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RECOGNIZING TARGET RATING POINT BY DETECTING AUDIO FINGERPRINT

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ABSTRACT:

Audio fingerprint is analysis of the audio waveforms that includes characteristics such as beats per minute, frequency range and average power in each frequency. People have been interested in sharing what they are watching on TV using the development of social TV Applications often based on mobile devices. IRTR (Improved Real- Time TV-channel Recognition) is a new method of channel Recognition that aimed at recognizing what people are watching on TV in real time(live) without any active user interaction. IRTR uses the audio signal fingerprint and TV channel real-time identification. Television Rating Point (TRP) is a tool provided to judge which programmes are viewed the most. This gives an index of the choice of the people and also the popularity of a particular channel. Target rating points (TRPs) quantify the gross rated points achieved by an advertisement or campaign among targeted individuals within a larger population.

Keywords: Fingerprint, Television Rating Point, IRTR.

I. INTRODUCTION

Millions of people now share their TV experience with other viewers on social media such as Twitter and Facebook using smart phones and tablets. people have been interested in sharing what they are watching on TV, allowing the development of Social TV. IRTR aimed at recognizing in real time (live) what people are watching on TV without any active user interaction. IRTR uses the audio signal of the TV program recorded by smart phones and the fingerprint is extracted from the recorded audio for TV channel real-time identification. The fingerprint is analysis of the audio waveforms and includes characteristics such as beats per minute (tempo), frequency range, and average power in each frequency. Television Rating Point (TRP) is a tool provided to judge which programmers are viewed the most. This gives an index of the choice of the people and also the popularity of a particular channel. Target rating points (TRPs) quantify the gross rated points achieved by an advertisement or campaign among targeted individuals within a larger population.

In this paper, IRTR aims at implementing a system based on a client server architecture capable of labeling noisy audio recordings with the name of the TV channel that is watched by a user. IRTR uses Audio Fingerprinting (AF) algorithm for music information retrieval , modified by tuning the basic parameters to decrease the computational load, making it more suitable for smart phone processing platforms.

II. LITERATURE SURVEY

In [1] a sample application for content sharing on commercial smart phones was proposed and analyze its efficiency and practical feasibility of sharing application. Utility computation and mobility learning algorithms were used. A hidden Markov model is used to predict an individual's future mobility information. It was proved that 87 percent of contents can be correctly discovered and delivered within 2 hours when the content is available only in 30 percent of nodes in the network. Energy consumption of smart phones are high when content sharing. In [2] surveys on different approaches to provide collaborative driver assistant services were performed. To provide driver assistant services such as road traffic information, road condition and collision, there is need of sensors such as GPS,

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Gyroscope, Accelerometer etc. Traffic signal detection algorithm is used to assist drivers. Different vehicles are used on road, so better prediction collaboration is needed.

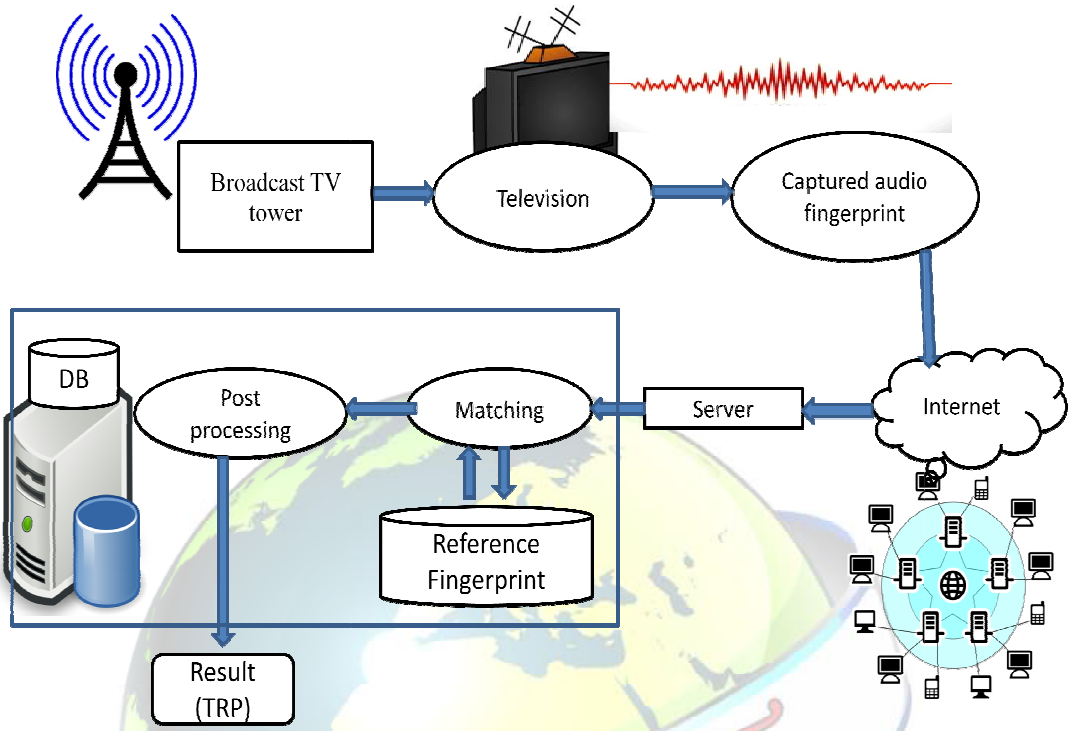

Fig. 1. Proposed System Architecture

Mian Dong and Lin Zhong [3] proposed Chameleon, a color rendering web browser for mobile displays that renders web pages with power optimized color schemes under user-supplied constraints. Chameleon provides end users with important options, offloads tasks that are not absolutely needed in real-time, and accomplishes real-time tasks by carefully enhancing the codebase of a browser engine. Only small portion of web pages can be shown on smart phone display, leads to inaccuracy of color.

Different algorithms used for audio finger printing was reviewed in [4]. Audio Fingerprinting technologies have recently attracted attention since they allow the monitoring of audio independently of its format and without the need of meta-data or watermark embedding. In [4] exploit opportunistic communication to facilitate the information dissemination and thus reduce the number of cellular traffic. Greedy, Heuristic and Random Algorithms were used. This requires the knowledge of user mobility in the future, which may not be possible in practical. Television Rating Point (TRP) is a tool provided to judge which programmers are viewed the most. I. Bisio *et al.,* [5] proposed a method for TRP calculation which is based on likelihood estimation.

III. PROPOSED TECHNIQUE

An IRTR method is proposed in this paper that aimed at recognizing in real time (live) what people are watching on TV without any active user interaction. It uses the audio signal of the TV program recorded by smart phone. First the fingerprint is extracted from the recorded audio signal, than based on fingerprint TV channel is identified. After identifying TV channel, to update the Target rating Points (TRPs) the device called People's Meter is used. It records the time and the programme that a viewer watches on a particular day. The overall architecture of the proposed system is shown in Fig. 1 and the important operations are explained below.

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A. Audio Fingerprint

An Audio Fingerprint(AF) is generated from an audio signal. It can be used to identify an audio sample or quickly locate similar items in an audio database. AF is also used for identifying the duplication of original audios. AF contains the Meta data information about the original audio signal. An AF can be called as condensed digital summary. An original audio composed of a large number of bits, but a fingerprint contains only a limited number of bits. An

AF is compact because it is significantly smaller, in terms of bits, than the audio it comes from. AFs have gathered attention since they allow the identification of audio independently of its format and without the need of meta-data or watermarking. Sample meta data is shown in Table 1.The AF-extracting methods proposed over the past few years share the same basic two-steps of processing of the audio samples: Linear transformation and feature extraction.

The fingerprint extraction algorithm used by IRTR is based on the following steps:

a) An audio recorded for a duration is sampled at a rate of particular *Hz* is divided into frames, with an overlap factor.

b) Each frame is filtered by means of a Hanning window function, in order to smooth the signal and to reduce spurious frequency components.

c) The Fast Fourier Transform (FFT) and squared modulus are applied to each frame in order to obtain the energy spectrum of each frame.

d) The spectrum is divided into *M* logarithmically spaced frequency bins and the energy is computed for each bin. The logarithmic spacing is chosen because of the similarity with the Human Auditory System.

e) By denoting the energy of band *m* of frame *n* by *E(n,m)*, the output of the fingerprint is defined.

Table 1. Sample Metadata

Parameters	Values
Recording Length(L_R)	10[s](CAF) and 5[min](RAFs)
Overlap(OL)	31/32
Sample Rate(RS)	44100[Hz]
Frame Length(L_F)	~0.37[s]
Number of Sub-Bands (M_{bins})	33

The FFT operates by decomposing an N point time domain signal into N time domain signals each composed of a single point. The second step is to calculate the N frequency spectra corresponding to these N time domain signals. Lastly, the N spectra are synthesized into a single frequency spectrum. In the FFT decomposition shown in Fig. 2, breaks the 16 point signal into two signals each consisting of 8 points at first stage. The second stage decomposes the data into four signals of 4 points. This pattern continues until there are 16 signals composed of a single point. An **interlaced decomposition** is used each time a signal is broken in two, that is, the signal is separated into its even and odd numbered samples. The FFT time domain decomposition is usually carried out by a **bit reversal sorting** algorithm. This involves rearranging the order of the N time domain samples by counting in binary with the bits flipped left-for-right

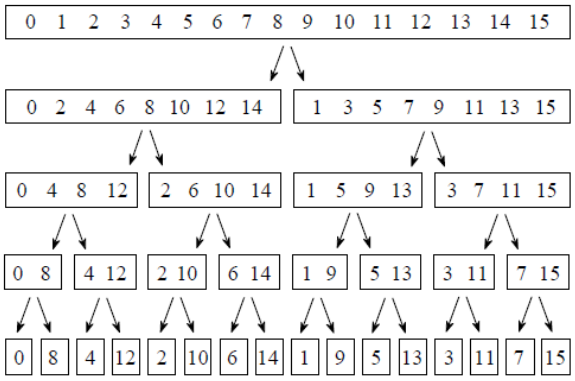

Fig. 2. FFT Decomposition

B. Audio Information Retrieval

Audio Information Retrieval(AIR) is the action of recovering/recognizing audio data within a set of pre-recorded audio traces. Christo Ananth et al. [6] discussed about a method, Sensor network consists of low cost battery powered nodes which is limited in power. Hence power efficient methods are needed for data gathering and aggregation in order to achieve prolonged network life. However, there are several

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energy efficient routing protocols in the literature; quiet of them are centralized approaches, that is low energy conservation. This paper presents a new energy efficient routing scheme for data gathering that combine the property of minimum spanning tree and shortest path tree-based on routing schemes. The efficient routing approach used here is Localized Power-Efficient Data Aggregation Protocols (L-PEDAPs) which is robust and localized. This is based on powerful localized structure, local minimum spanning tree (LMST). The actual routing tree is constructed over this topology. There is also a solution involved for route maintenance procedures that will be executed when a sensor node fails or a new node is added to the network. Three processes are performed by IRTR for audio recognition as shown in Fig. 3. They are Voice recognition, Fingerprint matching, and Channel recognition.

Fig. 3. Audio Recognition

C. TV Channel Recognition

When the user watches a TV channel, the app in the mobile can be used to record the audio information and sends it to the server. The server will extract the fingerprint to identify the channel information. This fingerprint is matched with the audio fingerprints available in the database of the server. Then update the Target rating Points (TRPs) using the device called as People's Meter. It records the time and the programmed that a viewer watches on a particular day. Television Rating Point (TRP) is a tool provided to judge which programs are viewed the most. This gives an index of the choice of the people and also the popularity of a particular channel.

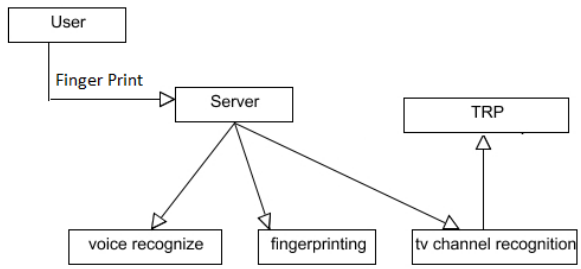

Fig. 4. TRP Update

IV. RESULTS

User may watch different TV programs as shown in Fig. 5. First the user needs to create an account in the server for authentication. Then record their favorite TV program using Smartphone and send the audio finger print to the server. The server program matches the received audio finger print with all available audio finger print of different TV programs in the database. When a match is found it update the TRP of the particular TV program. A sample registration form and updated TRP is shown in Fig. 6. and Fig.7 respectively.

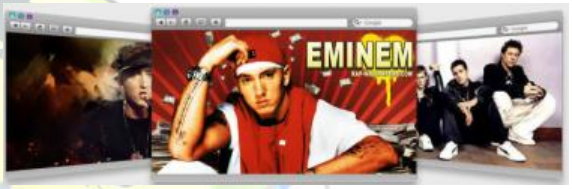

Fig. 5. TV Programs

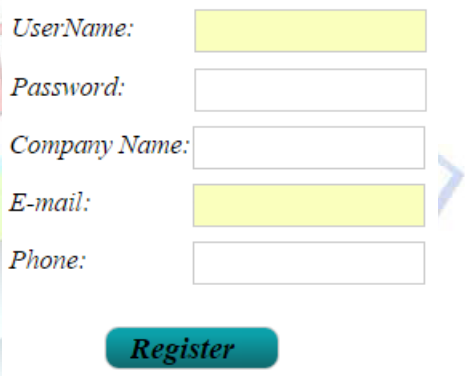

Fig. 6. Sample Registration Form

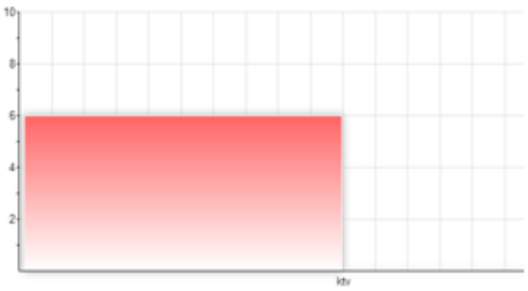

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Fig. 7. Updated TRP

The implementation constraint of the proposed method is discussed here. A hierarchical structuring of relations may result in more classes and a more complicated structure to implement. Therefore it is advisable to transform the hierarchical relation structure to a simpler structure such as a classical flat one. It is rather straightforward to transform the developed hierarchical model into a bipartite, flat model, consisting of classes on the one hand and flat relations on the other. Flat relations are preferred at the design level for reasons of simplicity and implementation ease. There is no identity or functionality associated with a flat relation. A flat relation corresponds with the relation concept of entity-relationship modeling and many object oriented methods.

V. CONCLUSION

A full system, called IRTR, capable of detecting the TV channel in real time through a short audio snippet has been introduced. We have presented an improvement of the parameter configuration used by the existing audio fingerprint computation algorithms in order to reduce the computational load and consequent energy consumption in the Smartphone client. Future improvements may derive from fingerprint progressive sending and from the use of users' individual watch history to compute a priori probabilities which further optimize the searching algorithm.

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