



Anand Nagar, Krishnankoil - 626126, Srivilliputtur (via), Virudhunagar District, Tamilnadu.

APPLICATION FOR ADMISSION TO Ph.D. PROGRAMMES

Date of Application:04-06-2020

Department	ELECTRONICS AND COMMUNICATION ENGINEERING	Application No.	20200050
Area of Research	MEDICAL IMAGE PROCESSING	Research Mode	PART TIME

Name :THENMOEZHI.N
Date of Birth / Age :06-04-1986 / 34 Years
Gender :FEMALE
Category :BC
e-Mail ID :thenu.michale@gmail.com
Mobile :9047970996



N. Thenu

Father's/Husband's Name	M.NAGARATHINAM	Father's/Husband's Occupation	NIL
Family Income	2,88,000	Residential Type	URBAN
Birth Place	RAJAPALAYAM	Mother Tongue	TAMIL
Religion	HINDU	Martial Status	MARRIED
Aadhaar No.	445649421744	PAN No.	AISPT2632H
Physically Challenged	NO	Type of Disability	-
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Qualification						
Degree	Discipline	College/university	Year Passed	AVG/CGPA	Class	Mode
M.E	ELECTRONICS & COMMUNICATION ENGINEERING	V.P.M.M.ENGINEERING COLLEGE FOR WOMEN, KRISHNANKOIL	2014	8.06CGPA	FIRST	REGULAR
B.E	ELECTRONICS & COMMUNICATION ENGINEERING	V.P.M.M.ENGINEERING COLLEGE FOR WOMEN, KRISHNANKOIL	2007	73%	FIRST	REGULAR
HSC	MATHS COMPUTER SCIENCE	N.A.ANNAPARAJA MEMORIAL HIGHER SECONDARY SCHOOL	2003	85.3%	FIRST	REGULAR
SSLC		S.R.B.A.K.D.D.GIRLS HIGHER SECONDARY SCHOOL	2001	86.8%	FIRST	REGULAR

Experience				
Organization	Designation	Experience From	Experience TO	Work Nature

M.KUMARASAMY COLLEGE OF ENGINEERING, KARUR	LECTURER	2007-06-21	2008-06-12	TEACHING
SELVAM COLLEGE OF TECHNOLOGY, NAMAKKAL	LECTURER	2008-11-03	2009-07-13	TEACHING
V.P.M.M.ENGINEERING COLLEGE FOR WOMEN,KRISHNANKOIL	LECTURER	2009-07-19	2012-07-21	TEACHING
P.S.R.RENGASAMY COLLEGE OF ENGINEERING FOR WOMEN, SIVAKASI	ASSISTANT PROFESSOR	2014-06-11	2016-04-30	TEACHING

Payment Details				
Transaction ID	Reference	Date of transaction	Amount	Status
20200050_200612102131	SHMP8889775013	12-06-2020	600	SUCCESS

MULTIMODAL IMAGE FUSION TECHNIQUE FOR BRAIN IMAGES

1. INTRODUCTION

In medical image processing MRI image, PET image, X- Ray image, CT-Scan image, etc. are the different modalities. Each and every modality has its own advantages and disadvantages. When the advantages of different modalities are combined, it will help the physicians for accurate diagnosis and treatment of the patient. **Image fusion** is an approach which is used to amalgamate the corresponding features of input images in a sequence, integrate and add the geometric detail of a **high-resolution panchromatic (Pan) image** and the color information of a **low-resolution multispectral (MS) image** for the production of a high-resolution MS image. Image fusion is also known as **pan sharpening**. The purpose of image fusion is to combine information from multiple images so that resulting fused image will be thus more suitable for human and machine perception or for further image processing tasks. The multimodality medical image fusion plays an important role in clinical applications which can support more accurate information for physicians to diagnosis diseases.

2. LITERATURE REVIEW

1. Padmavathi, K., Asha, C. S., & Maya, V. K, “ **A novel medical image fusion by combining TV-LI decomposed textures based on adaptive weighting scheme**”. Engineering Science and Technology, an International Journal, (2020).

The most recent MRI-PET fusion model TV-Land Particle Swarm Optimization (PSO) is used. This model decomposes the source images and their differences into cartoon and texture components and performs fusion as a weighted summation of these components. This fusion model is superior compared with approaches based on wavelet transforms, Laplace transforms, sparse representation, curvelet, NCST fusion .**Drawback- PSO considerably increases the computational time compared to spatial and transform domain approaches.**

2 . Shahdoosti, H. R., &Tabatabaei, Z., “**MRI and PET/SPECT image fusion at feature level using ant colony based segmentation. Biomedical Signal Processing and Control**” , International Journal of Imaging Systems and Technology(2019).

Ensemble Empirical Mode Decomposition (EEMD) and Ant Colony Optimization (ACC)) for adaptive fusion is proposed. This transform decomposes an image into a set of Intrinsic Mode Function (IMF) components, where each component is an ensemble of the signal and a white noise with finite amplitude. In order to eliminate noise pixel wise fusion methods constructs a segmentation map using ACO from the PET images. These maps are fused applying the majority voting rule to construct the fused image.

3. Tang, L, Qian, J., Li, L, Flu, J., & Wu, X. , “**Multimodal medical image fusion based on discrete Tchebichef moments and pulse coupled neural network**”, International Journal of Imaging Systems and Technology, (2017).

A multi modal fusion model based on discrete Tchebichef Moment (TM) and Pulse Coupled Neural Network (PCNN) proposed in this paper. It exhibits superior performance in MRI-PET fusion clearly depicting the fine textures and functional information in the fused image.

4. He, K., Zhang, X., Ren, S., & Sun, J, “**Deep residual learning for image recognition**” in Proceedings of the IEEE conference on computer vision and pattern recognition. (2016).

In this paper, perceptual quality of fused images are improved with deep CNN learning based fusion models, their accuracy tends to decrease due to the vanishing gradient problems. **Drawback-the weights are not updated at the deeper layers.**

5. Liu, Y., Chen, X., Wang, Z, Wang, Z J., Ward, R. K., & Wang, X , “**Deep learning for pixel-level image fusion**”, Recent advances and future prospects. Information Fusion (2018).

In this paper, a complete review on the conventional image fusion approaches which can be overcome with deep learning based fusion method is used. **Drawbacks-image representation approaches, image transforms and the ability of the models to capture significant details from the source images are identified as the major drawbacks of the transform based fusion approaches.**

6. Kim, L, Kwon Lee, J., & Mu Lee, K. “**Accurate image super-resolution using very deep convolutional networks**”, in Proceedings of the IEEE conference on computer vision and pattern recognition, (2016).

The Very Deep Super Resolution (VDSR) networks for enhancing the resolution of images are realized in this paper. The resolution of the low resolution PET images by are done by residual learning. **Drawbacks- well-defined mathematical transforms are not implemented.**

7. Liu, Y., Chen, X., Peng, H., & Wang, Z. , “**Multi-focus image fusion with a deep convolutional neural network**”, Information Fusion (2017).

This network designed with two branches of identical sub networks models image fusion as a classification problem. The deep learning based multi focus and the multi spectral image fusion models are based on this network.

Drawback- The weight map is further decomposed into Gaussian pyramid do not guides fusion process at each level of the pyramid.

8. Amini, N., Fatemizadeh, E, & Behnam, H, “**MRI-PET image fusion based on NSCT transform using local energy and local variance fusion rules**”, Journal of medical engineering & technology, (2014).

The authors have employed the **Non-Subsampled Contourlet Transform (NSCT)** featuring **multi directionality and shift invariance for MRI-PET fusion**. This approach separates the source images into low and high frequency bands and fuses the coefficients of these bands applying the maximal variance fusion rules respectively. **Drawback- The NSCT transform domain requires the maximum energy for fine edges and contours in the fused images.**

3. RESEARCH PROBLEM

From the above literature survey the following problems are identified.

1. There is no exclusive adaptive model for different image modality and fusion with design considerations on resolution, texture and spectral components of source images.
2. Different subsystems for different component of images are limited.
3. Optimization of penalty parameters for image decomposition is difficult.

4. OBJECTIVES OF THE WORK

Based on the problem identified from the literature survey the following objectives are framed.

The highlights of this research proposal are:

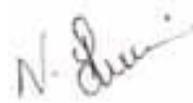
1. The deliverable of this research is an exclusive adaptive model for MRI-PET fusion with design considerations on **resolution, texture and spectral components of source images**.
2. Image decomposition is performed with self adaptive TV minimization **optimized with adaptive penalty parameters**.
3. **Separate subsystems** are designed for fusion of structure and texture component

5. CONTRIBUTIONS

In this research work, a new fusion scheme to fuse high resolution **Magnetic Resonance Images (MRI)** and low resolution **Positron Emission Tomography (PET)**

images based on **Deep Residual Learning (DRL)** framework and **Self Adaptive Total Variation (SATV)** is proposed. Residual learning model is suitable for super resolving an image and the SATV decomposes an image into structural and textural components. PET/MRI medical image fusion has important clinical significance. MRI is a predominant modality in medical image fusion due to its proliferating usage in the diagnosis and treatment protocols of several pathologies concerned with abdomen, liver, brain. PET is efficient in capturing the internal functions of internal organs and in therapeutic treatment of lesions, metastases, tumours, Alzheimer. The proposed model is implemented with Matlab 2017b software in an i7-7700K processor with 32GB DDR4 RAM equipped with a NVIDIA GeForce GTX1060 3GB Graphics card.

Finally, the proposed research work of image fusion is an **integral model encompassing super resolution and fusion operations which has not been attempted so far in any of the research papers**. Also in this research paper, proficiently integrated and adapted prospective mathematical approaches such as **ADMM, TV, SFN, RAP and PReLU** will be used in this flexible fusion model.



Mrs.N.Thenmoezhi

Anna University Chennai



The Syndicate of the Anna University Chennai hereby makes known that **THENMOEZHI N** has been admitted to the **DEGREE OF BACHELOR OF ENGINEERING** in **ELECTRONICS AND COMMUNICATION ENGINEERING** under the *Faculty of Information and Communication Engineering*, having completed the prescribed programme of study and having been certified by the duly appointed examiners to be qualified to receive the same, and has been placed in **FIRST CLASS** at the Examination held in **APRIL 2007**.

Given under the Seal of the University



Chennai 600 025
India
December 2007

DU/M410623149

V. Jayaraman
Controller of Examinations

K. Jayaraman
Registrar

allan...
Vice-Chancellor

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Anna University



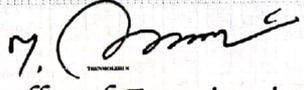
Reg.No. 953512473019/RG

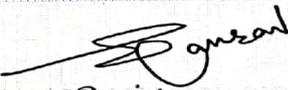
The Syndicate of the Anna University hereby makes known that
THENMOEZHI N *has been admitted to the* **DEGREE OF MASTER OF ENGINEERING** *in* **ELECTRONICS AND COMMUNICATION ENGINEERING** *under the Faculty of Information and Communication Engineering, having completed the prescribed programme of study and having been certified by the duly appointed examiners to be qualified to receive the same, and has been placed in* **FIRST CLASS** *at the Examination held in* **JUNE 2014.**

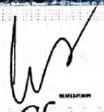
Given under the Seal of the University



Chennai 600 025
India
November 2014
KPMCH447315599


Controller of Examinations


Registrar


Vice-Chancellor
TPN34212100001

V.P.M.M. Engineering College For Women



V.P.M. Nagar, KRISHNANKOVIL-626 190.

Approved by AICTE in F.No. 730-52451 (E)/E7/2002 dt. 2-8-2002

TRANSFER CERTIFICATE

S.No. : 1258

Admn.No : 1 / 2012

1. Name of the Student : N.THENMOEZHI
2. Name of the Father / Guardian : NAGARATHINAM
3. Date of Birth : 06/04/1986
4. Nationality and Religion : Indian, Hindu
5. Caste (OC/BC/MBC/SC/ST) : BC
6. Date of Admission : 16/04/2012
7. Date of Leaving : 05/06/2014
8. Class in which the Student was Studying at the time of leaving : II M.E.
9. Branch of Study : Electronics and Communication Engineering
10. Duration of Course : 2 years
11. Whether qualified for promotion to the higher class : Yes (Refer mark sheet)
12. Whether the Student had paid all the fee due to the college : Yes
13. Attendance : 100%
14. Conduct and Character : Good

Date : 05/06/2014


PRINCIPAL
J.P. Muthiah Pillai Maanakshi Ammal
Engg. College for Women,
Krishnankovil-626 190.
Virudhunagar District. (T.N)





M. KUMARASAMY COLLEGE OF ENGINEERING

THALAVAPALAYAM, KARUR - 639 113. KARUR District.

AICTE approval No. 732-53-004 (NDEG) / 97 dt. 22-10-1999

(CSE, ECE, MECH : NBA Accredited Courses)

Phone : 04324 - 270755, 272155 Fax : 04324-272457

MKCE / STAFF/2008

03.11.2008

SERVICE CUM SALARY CERTIFICATE

This is to certify that Ms. N. THENMOZHI was working as a LECTURER in Electronics & Communication Engineering Department from 21.06.2007 to 12.06.2008. She was relieved from her duties on her personal reasons.

Her Conduct & Character were good during this period.

She was drawing Rs.11,006/-(Eleven Thousand and Six Only) as her salary per month.

Dr J. Kumar,
Principal.





Selvam College of Technology

(An ISO 9001 : 2000 Certified Institution)

(Approved by AICTE, New Delhi and Affiliated to Anna University.)

Salem Road (NH-7), Ponnusamy Nagar, Pappinaickenpatti (Po), NAMAKKAL - 637 003, T.N.

Ph: 04286-645602, 244602 Fax: 244186 website: SelvamTech.com e-mail: sctnkt@rediffmail.com

Dr. P. Selvaraj, B.V.Sc.
Chairman

Dr. S. Chenthur Pandian,
B.Sc., LL.B., M.E., Ph.D., FIE., MISTE., MIEEE. (USA)
Principal

153/SCT/3.05/2009-10

10.08.2009

SERVICE CERTIFICATE

This is to certify that Ms. Thenmoezhi N has worked as a Lecturer in the ECE Department in this Institute from 03.11.2008 to 13.07.2009. During this period her Conduct and Character were GOOD.

Principal

Principal,

Selvam College of Technology,
Ponnusamy Nagar, Salem Road,
Pappinaickenpatti (Po),
Namakkal - 637 003.T.N.

Phone : 04563 - 289001
Fax No : 04563 - 289337



V.P.MUTHAIAH PILLAI MEENAKSHI AMMAL ENGINEERING COLLEGE FOR WOMEN

Approved by AICTE in E.No.730-52451 (E)/ET/ 2002 dt.2.8.2002 & Affiliated to Anna University

V.P.M. Nagar, KRISHNANKOIL - 626 190.
Srivilliputtur (TK) Virudhunagar (DT.)

2nd July 2012

Prof.K.GANESAN B.E.,M.E.,(Ph.D)
Principal

EXPERIENCE CERTIFICATE

This is to certify that Mrs.N.Thenmozhi worked as a Lecturer in the department of Electronics and Communication Engineering in our institution for 3 years from 19th July 2009 to 21th July 2012. During her service period she got salary amount of Rs 15,000/-.



PRINCIPAL

PRINCIPAL

V.P. Muthaiah Pillai Meenakshi Ammal
Engg. College for Women,
Krishnankottai - 626 190.
Virudhunagar District. (13)

P.S.R. RENGASAMY COLLEGE OF ENGINEERING FOR WOMEN



Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai
An ISO 9001:2008 Certified Institution

Appayanaickenpatti, Sivakasi - 626 140.
Virudhunagar District, Tamil Nadu.



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Date :

Dr. K. RAMASAMY, M.E., Ph.D.,
PRINCIPAL

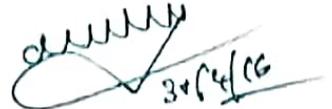
Date: 30.04.2016

SERVICE CERTIFICATE

This is to certify that Mrs.N.THENMOEZHI was working as Assistant Professor in Electronics and Communication Engineering Department at P.S.R. RENGASAMY COLLEGE OF ENGINEERING FOR WOMEN, Sivakasi from 11.06.2014 to 30.04.2016.

She was relieved from her duties from this afternoon 30.04.2016 on her own request.




30/04/16

PRINCIPAL
PRINCIPAL

P.S.R. RENGASAMY COLLEGE
OF ENGINEERING FOR WOMEN
APPAYANAICKENPATTI
SIVAKASI.

आयकर विभाग

INCOME TAX DEPARTMENT

N THENMOEZHI

NAGARATHINAM

06/04/1986

Permanent Account Number

AISPT2632H

N. Thenmoezhi

Signature



भारत सरकार

GOVT. OF INDIA



23112012



ELECTION COMMISSION OF INDIA

IDENTITY CARD

இந்திய தேர்தல் ஆணையம்

வாக்காளர் அடையாள அட்டை

GRV2274694



Elector's Name : Thenmozhi

வாக்காளர் பெயர் : தேன்மொழி

Father's Name : Nagarathinam

தகப்பனார் பெயர் : நாகரத்தினம்

Sex / பாலினம் : Female / பெண்

Age as on 1.1.2006

1.1.2006 அன்று வயது

23

BC

சான்றிதழ் எண்.
Certificate No.

183/96



மாவட்ட குறியீடு எண்
District Code
மாவட்ட குறியீடு எண்
Taluk Code
கிராமக் குறியீடு எண்
Village Code

1	7
0	2
0	4

663210

சாதிச்சான்றிதழ்

COMMUNITY CERTIFICATE

காமராசர் மாவட்டம் இராஜபாளையம் வட்டம்
 இராஜபாளையம் கிராமம் / நகரம், திரு / திருமதி / செல்வி /
 சான்றிதழ் பெயர் (N. தோண்டொழி) தகப்பனார் /
 சான்றிதழ் பெயர் (N. திருத்தொழி)

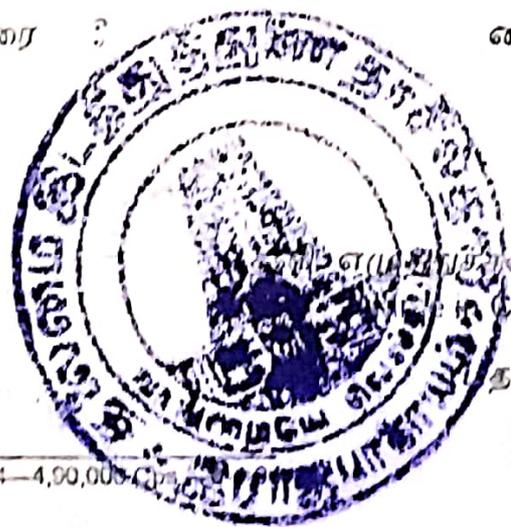
விசுவநாதர் சார்நதவர், அரசு ஆணை எண். 1564, சமூக நலத்துறை, நாள் 30-7-1985.
 வ.எண் 083, படி பிற்பட்ட பிரிவைச் சார்நதவர் என
 சான்றளிக்கப்படுகிறது.

This is to Certify that N. THENMOZHI Son / Daughter of
 Thru NAGARATHINAM of Village / Town RAJAPALAYAM
 Taluk KAMARAJAR District of the State of Tamil Nadu belongs to H.I.N.D.U.
NADAR Community, which is recognised as a Backward Class as
 per Government Order (Manuscript Series) No. 1564, Social Welfare Department, dated
 30-7-1985 vide Serial No. 083.

2. திரு / திருமதி / செல்வி / செல்வர் N. தோண்டொழி
 சான்றிதழ் பெயர் சான்றிதழ் பெயர்
 மாவட்டத்தில் இராஜபாளையம் வட்டத்தில் இராஜபாளையம்
 கிராமத்தில் / நகரத்தில் வசித்து வருகிறார்கள் என சான்றளிக்கப்படுகிறது.

2 It is certified that Thru / Thru / Selvi / Selvan N. THENMOZHI
 and his / her family ordinarily reside(s) at RAJAPALAYAM village / Town
 Taluk RAJAPALAYAM, KAMARAJAR District of Tamil Nadu.

முத்திரை
Seal



கையொப்பம்
Signature
நாள்
Date
முன்னிலை பெயர்
Capital Letters
தலைப் பெயர்
Designation

சு. உமர்லி.
30/5/96

முன்னிலை பெயர்
முன்னிலை பெயர்
இராஜபாளையம்

30/5/96

ANNEXURE-I

CERTIFICATE FROM THE ORGANISATION WHERE THE CANDIDATE IS EMPLOYED

Certified that Mr./Ms./Mrs. N. THENMOEZHI is employed as ASSISTANT PROFESSOR (Designation) in the ELECTRONICS & COMMUNICATION ENGINEERING (Department/Division Name) of AAA COLLEGE OF ENGINEERING & TECHNOLOGY, SIVAKASI (Institution/Industry Name).

We have no objection in forwarding his/her application for the Ph.D. Research Programme.

FOR FULLTIME:

~~The candidate will be sanctioned leave for the duration of the research programme and will be relieved from duty from _____ to _____ to undertake the full time research work in the University.~~

✓ FOR PART TIME:

The candidate will be permitted to undertake part time study in the University/College and will be allowed to be present for discussions with the supervisor, attending course works, conduct of experiments and participations in seminars and related presentations. Further the required facilities at our organization will also be provided to the candidate for doing research.

Date: 11-06-2020


Signature of the Head of Organization with office seal

PRINCIPAL
AAA COLLEGE OF ENGG. & TECHNOLOGY
SIVAKASI.