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ANALYZATION OF QUALITY OF COCONUT

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Abstract: Coconut is one of the plants that are important enough to meet the daily needs of human beings. The aim of this project is to analyze the quality of a coconut and classify it based on its quality. Sound processing of coconut is done in-order to know its quality. The coconut quality is determined by classification using the data sets. The data set will have information for classification of coconut as poor, medium or good quality. It will be used to compare different attributes of a coconut and classify it into a class or category depending upon the quality. The quality of the coconuts used for various purposes is of atmost importance. Demand for better quality products is constantly on the rise due to the improvements in the standard of living of people. There is a possibility that a bad coconut goes unnoticed by the traders, as it is hard to decide if a coconut is good or bad by relying only on its external appearance. Traditionally, quality assessment is carried out manually with the help of three senses; sight, hearing and smell. In the proposed work, a sound processing technique is used in an attempt to automate this process which overcomes the drawbacks of manual processing, which can be used in large godowns and warehouses. This proposed method provides the quality assessment of the coconut purely based on audioception. The training dataset is created by using hitting the coconut with rigid object and the sound will be extracted. The rate of the coconut is also a important factor. Feature are extracted from the sound factor.

Keywords: Sound Processing, Coconut Grading, Audioception

INTRODUCTION

Agriculture is a core occupation for most of the people in India. One of the main source of income for farmers of coastal India is coconut products. Farmers do not get satisfied with the price of products. One of the reason is that they cannot interact directly with the customers. In existing system of selling and buying, farmers can't interact with customers. The main disadvantages of existing system are: Time consuming manual process. Third party involvement in between customers and farmers. By using Sound processing technique, coconuts can be classified based on different features. As coconut play main role in day to day life, some new technology can be introduced for the purpose of segregation of coconuts based on quality determination. The new technology should be accurate in classifying.

Audioception refers to the ability to perceive or hear a sound. These sound waves are nothing but some sort of disturbances which travel through a medium. These disturbances are termed as vibrations. They hit the eardrum, which then traverse to the brain using auditory nerves. It is only then that the brain perceives the vibrations as sound. The human brain then tries to relate the sound produced to form some sensible data.

Sound based techniques are used in various other fields of work thus far; medicine, industries and the military are but a few. In the field of medicine, ultrasound tests are done in order to view the internal organs of the human body, it is also a test performed on pregnant women to check if there is any abnormality in the fetus.

The proposed work uses the properties of sound to classify if a coconut is usable or not. Deem a coconut usable if it has good amount of water content within it and is not cracked or rotten. The coconut palm (Cocos nucifera linn) is the most treasured palm in the field of agriculture. All aspects of the tree is valuable to human life for some reason or the other. Consequently, the coconut palm is endearingly called "kalpavriksha" which means the tree of heaven. The copra got by drying the kernel of coconut is the wealthiest wellspring of vegetable oil containing 65 to 70 percent oil. The good coconuts can be used by the people. The older coconuts can be used for making oil. The bad rotten ones can be discarded. Perceiving if a coconut is good or bad based on its exterior appearance is a hard task. The coconut might be rotting inside, but at the same time its exterior composure still holds good.

Thus classifying it in terms of usable or unusable is difficult. A system to help in deciding whether the coconut is good or bad without breaking the coconut is very much required.

I. PROBLEM STATEMENT

To classify the coconut based on its quality, there is a need to adopt a new technology. Sound processing is used. Processing the sound produced by hitting the coconut can be used to classify them based on its quality. Hitting the coconut with rigid object and the sound is extracted. To identify the degree of maturity and quality of coconut, the analysis, classification and identification of the coconut sound which are selected and send into the system based on color, shape, size and other features of coconut.

II. EXISTING SYSTEM

The current system in classifying coconuts involves a manual approach. Often the rotten coconuts go undetected until their foul odor is smelt. Most of the time, the coconuts are classified only after it is broken based on how it is from the inside. This approach again is a tedious process. The accuracy in classifying the coconuts is lesser when it is classified without being broken and repeating this process on a large scale is time consuming. Replacing this manual process with a self-automated system where it can classify the coconuts only with the outer appearance would be very efficient. From the outside all the coconuts look similar. Due to this it is very difficult to classify coconuts using image processing. So sound processing would be a more optimal method in coconut grading.

III. PROPOSED SYSTEM

Processing of coconut is done to know its characteristics and quality. Sound processing is done in order to obtain the characteristics of the coconut. Characteristics include shape, size, colour and the quality of coconut. The characteristics helps in distinguishing the coconuts among each other. The characteristic features are matched with the pre-stored data sets. After matching the characteristics, the coconut is grouped accordingly.

IV. LITERTURE SURVEY

Authors Karishma Chavan and Ujwalla[1] proposed a method to develop accurate voice recognition system. The four main steps used for speech recognition were explained. First step was creation of database, which contained voice samples which were recorded in quiet and noisy environment. At the time of voice recording some key points about voice frequency like band ranges were considered. Second, Speech pre-processing (enhancement and normalization), where unwanted noise was removed. Third, feature extractio mean sequence of feature vectors were computed which provided a compact representation of the given input signal. and last was matching, which was based on percentage of the speech being recognized.

The paper by Sachin Chachada and C C Jay Kuo [2] presented a survey on recent developments and pointed out the future research and development trends in the environmental sound recognition (ESR) field. The three commonly used environmental sound processing schemes are framing-based processing, sub-framing-based processing and sequential processing. Features developed for speech/music based applications had been traditionally used in stationary ESR techniques. These features were often based on psychoacoustic properties of sounds such as loudness, pitch, timbre, etc. Mel-Frequency Cepstral Coefficients (MFCC) were developed to resemble the human auditory system and have been successfully used in speech and music applications. MPEG-7 based demand low computational complexity and encompass psychoacoustic (or perceptual-based) audio properties.

Valero and Alias proposed a new set of features called the Narrow-Band Auto Correlation Function features (NB-ACF). The NB-ACF features offer better performance for wide-sense-stationary (WSS) signals than most static features. Real life audio signals often are assumed to have time varying characteristics, and thus are “non-stationary”. Umapathy et al proposed a new set of features based on the binary wavelet packet tree (WPT) decomposition. Local Discriminant Bases (LDB) algorithm was used to identify the most discriminant nodes of the WPT. WPT-LDB and MFCC features gave similar performance, yet much better performance was achieved when the two were combined together. Chu et al proposed to use the Matching Pursuit (MP) based features for ESR. The basis MP (BMP) is a greedy algorithm used to obtain a sparse representation of signals based on atoms in an over-complete dictionary. Environmental Sound Database (ESD) was built from various sources as ESR field lacks a universal database.

In the paper by Joseph P Campbell [3], a tutorial on the design and development of automatic speaker recognition systems was presented. In speaker verification, the goal was to design a system that minimizes the probability of verification errors. Thus, the objective was to discriminate between the given speaker and all others. The general approach to ASV consists of five steps: digital speech data acquisition, feature extraction, pattern matching, making an accept/reject decision, and enrollment to generate speaker reference models. For speaker recognition, features that exhibit high speaker discrimination power, high interspeaker variability, and low intraspeaker variability were desired.

Speech processing extracted the desired information from a speech signal. This analog signal was conditioned with antialiasing filtering. The conditioned analog signal is then sampled to form a digital signal by an analog to-digital (A/D) converter. In mean and Covariance Estimation, the LSP covariance matrixes could capture speaker identity. The three-dimensional (3-D) observation vectors had been successfully mapped to one-dimensional (1-D) points with perfect discrimination. The Bhattacharyya distance directly compared the estimated mean vector and covariance matrix of the test segment with those of the target speaker. The pattern-matching task of speaker verification involved computing a match score, which was a measure of the similarity of the input feature vectors to some model. Speaker models were constructed from the features extracted from the speech signal. Using a stochastic model, the pattern-matching problem could be formulated as measuring the likelihood of an observation given the speaker model. Using the YOHO prerecorded speaker-verification data base, a few results on wolves and sheep were measured. Cross-speaker testing (casual impostors) was performed, confusion matrixes for each system were generated, wolves and sheep of DTW and NN systems were identified, and errors were analyzed. The new speaker-recognition system was evaluated in closed-set speaker identification testing. Speaker identification experiments using 44 and 43 speaker subsets of the YOHO data base were performed. In the 44-person test from the YOHO data base, each speaker is compared to a different session of himself and to two sessions of 43 other speakers using 80 seconds of speech for training and a separate 80 seconds of speech for testing. A new speaker-recognition system was presented that used an information-theoretic shape measure and LSP frequency features to discriminate between speakers. The LSP frequencies were found to be effective features in this divergence-shape measure. A speaker-identification test yielded 98.9% correct closed set speaker identification. The new speaker-recognition system presented here was practical to implement.

In the paper, authors Selina Chu, Shrikanth Narayanan and C C Jay Kuo [4] considered the task of recognizing environmental sounds that utilized matching pursuit (MP) for the understanding of a scene or context surrounding an audio sensor. Because of the nature of unstructured data, it was difficult to form a generalization to quantify them. Here, they examined some of the commonly used audio signal features. By using a dictionary that consists of a wide variety of functions, MP provided an efficient way of selecting a small set of basis vectors that produces meaningful features as well as flexible representation for characterizing an audio environment. MP was a desirable method to provide a coarse representation and to reduce the residual energy with as few atoms as possible. The MP algorithm selects atoms in a stepwise manner among the set of waveforms in the dictionary that best correlate the signal structures. In the comparison of Time-Domain Features, MP features provided a more flexible and effective way to extract temporal features of environmental sounds using time and frequency-localized representation. Experiments were conducted to demonstrate the advantages of MP features as well as joint MFCC and MP features in environmental sound classification. A listening test was conducted to study human recognition capability of environmental sounds. The motivation was to find another human-centric performance benchmark for the automatic recognition system. The test showed that human listeners were able to correctly recognize 82% of ambient environment sounds for a duration of 4 s. MP features can classify sounds where the pure frequency-domain features fail.

VI METHODOLOGY

The coconuts need to be of a standard size and a standard shape. When the coconut is battered with the rigid object, a sound is produced because of the impact. This sound is recorded under uniform environmental conditions. After the sound is recorded, it is cropped and saved as a input audio file.

The microphone will continue recording for about ten to fifteen seconds. But out of the entire audio recorded. The portion of the audio where the actual impact of the coconut was recorded is cropped out. This helps in reducing the overall processing time involved with each audio file. The cropped audio files are saved in 16bit int PCM format.

These audio files are then individually considered for feature extraction. After the sound is recorded the coconut is opened and its condition is manually checked. While testing, sound is recorded, features are extracted, classified and the status of the coconuts are noted for verifying the accuracy of the results generated.

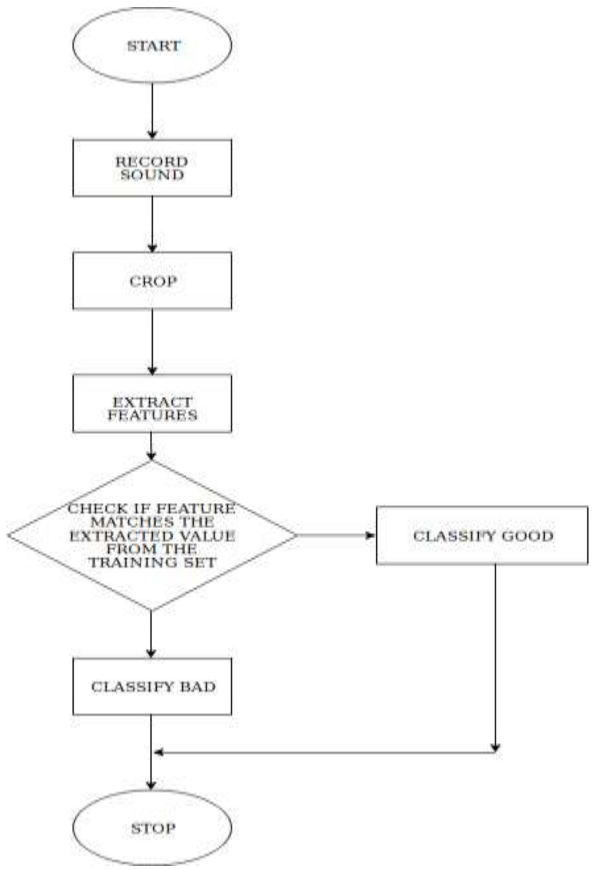

Fig 6.1 System Work Flow Model

The proposed work aims at classifying coconuts based on sound. The coconut will be battered using a rigid object on the surface with a constant force. The process will be done inside a noise proof chamber. A mic with noise cancellation feature is placed inside the chamber to record the sound produced from the Impact.

Reasonable features from the sound which help in the classification of the coconut are extracted and run against a database consisting of extracted features. Compared to the manual process the automated process is prone to lesser number of errors. The manual process of classification requires humans to visually grade a coconut.Perceptions and judgements tend to vary from person to person. Moreover, errors in judgement are bound to happen in such situations. The constraints provided make classification easier.

DATA COLLECTION:

There will be two sets of data, each consist of unique collection of recordings. The dataset 1 can be called as Bad_Samples and the dataset 2 can be called as Good_Samples.

Bad_samples: This Dataset consist of collection of audio recordings consisting of bad coconut. Here Bad coconuts are rotten and unusable coconuts. The number of coconut samples taken was 5. The dataset consists of 15 recordings, each of 10 seconds.

Figure 6.2 Examples of Bad Coconut Samples

Good_samples: This Dataset consist of collection of audio recordings of good coconut. Here Good coconuts are have nice water content and thick inner layer. The number of samples taken was 5. The dataset consists of 15 recordings, each of 10 seconds.

Figure 6.3 Examples of Good Coconut Samples

PRE-PROCESSING

The sample coconut sample is placed in the noise proof chamber one by one. The sample in the chamber is battered using a rigid object with a constant force. The sound produces from the impact is recorded. The sound is recorded at 8000 Hz with bit rate of about 16-bits per sample. This is a constant constraint throughout the entire recording procedure. The recording should be a mono recording and not a dual recording as it may take more time to process the dual audio files.

Figure 6.4 Variation in Amplitude

VII CONCLUSION

The proposed methodology uses the concept of audioception to term the usability of a coconut, using the sound produced a coconut can be segregated into the good or bad category. Audacity is used to record the sound made by a coconut colliding into a stationary granite surface. This concept can mainly be used in large warehouses and godowns. The entire process of coconut grading can be automated by using machines. The accuracy of the proposed method of grading coconuts can further be improved by increasing the number of recordings in the dataset. The number of recordings available in each dataset is currently limited to a few recordings.

FUTURE WORK

Application of the concept to find out the status of other goods is also possible. For example, by tapping on a watermelon to tell us whether it is ripe or not can also be another application of the proposed concept. Combining the enhancements mentioned with the proposed methodology, a working system to classify coconuts can be built and deployed.