# 2017 International Conference on Culture and Computing

10-12 September 2017 • Kyoto, Japan

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# Culture and Computing 2017

Kyoto, Japan
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# 2017 International Conference on Culture and Computing

# Culture and Computing 2017

## Table of Contents

**Message from Chairs**.....x

**Conference Organization**.....xi

**Program Committee**.....xii

**External Reviewers**.....xiii

**Keynote**.....xiv

**Special Talks**.....xvi

**Invited Talk**.....xx

**Sponsors**.....xxii

---

## Session 1: Cultural Heritage and Archiving

Effect of First Impressions in Tourism by Using Walk Rally Application .....1

*Yuya Ieiri, Takuya Mizukami, Yuu Nakajima, Ryota Ayaki, and Reiko Hishiyama*

Highlighting Feature Regions Combined with See-Through Visualization of Laser-Scanned Cultural Heritage .....7

*Naoya Okamoto, Kyoko Hasegawa, Liang Li, Atsushi Okamoto, and Satoshi Tanaka*

Improving Transparent Visualization of Large-Scale Laser-Scanned Point Clouds by Using Poisson Disk Sampling .....13

*Shu Yanai, Ryohei Umegaki, Kyoko Hasegawa, Liang Li, Hiroshi Yamagushi, and Satoshi Tanaka*

Walk through a Museum with Binocular Stereo Effect and Spherical Panorama Views .....20

*YanXiang Zhang, ZiQiang Zhu, and PengFei Ma*

## Session 2: Language and Infrastructure for Culture

Reality Determination through Action ....24
*Matthias Rauterberg*

Experimental Analysis for the Design of Sustainable Service Computing Infrastructure ....29
*Ryutaro Otsuka, Yuu Nakajima, and Reiko Hishiyama*

Plan Optimization for Creating Bilingual Dictionaries of Low-Resource Languages ....35
*Arbi Haza Nasution, Yohei Murakami, and Toru Ishida*

Federation of Language Service Infrastructures for Global Collaboration ....42
*Takao Nakaguchi, Yohei Murakami, Donghui Lin, and Toru Ishida*

Constructing a Judging Model of Closeness in Japanese Business Relations ....49
*Yuka Teramoto, Kazuma Kusu, Takamitsu Shioi, and Kenji Hatano*

## Organized Session: Intangible Cultural Properties

Digital Archives of Intangible Cultural Properties ....55
*Kozaburo Hachimura*

Multi-site Linked MOCAP Streaming System for Digital Archive of Intangible Cultural Heritage ....61
*Kazuya Kojima, Kohei Furukawa, Mitsuru Maruyama, and Kozaburo Hachimura*

The Postures and Movements of Balinese Dance ....63
*Minako Nakamura*

Quantification of Multimodal Interactions as Open Communication in Manzai Duo-Comic Acts ....65
*Mamiko Sakata*

Analysis of Interpersonal Effects in Dance Performance ....67
*Nao Shikanai and Kozaburo Hachimura*

Analysis of Movements of Body Trunk in Japanese Traditional Dance ....69
*Annla Utsugi, Tsuyuki Masaya, and Hideo Takaoka*

## Session 3: Human Behaviors and Culture

Estimation of Emotional State in Personal Fabrication: Analysis of Emotional Motion Based on Laban Movement Analysis ....71
*Yoichi Yamazaki, Michiya Yamamoto, and Noriko Nagata*

Analyzing Facial Expressions and Hand Gestures in Filipino Students' Programming Sessions ....75
*Thomas James Tiam-Lee and Kaoru Sumi*

Effects of Different Behaviors between Cross Cultures on Learners When Studying ....82
*Sanggyu Shin, Hiroshi Hashimoto, and Ikuyo Yoshida*

Adapting a Persuasive Conversational Agent for the Chinese Culture ....89
*Shuo Zhou, Zhe Zhang, and Timothy Bickmore*

Learning the Cultural Consistent Facial Aesthetics by Convolutional Neural Network ....97
*Song Tong, Xuefeng Liang, Takatsune Kumada, Sunao Iwaki, and Naoko Tosa*

## Session 4: Information Technologies for Performing Arts

Magic Props: A Multi-sensory System Fusing Virtual Effects in Live Drama Performance Spatially ....104
*YanXiang Zhang, PengFei Ma, and ZiQiang Zhu*

A Chinese Drama Rehearsal System Based on Phonetic Matching and Augmented Reality ....108
*YanXiang Zhang and Rongli Huang*

Design of Virtual Tea Ceremony "Otemae" from Remote Place Using Haptic Retargeting ....112
*Yoshihiro Ikeda, Hiromi T. Tanaka, Haruo Noma, Kohei Matsumura, and Roberto Lopez-Gulliver*

Content Concept for VR-based Interactive Korean Traditional Dance ExperienZone (IKTDEZ) ....118
*Unmi Kim and Kyeonga Shin*

## Demo Session & Exhibition

Development of a Streetscape-Simulation System to Support Regional and Historical Culture: Fujisawa-Shuku Post-Station Town on the Former Tokaido Road during the Late Edo Period ....123
*Yasuo Kawai*

Case Study of Digital Exhibition of Japanese Classical Writings and Drawings Based on AR Technology ....125
*Keiko Kitamura*

Sketch-Based Shadow Image Retrieval for Digital Library ....127
*Jinjoo Song, Hyeyoun Cho, and Sang Min Yoon*

## Session 5: Media Art and Culture

Creation of Media Art Utilizing Fluid Dynamics ....129
*Naoko Tosa, Ryohei Nakatsu, Pang Yunian, and Liang Zhao*

A Study on Variable Control of Sound Vibration Form (SVF) for Media Art Creation ....136
*Yunian Pang, Liang Zhao, Ryohei Nakatsu, and Naoko Tosa*

## Poster Session

Evaluating the Use of Motion Capture in Practicing Local Folk Dance ....143
*Katsumi Sato, Yoko Usui, Erina Yanagida, and Shinichi Watabe*

Towards Resolution Support to Cross-Cultural Communication Gaps: Using Partially Bilingual Experience Corpus ....145
*Masami Suzuki*

Pivot-Based Hybrid Machine Translation to Support Multilingual Communication ....147
*Arbi Haza Nasution, Nesi Syafitri, Panji Rachmat Setiawan, and Des Suryani*

Issues in Visualizing Intercultural Dialogue Using Word2Vec and t-SNE ....149
*Heeryon Cho and Sang Min Yoon*

Creating a Digital Edition of Mongolian Historical Documents ....151
*Biligsaikhan Batjargal, Garmaabazar Khaltarkhuu, and Akira Maeda*

Sound Reproduction by Concatenative Synthesis for Japanese Traditional Music Box ....153
*Misaki Otsuka, Sayaka Okayasu, Takahiro Fukumori, Takanobu Nishiura, and Ryo Akama*

Realizing Multilingual Interactive Agents through Wizard of Oz ....155
*Ryosuke Okuno, Donghui Lin, Toru Ishida, and Masayuki Otani*

Absorbed in Architectural Representations: Venomenon as an Example for Stereoscopic Video Connecting Cultural Heritage and Media Art ....157
*Elke E. Reinhuber*

Collaborative Authorship Visualization of Yasunari Kawabata's Novel ....159
*Hao Sun and Mingzhe Jin*

Support System Using Motion Data for Creating Solo Performances of Shorinji Kempo ....161
*Asako Soga*

## Session 6: Music and Culture

A Novel System for the Elderly to Learn Playing Electronig Musical Instrument in Ensemble .....163
*Naomi Takehara, Tomoko Ichinose, Kakuko Matsumoto, Ryuhei Okuno, Shinichi Watabe, Katsumi Sato, Tsutomu Masuko, and Kenzo Akazawa*

Quantitative Analysis of Traditional Folk Songs from Shikoku District .....170
*Akihiro Kawase*

**Author Index** .....178

# Message from the Chairs
## Culture and Computing 2017

Welcome to 2017 International Conference on Culture and Computing (Culture and Computing 2017).

International communities are facing various problems in different topic areas such as: population demographic shifts, energy use and creation, the environment, and food supply. It is necessary to build a global consensus for resolving problems within these topic areas. Unfortunately, there are difficulties that hinder communication among cultures. It is imperative to develop information and communication technologies that encourage mutual understanding and bridge the difference in cultures.

Several research directions impinge on the relations between culture and computing: archiving cultural heritage via ICT (cf. digital archives), empowering humanities researches via ICT (cf. digital humanities), creating art and expressions via ICT (cf. media art), generating culturally-directed behavior (cf. cultural agent), supporting multi-language, multi-cultural societies via ICT (cf. intercultural collaboration), and understanding new cultures born in the Internet and the Web (cf. net culture).

This year, Culture and Computing 2017 is held in Kyoto, the cultural heart of Japan, to provide an opportunity to share research issues and discuss the future of culture and computing. The conference proceedings include full papers and short papers for oral presentation, poster papers and demonstration papers. The oral presentation track will present a collection of scientific or engineering research results that include six regular sessions and one organized session: cultural heritage and archiving, language and infrastructure for culture, human behaviors and culture, information technologies for performing arts, media art and culture, music and culture, and intangible cultural properties. The poster session and the demonstration session will provide thought-provoking stimulation and discussion. We are sure you will find your participation in the conference fruitful and hope that it is enjoyable.

We wish to express our sincere appreciation to everyone who has contributed to Culture and Computing 2017. Our foremost thanks go to the authors of the submitted papers from 11 countries for their valuable ideas and substantial efforts. We are also very grateful for the hard work of the program committee members and external reviewers who have helped to ensure the quality of the Culture and Computing program. Without them, the review process would not have been so thorough and effective. Finally, we wish to thank the IEEE Computer Society Conference Publishing Services for their support in compiling the proceedings.

We hope you enjoy the stimulating Culture and Computing program and your stay in Kyoto!

Toru Ishida, Naoko Tosa, and Kozaburo Hachimura
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# Pivot-based Hybrid Machine Translation to Support Multilingual Communication

Arbi Haza Nasution, Nesi Syafitri, Panji Rachmat Setiawan, Des Suryani
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***Abstract*—Machine Translation (MT) is very useful in supporting multicultural communication. Existing Statistical Machine Translation (SMT) which requires high quality and quantity of corpora and Rule-Based Machine Translation (RBMT) which requires bilingual dictionaries, morphological, syntax, and semantic analyzer are scarce for low-resource languages. Due to the lack of language resources, it is difficult to create MT from high-resource languages to low-resource languages like Indonesian ethnic languages. Nevertheless, Indonesian ethnic languages' characteristics motivate us to introduce a Pivot-Based Hybrid Machine Translation (PHMT) by combining SMT and RBMT with Indonesian as a pivot which we further utilize in a multilingual communication support system. We evaluate PHMT translation quality with fluency and adequacy as metrics and then evaluate usability of the system. Despite the medium average translation quality (3.05 fluency score and 3.06 adequacy score), the 3.71 average mean scores of the usability evaluation indicates that the system is useful to support multilingual collaboration.**

## 1. Introduction

Machine Translation (MT) is very useful in supporting multicultural communication, but scarce for low-resource languages. Existing MT researches are Statistical Machine Translation (SMT) which requires high quality and quantity of corpora and Rule-based Machine Translation (RBMT) which requires bilingual dictionaries, morphological analyzer, syntax analyzer (parser) and semantic analyzer. There are research challenges when we want to create MT from high-resource languages (HRL) to low-resource languages (LRL) like Indonesian ethnic languages which are the scarcity of corpora, sizable dictionary, good morphological, syntax and semantic analyzer. Nevertheless, Indonesian ethnic languages characteristics, i.e., several clusters of similar languages with morphology and syntax similarity, motivate us to find an answer to these challenges. We address the following research goals:

- *Developing a pivot-based hybrid machine translation (PHMT)*: We combine SMT and RBMT to bridge the gap between HRL and LRL.
- *Supporting multilingual communication with the PHMT*: We implement the PHMT to develop a multilingual communication support system.

The rest of this paper is organized as follows: In Section 2, we will briefly discuss our proposed PHMT. Section 3 discusses our experiments and the results. Finally, Section 4 concludes this paper.

## 2. Pivot-Based Hybrid Machine Translation

Recently, [1] introduced the promising approach of creating bilingual dictionary A-C with only bilingual dictionaries A-B and B-C as input. The output machine readable bilingual dictionary is wrapped as a service in Language Grid [2] to support intercultural collaboration [3]. We combine Google Translate service and Bilingual Dictionary service as a composite service in Language Grid as shown in Figure 1. In this paper, we create English-Minangkabau PHMT with Indonesian as pivot, since Minangkabau has 61.59% lexical similarity with Indonesian based on ASJP [4], thus the morphology and syntax is also similar. Therefore, we expect that Indonesian-Minangkabau word-to-word translation is acceptable.

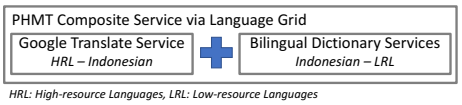


Figure 1. PHMT as a Language Grid Composite Service.

## 3. Experiment

To provide multi-language support system for international symposiums, [5] combined human inputters and language services. The PHMT is used to support multilingual communication with similar settings. In this experiment, the system support Minangkabau speaker audience to understand English presentation. Indonesian-Minangkabau Dictionary Service has 5,391 entries.

### 3.1. Experiment Settings

A video of English presentation was played to 165 bachelor of Informatics Students, Islamic University of Riau, Indonesia. The video and the system were displayed in a separate screen. While listening to the English presentation, one inputter input summarized and simplified English sentences to the system. Audiences could also view the system from any web browser (via personal PC or smartphone) as shown in Figure 2.

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TABLE 1. USABILITY EVALUATION OF PHMT

| Question | Rate of Each Scale* | | | | | mean |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | |
| Was the interface easy to look at? | 0.006 | 0.073 | 0.341 | 0.246 | 0.335 | 3.81 |
| Did you understand the content of the presentation? | 0.000 | 0.056 | 0.335 | 0.385 | 0.223 | 3.74 |
| Was the Minangkabau translation result correct? | 0.000 | 0.207 | 0.458 | 0.257 | 0.078 | 3.25 |
| Was the Minangkabau translation result easy to understand? | 0.000 | 0.089 | 0.464 | 0.307 | 0.140 | 3.51 |
| Was the Minangkabau translation result helpful to understand the presentation? | 0.006 | 0.078 | 0.458 | 0.291 | 0.168 | 3.56 |
| Was the translation displayed in a timely manner? | 0.006 | 0.045 | 0.296 | 0.346 | 0.307 | 3.96 |
| Do you think this system is needed and important to support multilingual communication in international seminar between English native speaker with non-native audience? | 0.006 | 0.022 | 0.251 | 0.257 | 0.464 | 4.11 |

* *Scaled from 1 (Extremely Disagree) to 5 (Extremely Agree)*

Figure 2. PHMT to Support Multilingual Communication.

### 3.2. Experiment Result

We assessed the translation quality of both English-Indonesian translations and Indonesian-Minangkabau translations and further evaluated the usability of the multilingual communication support system.

**3.2.1. Translation Quality Assessment.** We assessed the translation quality with fluency and adequacy as measures following the linguistic data annotation specification [6] with small modification on the 5-point scale (from scale 1 for the lowest score to 5 for the highest score). Fluency refers to the degree to which the translation is well formed according to the rules/grammars of the language. A fluent translation is one that is well-formed grammatically, has correct spellings, using common terms, titles and names, is intuitively acceptable and can be sensibly interpreted by a native speaker of the language. The fluency and adequacy of the English-Indonesian translations and Indonesian-Minangkabau translations are evaluated by bilingual speakers of those languages as judges. The average fluency score of English-Indonesian translations and Indonesian-Minangkabau translations are 3.52 and 3.05 respectively. Adequacy refers to the degree to which information existed in the original sentences is also conveyed in the translations. The judges determine whether the translation is adequate by comparing the English-Indonesian translations and Indonesian-Minangkabau translations against the reference translations. The average adequacy score of English-Indonesian translations and Indonesian-Minangkabau translations are 3.59 and 3.06 respectively.

**3.2.2. Usability Evaluation.** The multilingual support system with Pivot-based Hybrid Machine Translation which has 3.71 average mean scores as shown in Table 1 is useful to support multilingual collaboration.

## 4. Conclusion

There are only small decreases of translation quality of the Indonesian-Minangkabau translations from the English-Indonesian translations which are 13% for the average fluency score and 15% for the average adequacy score. Even though the fluency and adequacy scores are considered medium, but the result is promising since we only applied the simplest RBMT method, i.e, word-to-word translation of English-Indonesian translations to Minangkabau.

Based on the audience's comments from the questionnaire, in our future work, we will improve the PHMT quality by refining and adding more entries to the Indonesian-Minangkabau bilingual dictionary by consulting language experts. We will also utilize multiple inputter to improve translation speed and quality in supporting multilingual communication.

## Acknowledgments

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## References

[1] A. H. Nasution, Y. Murakami, and T. Ishida, "Constraint-based bilingual lexicon induction for closely related languages," in *Proceedings of the Tenth International Conference on Language Resources and Evaluation (LREC 2016)*, Paris, France, May 2016, pp. 3291–3298.

[2] T. Ishida, Ed., *The Language Grid: Service-Oriented Collective Intelligence for Language Resource Interoperability*. Springer Publishing Company, Incorporated, 2011.

[3] T. Ishida, "Intercultural collaboration and support systems: A brief history," in *International Conference on Principles and Practice of Multi-Agent Systems (PRIMA 2016)*. Springer, 2016, pp. 3–19.

[4] E. W. Holman, C. H. Brown, S. Wichmann, A. Müller, V. Velupillai, H. Hammarström, S. Sauppe, H. Jung, D. Bakker, P. Brown *et al.*, "Automated dating of the world's language families based on lexical similarity," *Current Anthropology*, vol. 52, no. 6, pp. 841–875, 2011.

[5] T. Nakaguchi, T. Takasaki, N. Pangaea, M. Otani, and T. Ishida, "Combining human inputters and language services to provide multi-language support system for international symposiums," *WLSI-OIAF4HLT 2016*, p. 28, 2016.

[6] L. D. Consortium *et al.*, "Linguistic data annotation specification: Assessment of fluency and adequacy in translations," Technical report, Tech. Rep., 2005.