voice command issued (Liu, 2008). The basic principle of voice recognition involves the identification of the voice features, and then followed by the application of different algorithms. The application of various algorithms is to determine the discrepancy between the source and the audio sample in the database (Lai, 2000).

Overall speech sounds are composed of linear combination of sine waves with different frequency. For human voice, the frequency range is in between 300Hz to 3300Hz. It is possible to make an effective sampling with a double frequency value of sound and a higher sampling frequency according to the Nyquist Theorem. In order to recognize the voice expression, the voice must be firstly converting from analog signal into numerical expression, then isolating the real character from the signal and recognizing the obtained information by recognition process. The first stage of the voice recognition process is transmitting the voice expression to the system through a microphone. The voice then converted into a numerical expression and will become ready to be analyzing by suitable method. (Karacı, 2006), (Huang, 2001)

2.2.1 The Design of Voice Recognition System via Grey Relational Analysis

Grey relation analysis is a method of analysis which used a specific concept of information. Grey relation defines situations and representing it as black and white. Black is for situation with no information, while, white represent a situations with perfect information. In other word, grey system is a system in which part of information is known and part of the system is unknown. Therefore, grey system showed no solution can be defined for system with no information while give unique solution for situation with perfect information (Chan, 2007).

The grey system theory was created by Professor Deng in 1982, and it is applied to the uncertain model system and incomplete information. The relational analysis and model construction can be made by referring to grey system theory. Based on the theory also, the system situation can be understood by using prediction and decision making method. In addition, it can also solve the problem of multi input real system and uncertainty. Most of the voice recognition system that been research by only focusing on the control algorithms and very few were related to grey system theory. In the design of voice recognition controller via grey relational analysis, it covers the mathematical model analysis which is grey relational grade (Hsiu, 2011).

The structure of the voice recognition design in the system featured for this design which used grey rational analysis can be divided into three components. The structure started from the primary platform which PC-based workstation. This first component responsible for the processing of voice signals sampling and filter. The second component is the segmentation of voice using Mel-scale Frequency Cepstral Coefficients (MFCC). The last components is the comparison and computation that using grey rational analysis. The system will identify the closest sample as the result of recognition after comparing the voice sample with the reference database. The overall structure of the voice recognition controller via grey relational analysis is as shown in Figure 2.1 below.

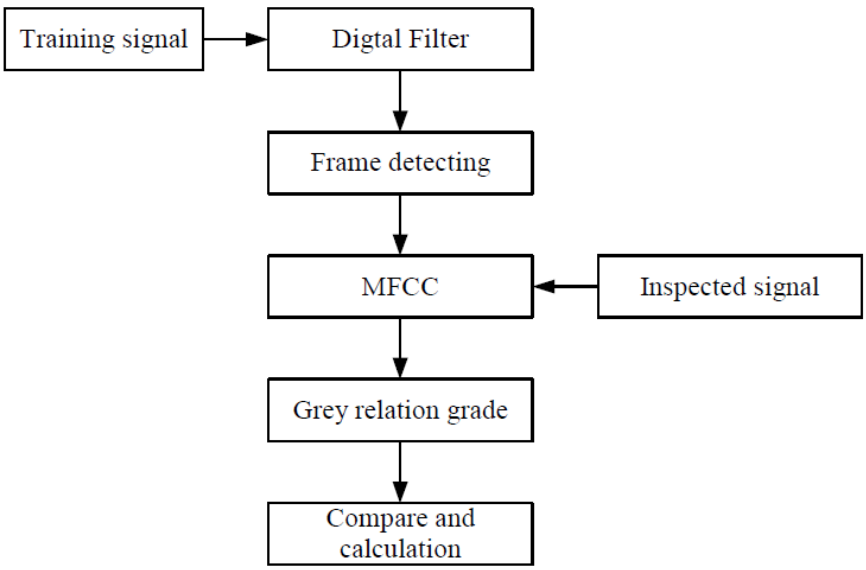

Figure 2.1: Structure of the voice recognition controller via grey relational analysis (Source: Hsiu, 2011)

2.2.2 Access Control System Based on Voice Recognition

Due to the different purpose and function, the voice recognition system can be classified as speech recognition and speaker recognition. Speech recognition system identify the word that been speak while, speaker recognition system recognize who is speaking. Speaker recognition also can be divided into two types which are relevant to the text and the other is irrelevant to text. The voice recognition system that is relevant to text needs users to pronounce according to the stated contents and then everyone speech model is built up accurately. This types of voice recognition is effective for security because voice identification from user is needed before the system operate. While the voice recognition system that irrelevant to text does not rule the pronunciation contents of the talkers. Speech model for this type of voice recognition is difficult to build but is more convenient and widely used (Han, 2004).

In this voice recognition design, the central processor is the SPCE061A single chip. This is speaker recognition system which the talker confirmation that is relevant to the text is realized on the chips. After the confirmation process, the system will perform homologous order and operations are carried out. In training, the voice of the stalker gets into voice signal collection circuit through a microphone. The collected signals are processed by the voice processing circuit. In this process, the characteristic parameters of the talkers are filtered and saved in the database. In identifying process, the voice collected from the user and compared with the voice characteristic parameter in the database. After the collected voice or input compared with that in the data base, the output circuit controls the gating electrical machine and controlled the door lock. The system will perform an action which is to unlock or to remain lock the door corresponds to the compared result. The frame of the system is as shown in the Figure 2.2 (Cui, 2009).

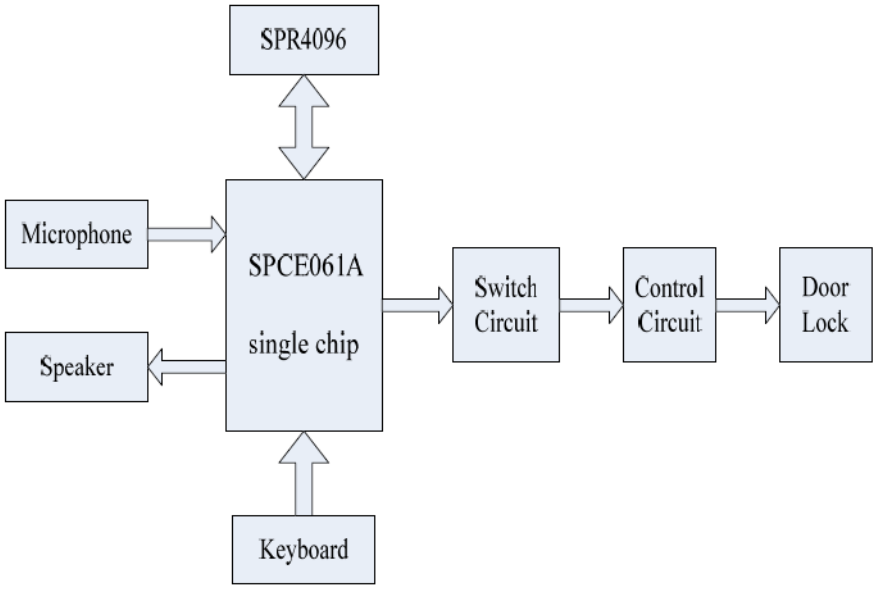

Figure 2.2: The frame of the system (Source: Cui, 2009)

The principal of the voice recognition circuit is that the voice signals are analyzed by the intelligent system after distilling voice. The noises are filtered and only the useful voice signals are distilled through the filter group. The filtered signal then are processed and chosen by calculation match. The voice signal then carried along with the voice datum in the database after processing and analysis. Lastly, the voice recognition performs an output according to the match result (Cui, 2009). Figure 2.3 showed the basic structure of the voice recognition circuit.

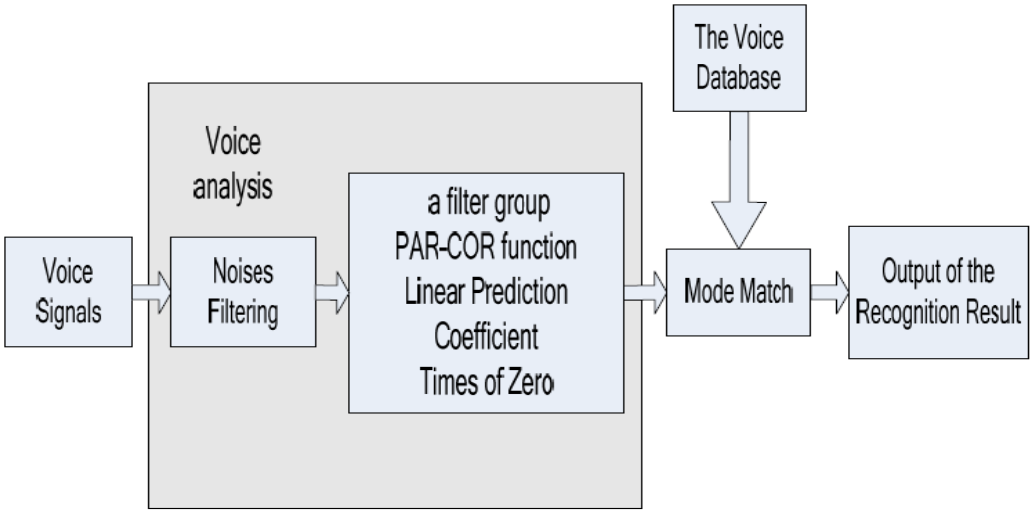

Figure 2.3: Voice recognition circuit (Source: Cui, 2009)