SOUND CHARACTERISTICS FOR SWIFTLETS ATTRACTION

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ABSTRACT

This project research about the analysis of sound can attract the swiftlets enter in swiftlets house. This is because the main swiftlets character is attraction toward sound. But the problem is doing not have any research to identify sound characteristic most are swiftlets more attract. These are important use for industry to attract swiftlets enter and build their nests in man-made house. In house fitted bird-call recording in cave to attract attention bird go inside house to be doing nest. Therefore, this study shall be analyzing sound features that there is in bird-call recording that has attracted attention bird. The method that will be used is taking a few of sample of swiftlets sound for analysis by using Matlab software. From analysis can identify sound characteristic where can attract swiftlets from analysis the signal. The expectation from this research is can find sound characteristic for swiftlets attraction by analysis the frequency and amplitude of noise sound and original sound.

ABSTRAK

Kajian projek ini tentang analisis bunyi yang boleh menarik burung walet memasuki rumah burung walet buatan manusia. Hal ini kerana, sifat utama burung walet yang tertarik ke arah bunyi. Tetapi masalahnya ialah tiada sebarang kajian untuk mengenal pasti ciri-ciri bunyi yang membuatkan burung itu tertarik untuk membuat sarang burung di dalam rumah. Perkara ini penting kepada penggunaan industri untuk menarik swiftlets memasuki dan membina sarang mereka dalam rumah buatan manusia untuk tujuan perniagaan. Rakaman kicauan burung dalam gua iaitu habitat semula jadi burung walet untuk akan diletakkan di luar rumah untuk menarik perhatian burung untuk masuk ke dalam rumah untuk membuat sarang. Jadi, kajian ini akan menganalisis ciri-ciri bunyi yang terdapat dalam rakaman kicauan burung walet tersebut yang menjadi penyebab burung walet tertarik terhadap bunyi tersebut. Kaedah yang akan digunakan mengambil beberapa daripada sampel bunyi burung walet untuk dianalisis dengan menggunakan perisian Matlab. Daripada analisis tersebut, kita boleh mengenal pasti ciri- ciri bunyi yang terdapat pada rakaman tersebut dengan analisis terhadap isyarat yang diperolehi. Jangkaan dari penyelidikan ini ialah boleh melihat analisis terhadap bunyi asal dan bunyi bising dari aspek frekuensi dan kekuatan bunyi.

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FFT – Fast Fourier Transform

RHS – Right Hand Side

LHS – Left Hand Side

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CHAPTER 1

INTRODUCTION

1.1 Background

In this bustle development and modern century, healthy care is very important to human for continue their life. To obtain good healthy we must remember prevent disease better than treat. Because of that, we might need to choose health nutrition can care our health such as bird's nest from swiftlets. The nests of some species are built entirely from threads of their saliva, and are collected for the famous Chinese delicacy bird's nest soup [1].

Minister of Agriculture and Agro Industrial, Datuk Seri Noh Omar said the nests of swiftlets can give income that is luxurious for selling. This is because the demand that is high in the whole world such as China, Japan, America and Europe but only 20%-30% fill up global demand and the profit will be getting 80%-90% from capital production [2].

This is because Chinese medical study in Beijing find out swiftlets's nest make skin whiting agent and also good for eye's health. For asthma sufferer, it also became best agent restore respiratory system and strengthens lungs.

Result of experiment and present research that bird's nest benefiting all age level such as collagen nutrient which include in every swiftlets's nest can launch blood vessel increase appetite and improve alimentary canal, swiftlets's nest can reduce sputum and heal cough, nutrition that is good for lungs and strengthen respiratory tract, swiftlets's nest intake when pregnancy can lessen sense of pain in bottom, strengthen baby lungs that being included, accelerate healing process after giving birth, for woman systematically nutrition can enhance metabolism force, improve skin and delaying ageing process, for old people, systematically nutrition can strengthen vein and bone also increase body resistance to illness, for children the bird's nest can magnify nutrition absorbency that there is at every food and strengthen lungs and lastly elected as food that is very good to smokers apart from being able to reduce effect that mooted from from nicotine and prevent cancer attack [3].

The nests can give high potential and also benefiting for health although the value reaches thousands of ringgit. Within more this a decade, entrepreneurs explored various methods and new technology to increase production. There are a few factors to make swiftlets attract such as aroma, light, temperature, humidity and sound. Report from Department of Veterinary Services in Malaysia the swiftlets character is sensitive toward sound. Previously, sound that produced at swiftlets husbandry premise actually is produced from recording audio sound bird voice [4].

Therefore, the research and development about sound characteristic for swiftlets attraction needed to develop swiftlets industry. This is use for industry to attract swiftlets enter and build their nests in man-made house. The income can give benefits for good economic and healthy.

1.2 Problem Statement

Nowadays, bird house for swiftlets farming usually developed and equipped with recorded sound of chirping and mating from cave (natural habitat) to attract swiftlets to enter and build nest. These sound just taken using trial and error method without analysis (frequency, amplitude, wavelength, or other element) the elements of sound involve in signal to attract the swiftlets. This method is sometimes successful to attract the swiftlets, but certainly these sounds contains noisy and disturb by another sound. There are no details researches about type of sound or characteristic of sound that make the swiftlets attract.

1.3 Objective

The proposed analyze sound for swiftlets attraction by conducted some basic objectives of research step. The following objectives are:

i. To analyze the sound for swiftlets attraction at location can attract the swiftlets enter in swiftlets house.
ii. To find the elements of sound in the sound have been analyzed.
iii. To identify the sound of characteristic for swiftlets attraction.

1.4 Scope of Project

In order to achieve the research objectives, the following scopes will be covered:

i. In this project, there are tens samples of sound have placed at external location in swiftlets's house to be analyzed.

ii. Type of sound is one of the most factors in this project. So, I have decided to choose analyzed the original sound and noise sound in aspect:
    a) Frequency
    b) Magnitude

1.5 Thesis Outline

This thesis is organized as below:

Chapter 1 will describes the introduction of this system, the purpose of this project, problem statement, the work scope and brief explanation of this project.

In **Chapter 2**, the reviews about the information find on all the material or data used include the software in the development of this project will be shown.

Chapter 3 will explain about all the methods use in development of this system and also step by step on develop the module for training purpose and lastly described about the execution part.

Chapter 4 will show all the results followed by the explanation and discussion about the results from the beginning step until the end of development module.

Last chapter of **Chapter 5** will have a summary to describe the overall part of this project and come up with some recommendations and improvement.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter discusses on topics about swiftlets, sound, swiftlets attraction, sound characteristic, and sound analysis. Furthermore, discussion on sound classification FFT (Fast Fourier Transform) Algorithm and FFT application are presented.

2.2 Swiftlets

Swiftlets are birds contained within the four genera Aerodramus, Hydrochous, Schoutedenapus and Collocalia. They form the Collocaliini tribe within the swift family

Apodidae. This group contains around thirty species which is mostly confined to southern Asia, south Pacific islands, and northeastern Australia, all within the tropical and subtropical regions. They are in many respects typical members of the Apodidae, having narrow wings for fast flight, with a wide gap and small reduced beak surrounded by bristles for catching insects in flight [1].

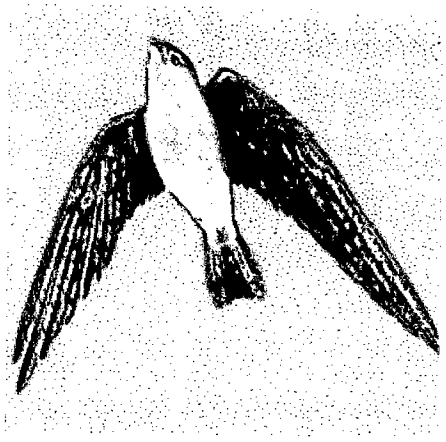

Figure 2.1 Swiftlets

A small-sized swift (*Family Apodidae*) have 24 species worldwide. The main producers of edible nest are White-nest Swiftlets (*Aerodramus fuciphagus*) and Black-nest Swiftlets (*A. maximus*). Two unique characters are salivary gland to build nest and Echolocation [16].

Figure 2.2 Swiftlets build nest from threads of their saliva

The distinguishes are many but not all species from other swifts and indeed almost all other bird is their ability to use a simple but effective form of echolocation to navigate in total darkness through the chasms and shafts of the caves where they roost at night and breed. The nests of some species are built entirely from threads of their saliva, and are collected for the famous Chinese delicacy bird's nest soup [1].

2.3 Swiftlets Attraction

There are environmental factors such as temperature, light intensity, humidity and sound is the key of successful place for swiftlets [8]. Sound is the main attraction for swiftlets for place in their house. The most interesting feature of swiftlets is that many species utilize a sonar-like system [9]. The swiftlets's voice proven very effective attracts swiftlets to be nested in bird house for swiftlets farming [10]. This is shown that swiftlets very sensitive on sound.

The previous research state that swiftlets hearing responses to the frequency 1 - 16 kHz [8] and which most energy on 2 - 5 kHz [12]. This frequency falls into normal hearing. This statement is shown that in general, the animals generate sounds to communicate with members of the same species [11]. Ińi year 1990, technique for swiftlets attraction by using recording began to be expended but recording quality that is adverse. Through technology development, swiftlets recording voice that produced with quality, clear and similar authentic swiftlets voice. This swiftlets's recording voice usable to increase swiftlets population to build nest. There are two locations to attract the swiftlets entered the swiftlets farming house which are puller and external [10].

2.3.1 Puller

The locations at puller swiflets's house is on the roof house. Mostly, this location will fit the swiftlets voice when they gather.

Figure 2.3 Puller locations at the swiflets's house

2.3.1 External

The location at external swiflets's house is on the outer house. Mostly, this location will fit the adult swiftlets voice.

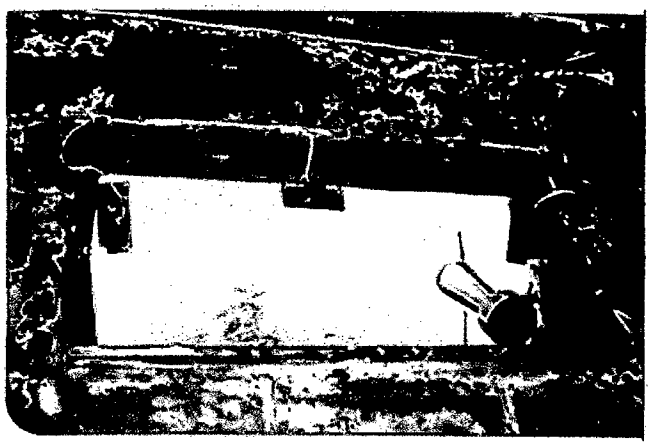

Figure 2.4 External locations in swiflets's house

2.4 Sound

Sound is a mechanical wave that is an oscillation of pressure transmitted through a solid, liquid, or gas, composed of frequencies within the range of hearing and of a level sufficiently strong to be heard, or the sensation stimulated in organs of hearing by such vibrations. Sound is a sequence of waves of pressure that propagates through compressible media such as air or water. When sound is moving through a medium that does not have constant physical properties, it may be refracted (either dispersed or focused). The perception of sound in any organism is limited to a certain range of frequencies. For humans, hearing is normally limited to frequencies between about 20 Hz and 20,000 Hz, although these limits are not definite. The upper limit generally decreases with age [6].

Sound is produced by the vibration of sound pressure waves in the air. Sound pressure levels are used to measure the intensity of sound and are described in terms of decibels. Sound is composed of various frequencies, but the human ear does not

respond to all frequencies. Frequencies to which the human ear does not respond must be filtered out when measuring highway noise levels [7]. Sound is the important thing for this project to find the characteristic of sound can attract the swiftlets and to know that the frequency of swiftlets most attract can be heard by human or not.

2.5 Sound Characteristics

Sound can be heard from different quality of sounds, i.e. loud or soft, high pitch or low pitch, audible or inaudible etc [7]. A sound can be characterized by the following three quantities are pitch, quality and loudness.

2.5.1 Pitch

Pitch is the frequency of a sound as perceived by human ear. A high frequency gives rise to a high pitch note and a low frequency produces a low pitch note. Figure 2.5 shows the frequencies of same common sounds.

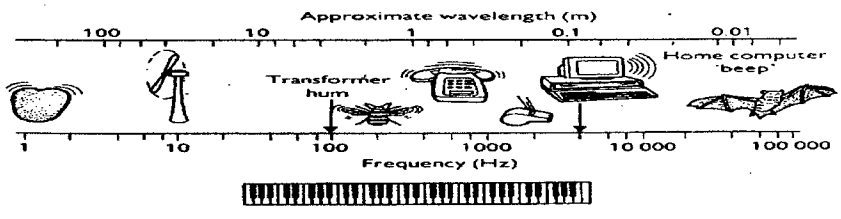

Figure 2.5 Frequency and wavelength of everyday sound

2.5.2 Quality

A pure tone is the sound of only one frequency, such as that given by a tuning fork or electronic signal generator. The fundamental note has the greatest amplitude and is heard predominantly because it has a larger intensity. The other frequencies such as 2fo, 3fo, 4fo, etc. are called overtones or harmonics and they determine the quality of the sound.

2.5.3 Loudness

Loudness is a physiological sensation. It depends mainly on sound pressure but also on the spectrum of the harmonics and the physical duration [13]. Sound waves are often simplified to a description in terms of sinusoidal plane waves, which are characterized by these generic properties [6]:

i. Frequency
ii. Magnitude
iii. Amplitude

2.6 Sound Analysis

There are many methods for analysis sound characteristic. For example sound frequency characteristic based on Electroencephalography (EEG) signals. The study includes feature extraction of the EEG signals with respect to different sound frequencies, covering low frequency (40 Hz), mid-range frequency (5000 Hz), and high frequency (15000 Hz) [14]. So, this project can use this technique by extraction of sound signal get from sample to different sound frequency such as low frequency, mid-range frequency and high frequency and combination of frequency called as full range frequency.

In this journal, EEG signal characterization is done using Fast Fourier Transform (FFT), moving average filters, and simple artifact filtering with reference EEG data per individual. Based on the characteristics of the EEG signal, the sound frequency can be categorized and identified using the proposed method [14].

Otherwise, a method for identifying cutting sound characteristics for machine tool industry based on a robust time-variant sound recognition system. The sound signal is compressed using linear prediction analysis method. The procedure taken here is based on the attraction of time-variant spectral features (example: raw data of sound) and characterization of each sample by obeying the autocorrelation coefficients and reflection coefficients of the sampled data. The proposed technique is shown to be very effective, accurate, and powerful in performing sound data identification [15].

For this project, analysis for the sound is by taking a few sample of sound to form a raw data of sound from different locations. Then, the data will be compared based on the similarity elements in different location for characterizations which are involved attracting the swiftlets.

2.7 Fast Fourier Transform (FFT) Algorithm

Fourier analysis is useful for data analysis, as it breaks down a signal into constituent sinusoids of different frequencies. It is particularly used in area such as signal processing [17].

Therefore, short time Fourier Transform (STFT) have been deployed using a variety of "windows" with different relative advantages to address principally difficulties in analyzing short term transient sound behavior [18]. Two things that are different about the FFT implementation in Matlab than the presentation the FFT uses complex numbers and the FFT computes positive and negative frequencies [19].

There is better way to compute the Fourier transform of discrete data called the FFT. The FFT was a truly revolutionary algorithm that made Fourier analysis mainstream and made processing of digital signals commonplace. The power of the FFT is that it allows computing the Fourier coefficients faster. The FFT has become such a commonplace algorithm that it is built into Matlab. The coefficient FFT is quite complex [20].

Use of complex numbers introduces some mathematical simplicity in Fourier transform algorithms and provides a convenient representation. Real numbers are often represented on the real number line and complex numbers are often visualized on the two dimensional complex plane. In the complex plane it is clear to see that the absolute value is simply the distance of the complex number from the origin.