

# **ANNA UNIVERSITY: CHENNAI 600025**

## **BONAFIDE CERTIFICATE**

Certified that this project “**AUDIO CONTENT RECOGNITION USING FINGERPRINTING**” is the bonafide work of “**ADARSH T ARAVIND (714015104004), V HARISH (714015104023), and S NIKIL NANDHA (714015104049)**” who carried out the project work under my supervision.

.....

### **SIGNATURE**

**Dr.K.E.KANNAMMAL**

### **PROFESSOR AND HEAD**

Department of Computer Science  
and Engineering,  
Sri Shakthi Institute of Engineering  
and Technology,  
Coimbatore –641062.

.....

### **SIGNATURE**

**Mr.G.SELVA KUMAR**

### **SUPERVISOR**

Associate Professor  
Department of Computer Science  
and Engineering,  
Sri Shakthi Institute of Engineering  
and Technology,  
Coimbatore –641062.

**Submitted for Anna University project viva-voce conducted on.....**

**INTERNAL EXAMINER**

**EXTERNAL EXAMINER**

## ACKNOWLEDGEMENT

We express our deepest gratitude to our **Chairman Dr.S.Thangavelu** for his continuous encouragement and support throughout our course of study.

We are thankful to our **Secretary Er.T.Dheepan** for his unwavering support during the entire course of this project work.

We are also thankful to our **Joint Secretary Mr.T.Sheelan** for his support during the entire course of this project work.

We are very grateful to our **Principal Dr.S.Prakash** for his magnanimity in allowing us to avail the facilities in the department.

We are deeply indebted to our **Head of the Department, Computer Science and Engineering, Dr.K.E.Kannammal**, for providing us with the necessary facilities.

It's a great pleasure to thank our **Project Guide Mr.G.SELVA KUMAR**, Associate Professor for his valuable technical suggestions and continuous guidance throughout this project work.

We are also thankful to our **Project Coordinator Mrs.A.MohanaPriya** Assistant Professor and **Internal Review Members Dr.Godlin Atlas, Dr.K.Rajakumari, Mrs.P.Hamsagayathri** Department of Computer Science and Engineering, for providing us with necessary facilities and encouragement.

We solemnly extend our thanks to all the teachers and non-teaching staff of our department, family and friends for their valuable support.

ADARSH T ARAVIND  
V HARISH  
S NIKILNANDHA

# ABSTRACT

Audio fingerprinting is a process that uses computers to analyze small clips of music recordings to answer a common question that people who listen to music often ask: “What is the name of that song I hear?” Audio fingerprinting systems identify musical content in audio and search a reference database for recordings that contain the same musical features. 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. These systems can find matching recordings even when the query has been recorded in a public space and contains added noise. Audio fingerprinting algorithm make use of usually short audios of three to thirty seconds in length to create an audio fingerprint. This audio fingerprint is compared to a database of known audio fingerprints to identify the original audio source. After getting identified it provides the metadata of the audio as a result. This work is done with the help of Application Program Interface (ACR Cloud). The audio fingerprints of the segments do not necessarily have to be of high quality to be a match. Distortions and interference of the original signal makes matching of the fingerprints less reliable, but (to a certain extent) it will still be recognizable. The interface is created using Android studio and ACR libraries are included. This can be used to search a segment of an audio file from millions of audio collections within seconds with the help of ACR cloud API.

**Keywords:** Audio Fingerprinting, Automatic Content Recognition, ACR Bucket

# TABLE OF CONTENTS

CHAPTER NO.	TITLE	PAGE NO.
	<b>ABSTRACT</b>	<b>iii</b>
	<b>LIST OF FIGURES</b>	<b>vi</b>
	<b>LIST OF ABBREVIATIONS</b>	<b>vii</b>
1.	<b>INTRODUCTION</b>	
	1.1 Audio Finger printing	1
	1.2 Requirement of audio finger printing algorithm	3
	1.3 Audio Finger printing process	4
	1.4 Finger printing algorithm used in evaluation	7
	1.5 Contribution of this Implementation	8
2.	<b>LITERATURE SURVEY</b>	
	2.1 Introduction	9
	2.2 Existing System	17
3.	<b>SYSTEM SPECIFICATION</b>	
	3.1 Software Requirements	20
	3.1.1 Android Studio	20
	3.1.2 ACR Cloud Libraries	20
	3.1.3 Adobe Photoshop	21
	3.2 Hardware Requirements	22
4.	<b>IMPLEMENTATION</b>	
	4.1 Proposed System	23
	4.2 System Architecture	24
	4.3 List of Modules	25
	4.3.1 ACR Library Implementation	25
	4.3.2 ACR Bucket	26
	4.3.3 Dependencies	28
	4.3.4 ACR Application Program Interface	29
	4.3.5 Flash Screen	30
	4.3.6 UI Design	31

5.	<b>RESULT AND DISCUSSION</b>	
	5.1 Introduction	34
	5.2 Algorithm used	35
	5.2.1 Front End	38
	5.2.2 Fingerprint Modelling	40
	5.2.3 Factors for Good Audio Fingerprinting System	41
	5.3 How the application works	42
6.	<b>CONCLUSSION AND FUTURE STUDIES</b>	
	6.1 Conclusion	44
	6.2 Future Works	44
	<b>APPENDIX</b>	
	A.1 Screenshots	46
	A.2 Codes	47
	<b>REFERENCE</b>	61

## LIST OF FIGURES

FIGURE	TITLE	PAGE NO.
1.1	Convert audio to fingerprint	5
1.2	Audio fingerprinting process	7
2.1	Workflows in a typical audio fingerprint system.	13
2.2	Background process of shazam	18
4.1	System Architecture	24
4.2	Overview of ACRcloud	26
4.3	Creating Bucket	27
4.4	Uploading Audio to Bucket	27
4.5	Creating Project	28
4.6	ACR Bucket View	28
4.7	Flash screen design	31
4.8	UI Design	32
5.1	Steps in Audio Fingerprinting	37
5.2	Result page	43
A.1	Home Screen	46
A.2	Flash Screen	46
A.3	Final Result	47

## **LIST OF ABBREVIATIONS**

ACR	- Automatic Content Recognition
CB	- Cloud Bucket
CBID	- Central Brain Identifier
DCT	- Discrete Cosine Transform
DFT	- Discrete Fourier Transform
ENMFP	- Echo Next Musical Fingerprint
GPU	- Global Processing Unit
HSD	- Heavy Signal Degradation
IDE	- Integrated Development Environment
KOD	- Key Oriented Distribution
KSE	- Knowledge System Engineering
LUT	- Lookup Table
LLoV	- Linked List Over Vector
MIR	- Music Information Retrieval
QBC	- Query Bycontent
QBH	- Query ByHumming
STFT	- Short Time Fourier Transform