博 士 学 位 論 文

Doctoral Thesis

内容の要旨
及び
審査結果の要旨

Thesis Abstracts
and
Summaries of the Thesis Review Results

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The University of Aizu

はしがき

博士の学位を授与したので、学位規則（昭和２８年４月１日文部省令第９号）第８条の規定に基づき、その論文の内容の要旨及び論文審査の結果の要旨をここに公表する。

学位記番号に付した「甲」は学位規則第４条第１項（いわゆる課程博士）によるものであることを示す。

Preface

On granting the Doctoral Degree to the individuals mentioned below, abstracts of their theses and the theses review results are herewith publicly announced, in according to the provisions provided for in Article 8 of the Ruling of Degrees (Ministry Of Education Ordinance No.9, enacted on April 1, 1953)

The Chinese character, “甲”, at the beginning of the diploma number represents that an individual has been granted the degree in accordance with the provisions provided for in Paragraph 4-1 of the Ruling Of Degrees (what in called “Katei Hakase,” or the Doctoral Degree granted by the University at which the grantee was enrolled.)

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The relevant degree 学位の種類	Doctoral degree (in Computer Science and Engineering) 博士(コンピュータ理工学)
Number of the diploma of the Doctoral Degree 学位記番号	甲Ⅰ博第 21 号
The Date of Conferment 学位授与日	March 21, 2008 平成 20 年 3 月 21 日
Requirements for Degree Conferment 学位授与の要件	Please refer to the article five of “University Regulation on University Degrees” 会津大学学位規程 第5条該当
Thesis Title 論文題目	Multilingual Similarity between Perceptual and Semantic Structures of Aural-Visual Modalities 聴覚視覚様相の知覚及び意味構造間の多言語の類似
Thesis Review Committee Members 論文審査委員	University of Aizu, Prof. M. Cohen (Main Referee) University of Aizu, Prof. M. Osano University of Aizu, Prof. S. Tripp University of Aizu, Prof. L. Schmitt 会津大学教授 M. Cohen(主査) 会津大学教授 小佐野 峰忠 会津大学教授 S. Tripp 会津大学教授 L. Schmitt

Multilingual Similarity between Perceptual and Semantic Structure of Aural-Visual Modalities

Thesis Abstract

Chapter 1 : Introduction

This capture describe some information on my research motivation, contribution, research hypothesis and outline of my thesis.

Chapter 2 : Background

This chapter presents the reviewed literature, which were related in my research and related models and theories, which already exist in aural and visual modalities.

Chapter 3 : Methodology

This chapter contains the methodology and its statistical techniques, which are practices throughout the research. Statistical techniques are explained referencing the mathematical background in the dissertation

Chapter 4 : Perceptual Structures

This chapter describes the perceptual structures of aural-visual modalities. As described in Chap.1, the object of finding perceptual structures to see whether the subjects' perception differ across various languages. And also identify most salient perceptual dimensions in order to create perpetually informed human computer interfaces, specially for technically untrained users. Further, one of the motivations of this study was to focus upon the question of whether multilingual semantic structures may be related to the perceptual structures.

Chapter 5 : Semantic Structures

This chapter describes the semantic structures of aural and visual modalities. Semantics is the study of the meaning of words in language. The main purpose of finding semantic structures of languages to see whether the words used by multilingual groups of people may share common underlying semantic structures when used to describe the set of same stimuli. And also provide basis foe developing multilingual multimedia information retrieval systems and more user centered human computer interfaces.

Chapter 6 : Perceptual Structures vs. Semantic Structures

This chapter contains results of comparison between aural modality and visual modality and, the answers of the following question: does aural semantic structures relate to aural common perceptual structure? Does visual semantic structures relate to visual perceptual structures? Which modality makes a better mapping between perceptual structures and semantic structures of each language? And which modality the different language groups show a better perceptual relation to each other?

Chapter 7 : Linguistic Boundaries and Propose Prototypes

Experiments, results and concluding comments of linguistic boundaries between color characteristics and propose prototypes for aural and visual modalities information retrieval are described in this chapter.

Chapter 8 : Conclusion and Future Research

Conclusion drawn from the current research and suggest directions for further research are summarized in this chapter.

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Requirements for Degree Conferment 学位授与の要件	Please refer to the article five of “University Regulation on University Degrees” 会津大学学位規程　第5条該当
Thesis Title 論文題目	Voice/Non-Voice Classification Methods and Their Applications 音声／非音声判別法とその応用の研究
Thesis Review Committee Members 論文審査委員	University of Aizu, Prof. M. Sugiyama (Main Referee) University of Aizu, Prof. R. Oka University of Aizu, Prof. M. Cohen University of Aizu, Associate Prof. J. Huang 会津大学教授　杉山　雅英(主査) 会津大学教授　岡　隆一 会津大学教授　M. Cohen 会津大学上級准教授　J. Huang

Voice/Non-Voice Classification Methods and Their Applications

Thesis Abstract

Chapter 1

This chapter will describe about the background, purpose, and related research of this research. Recently, Voice Activity Detection (VAD) is noticed. It is very important for speech communication application such as speech recognition, hands-free telephony, and speech coding. This chapter shows purpose of this research.

Chapter 2

This chapter will describe about related research for VAD. The standard flow of VAD and various characteristics of other algorithms are compared.

Chapter 3

This chapter will introduce sound feature parameter Block Cestrum Flux (BCF) which is mainly used in this research. In generally, the transition of sound spectrum in voice section is larger than non-voice section's one. Because of that BCF means the average of the distances of logarithmic spectrum between related 2 points, the value of BCF becomes larger at voice section and smaller at non-voice section. Then it is able to discriminate voice and other by using appropriate threshold. When BCF equals or is larger than threshold, the section is considered as voice. This chapter describes about definition of BCF, voice/non-voice classification method, noise robustness of BCF.

Chapter 4

This chapter will describe about detection of voice section in these multimedia contents. By removing unnecessary section (noise, music, and so on) from sound data, speech recognition techniques can prevent miss recognition. This section detection technique can pre-process of speech recognition techniques. This chapter investigates voice/non-voice classification method and its automatic training method. By creating teaching signal from target data, it is able to apply recognition techniques to some data that it is difficult to do previous training. Also it is able to prevent reduction of effectiveness by the difference of training data and testing data. As a result, proposed method shows 4.2% of classification error rate. The efficiency of voice/non-voice model which is created by proposed method equals to model which is created by about 40% to 50% of manually created teaching signal and proposed method can reduce manual creating work of teaching signal.

Chapter 5

This chapter will describe about Time compressed speech playing method. Recently, the effectiveness of audio-visual machine improves and they becomes to be able to storage many multi-

media data. Although to strong data is done by machine automatically, to watch data is done by human and it is bottle-neck for improvement of multimedia data processing. This chapter attentions to sound part of multimedia data and proposes time-compressed speech playing method. The proposed method picks out voice section and deletes continuous part by using BCF and voice/non-voice classification method. By to remove non-voice section from sound data, it can create compressed data with more slowly voice than the compressed data with constant compress rate. The experimental result for compressed sound listening test shows that the proposed mothod brings better impression than constant compress rate.

Chapter 6

This chapter will conclude all of the research. This will describe about the effectiveness and evaluation of BCF, problem and future work for it.

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Requirements for Degree Conferment 学位授与の要件	Please refer to the article five of “University Regulation on University Degrees” 会津大学学位規程　第5条該当
Thesis Title 論文題目	Narrowcasting Attributes for Articulated Media Privacy and Awareness in SIP Audio Conferencing SIP 上での音声会議におけるメディアプライバシーと音声感知 のためのナローキャスティング特性
Thesis Review Committee Members 論文審査委員	University of Aizu, Prof. M. Cohen (Main Referee) University of Aizu, Prof. G. Nikishkov University of Aizu, Prof. M. Osano Hosei University, Prof. A. Pasko 会津大学教授　M. Cohen（主査） 会津大学教授　G. Nikishkov 会津大学教授　小佐野　峰忠 法政大学教授　A. Pasko

Narrowcasting Attributes for Articulated Media Privacy and Awareness in SIP Audio Conferencing

Thesis Abstract

Chapter 1 : Introduction
This chapter describes some information regarding research motivation and contributions/

Chapter 2 : Related Research and Privacy Limitations
This chapter presents an review of background and related research useful for understanding later chapters. It discussed some conference control features both developed in industry and researched in academia. It also describes privacy limitations in conference communication. It also describes our group's Collaborative Virtual Environment, "Multiplicity" interface, and MSCML for controlling personalized mixing of media in a media server.

Chapter 3 : SIP Conferencing Architecture
This chapter provides an overview of SIP. It discuss SIP-based conference systems, models, and conferencing components.

Chapter 4 : Media Privacy: Concept of Narrowcasting
This chapter describes in detail the narrowcasting concept for media privacy. It also discusses design and implementation of narrowcasting attributes for articulated privacy.

Chapter 5 : This chapter elaborates an architecture and design for a media mixing mechanism. It describes in detail our narrowcasting implementation for real-time audio conferencing for the "Media Server Component Model." It also discuss SIP narrowcasting integration with Multiplicity.

Chapter 6 : Conclusion and Future Research
This chapter concludes this dissertation with a summary of its contributions and proposal for future research.

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Thesis Title 論文題目	Numerical Solutions of Normal Pressure Distribution in the Entrance Flow of Pipe and Channel 円管流と平行平板間流・助走区間での法線方向圧力分布
Thesis Review Committee Members 論文審査委員	University of Aizu, Prof. H. Kanda (Main Referee) University of Aizu, Prof. G. Nikishkov University of Aizu, Prof. R. Oka University of Aizu, Prof. H. Sagawa 会津大学教授　神田　英貞 会津大学教授　G. Nikishkov 会津大学教授　岡　嶐一 会津大学教授　佐川　弘幸

Numerical Solutions of Normal Pressure Distribution in the Entrance Flow of Pipe and Channel

Thesis Abstract

This paper deals with the computation of pipe and parallel plates flow in the entrance region. The pressure distribution and flow characteristics, particularly the effect of vorticity in the vicinity of the wall, were analyzed for Reynolds numbers (Re) ranging from 500 to 1000 at pipe flow and ranging from 100 to 500 at flow between parallel plates because the minimum critical Reynolds number for laminar-turbulent transition is approximately 2000 at pipe flow and 1300 at flow between parallel plates.

The pressure gradient in the normal or radial direction is caused by the normal component of the curl of vorticity, which decreases as Re increases. It was found, for the first time, that the pressure gradient along normal direction near the inlet is negative, i.e., the pressure at the wall is lower than that at the central core for $Re \leq 5000$. This result is beyond the scope of the boundary-layer assumption and contrary to the consequence of Bernoulli's law.

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Requirements for Degree Conferment 学位授与の要件	Please refer to the article five of “University Regulation on University Degrees” 会津大学学位規程　第5条該当
Thesis Title 論文題目	Theoretical Study and Computer Simulation of Tera hertz Plasma-Wave Devices テラヘルツプラズマ波素子の理論的研究およびコンピュータシミュレーション
Thesis Review Committee Members 論文審査委員	University of Aizu, Prof. V. Ryzhii (Main Referee) University of Aizu, Prof. H. Kanda University of Aizu, Assist. Prof. I. Kymyrova University of Aizu, Assist. Prof. M. Ryzhii Tohoku University, Prof. T. Otsuji 会津大学教授　V. Ryzhii 会津大学教授　　神田　英貞 会津大学准教授　I. Kymyrova 会津大学准教授　M. Ryzhii 東北大学教授　尾辻　泰一

Theoretical Study and Computer Simulation of Terahertz Plasma-Wave Devices

Thesis Abstract

Terahertz (THz) gap, the absence of solid-state devices generating and detecting electromagnetic waves with frequencies from 200 GHz to 30 THz, has been one of the most important and challenging issues in applied physics for several decades. The fact that THz waves lie between radio waves and optical lights makes them have applications in a wide variety of science: astronomy, biology, material science, medical science, information technology, imaging technology, and of course physics. For this reason, there is an increasing demand for THz solid-state devices which are compact, effective, and capable operating at room temperatures.

Devices which we call “plasma-wave devices”, having two-dimensional electron gas (2DEG) channels like high-electron-mobility transistors (HEMTs), have been studied extensively as THz wave generators and detectors. Plan waves are oscillations of the electron concentration and the electric field. 2DEG channels in those devices serve as resonant cavities of plasma waves, and their frequencies can be in the THz range if 2DEG channels have the submicron length and the electron concentration $\sim 10^{12}\mathrm{cm}^{-2}$. Moreover, due to the high mobility of 2DEG channels in such devices, the quality factor of resonant cavities is rather large. The THz generation and detection with plasma-wave devices have been realized experimentally, though not all experimental results are fully understood. Further theoretical and experimental studies of those devices as well as studies using computer simulation are necessary to improve their performance, develop new functionalities, invent more effective devices, and, ultimately, close the THz gap.

In the dissertation, for the understanding and further development of plasma-wave devices, we study them theoretically and by computer simulations. The dissertation is organized into three parts. First, the fundamental properties of plasma waves in 2DEG channels in transistor structures are studied theoretically using the hydrodynamic electron transport model with the support of numerical calculations. Several methods of calculating spectra of plasma oscillations are developed, and effects of metallic electrodes surrounding 2DEG channels are discussed. Second, the THz generation and detection by plasma-wave devices are studied. Performances of newly proposed local oscillators and detectors as well as the transit-time effect in a “conventional” plasma-wave generator are analyzed with the above-mentioned model. Third, the model based on the kinetic equation (Vlasov equation) coupled with the self-consistent Poisson equation is developed for computer simulations of plasma-wave devices, and simulation results for several devices are compared with analytical studies.

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