Leveraging ASEAN Economic Community through Language Translation Services

Badan Pengkajian dan Penerapan Teknologi

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Abstract

In this talk, I will present the activities of BPPT's Speech and Translation Research Group (PERISALAH), including the latest bidirectional Indonesian-English statistical machine translation, and our contribution toward developing network-based ASEAN Languages Translation Public Services (ASEAN-MT). This collaboration work involving 7 ASEAN languages: Thai, Malay, Indonesian, Lao, Cambodian, Vietnamese, Myanmar and English as predominant language in ASEAN countries. As part of the inauguration of ASEAN Economic Communities 2015, the ASEAN-MT public service in the travel domain will be brought online with acceptable response time with at least 3 of 5 score of user satisfaction on the service is achieved.

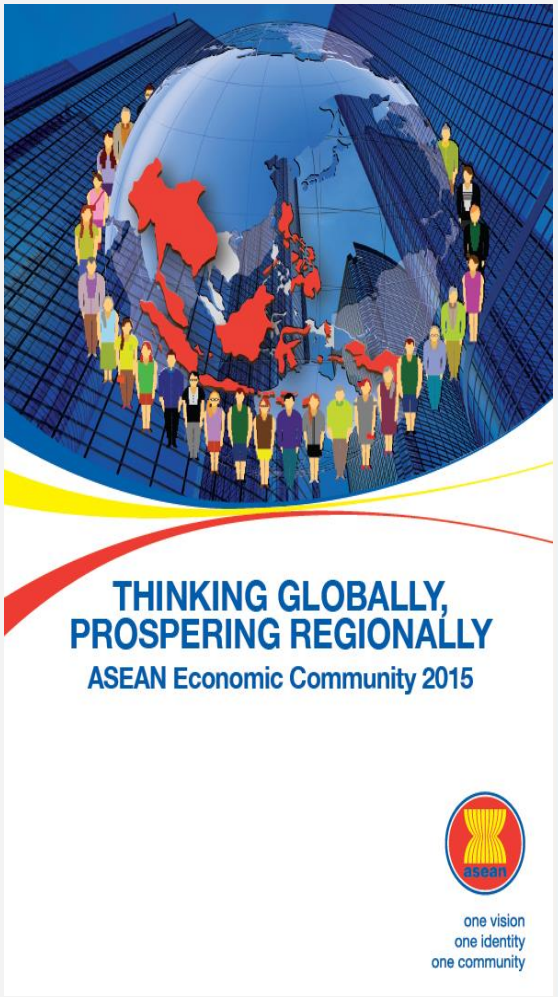
This joint effort not only building a practical network-based service on ASEAN languages text translation in the tourism domain, but most important to strengthen ASEAN collaboration in science and technology, sharing languages resources and knowledge of the translation technology among ASEAN member states and other countries. As part of improving Indonesian-English statistical machine translation, I will introduce the new 2014 project within Indonesian Language Development Agency (Badan Pengembangan Bahasa Indonesia) on building large scale parallel corpora based on ANTARA News corpora and e-KBBI (the official Indonesian Large Electronic Dictionary)

Introduction

- **READY:** This is ASEAN's time. In the geographic heart of the world's premier growth corridor, ASEAN is poised to "seize the moment."

- **SET:** With a market of **over 600 million consumers** and combined **GDP of nearly US$3 trillion**, ASEAN is offering a future of prosperity and stability. The AEC is one of the foundations of that future.

- **GO:** Agreements on trade, services and investment are changing the economic landscape and allowing the freer flow of goods, services and people across the region.



The ASEAN Economic Community (AEC) shall be the goal of regional economic integration by 2015.
AEC envisages the following key characteristics:

(a) a single market and production base,
(b) a highly competitive economic region,
(c) a region of equitable economic development,
(d) a region fully integrated into the global economy.

Total Population: 600 million+
GDP: USD $3 trillion

ASEAN Languages

Network-based ASEAN language translation for public services (ASEAN-MT)

- **ASEAN-MT Background**

ASEAN languages translation is increasiingly important to support the coming AEC 2015

- **The ASEAN-MT Project**

- Endorsed by SCMIT in May 2011
- Approved for ASF partial support in May 2012
- Start in July 2012
- Launch in Oct 2015

ASEAN-MT Objectives

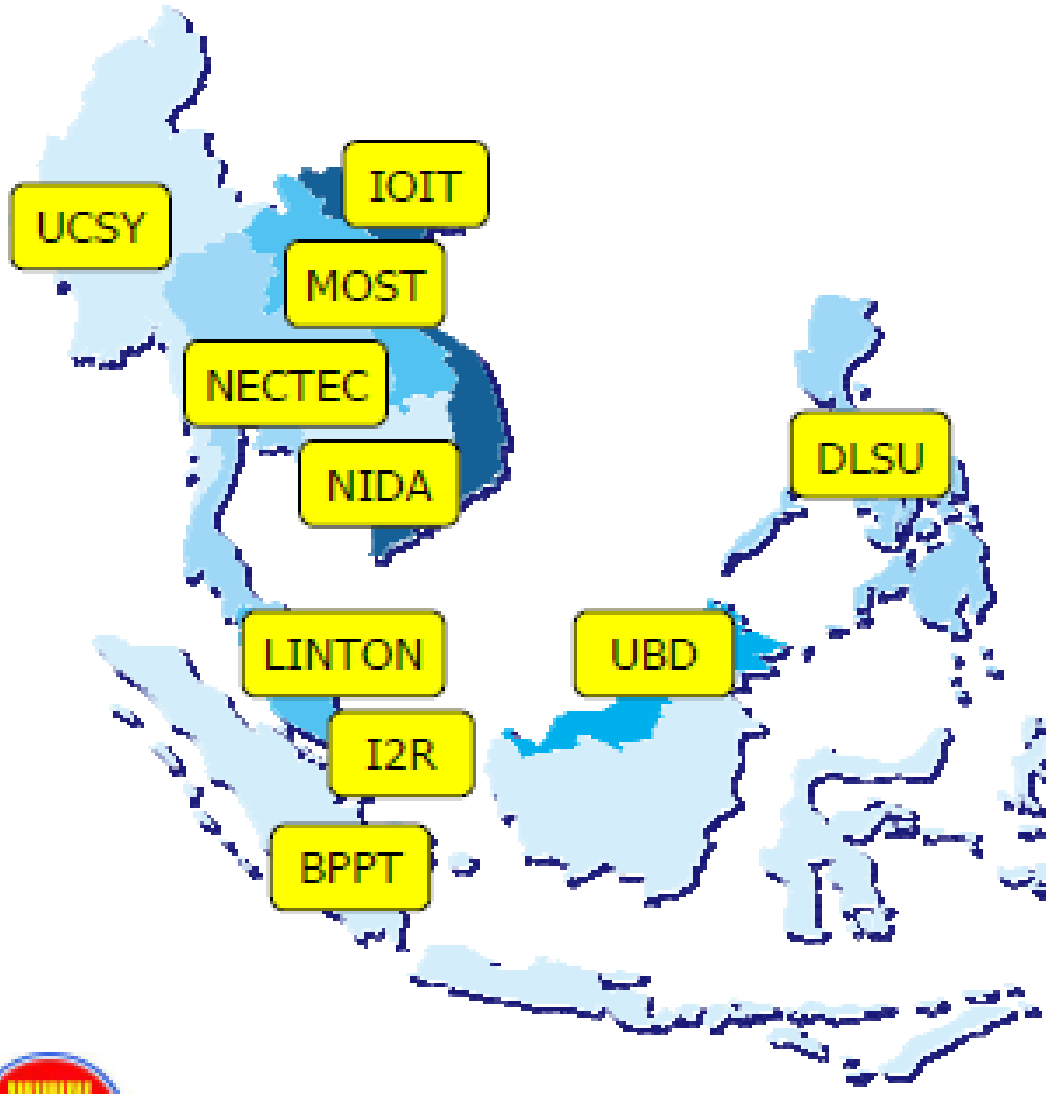
- R&D on network-based ASEAN languages machine translation for the public use
- Sharing language translation knowledge and resources among ASEAN countries
- Reducing the language barrier among and outside ASEAN after the beginning of ASEAN Community in 2015.

Create

Share

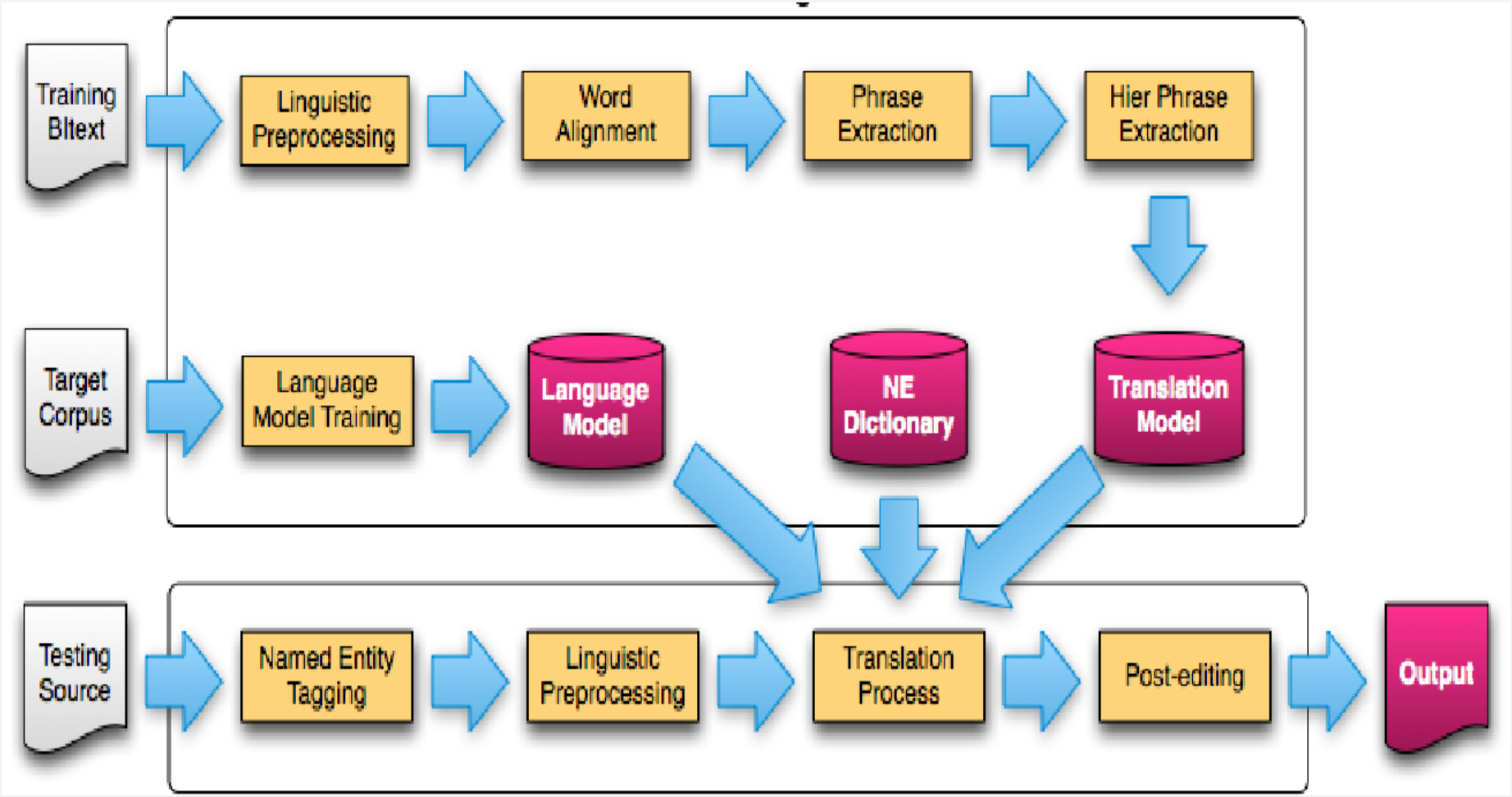
Sustain

ASEAN-MT Collaboration

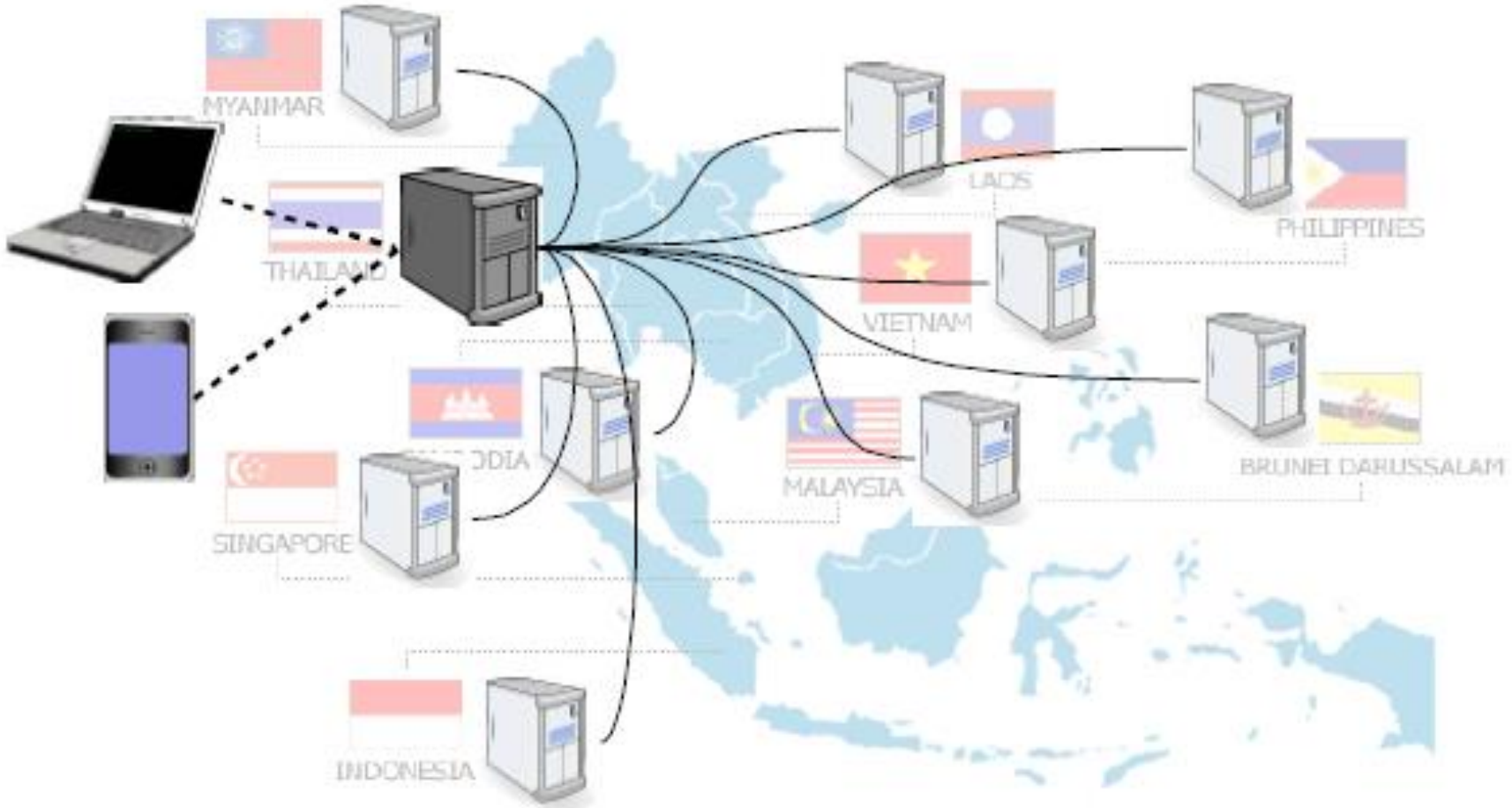


- *Universiti Brunei Darussalam (UBD)*
- *National Information Communications Technology Development Authority (NiDA)*
- *Agency for the Assessment and Application of Technology (BPPT)*
- *Computer Technology and Electronic Institute, Ministry of Science and Technology*
- *Linton University College*
- *University of Computer Studies, Yangon (UCSY)*
- *De La Salle University (DLSU)*
- *Institute for Infocomm Research (I2R)*
- *Institute of Information Technology (IOIT)*
- *National Electronics and Computer Technology Center (NECTEC)*

ASEAN-MT Approach
Statistical based Machine Translation



ASEAN-MT Architecture



Demonstration at SCMIT and COST meeting May 23, 2013

ASEAN-MT Activities

	Activity	1st year			2nd year		3rd year					
		2012	2013				2014					2015
Y1.1	Kick-off meeting (WC meeting 1)											
Y1.2	Resource development		5									
Y1.3	Technology workshop											
Y2.1	Individual MT engine development			5								
Y2.2	Service system development											
Y2.3	Client application development											
Y2.4	Demonstration in ASEAN COST											
Y2.5	WC meeting 2											
Y3.1	Resource extension											
Y3.2	Improvement and evaluation											
Y3.3	WC meeting 3 and press											
Y3.4	Conclusion and report											

MT Public Service

Thailand developers developed an application which will help the Association of Southeast Asian Nation in terms of language barriers.
The app is called an ASEAN One App. Right now the app is on its first phase. It will translate a local language into 11 different ASEAN language which includes English.

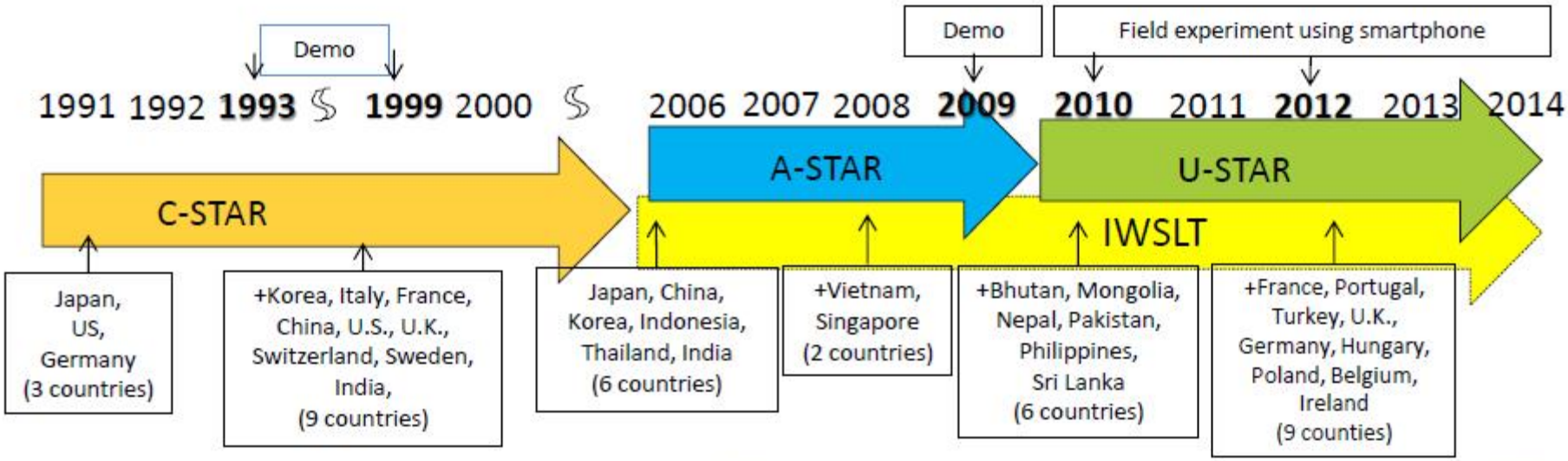
Source: http://philnews.ph/2012/03/09/asean-one-app-plans-speak-11-languages-developed-thailand/

Extending ASEAN+ICJK Languages

WAT 2015?

International Research Consortiums

for Network-based Speech-to-Speech Translation Technology

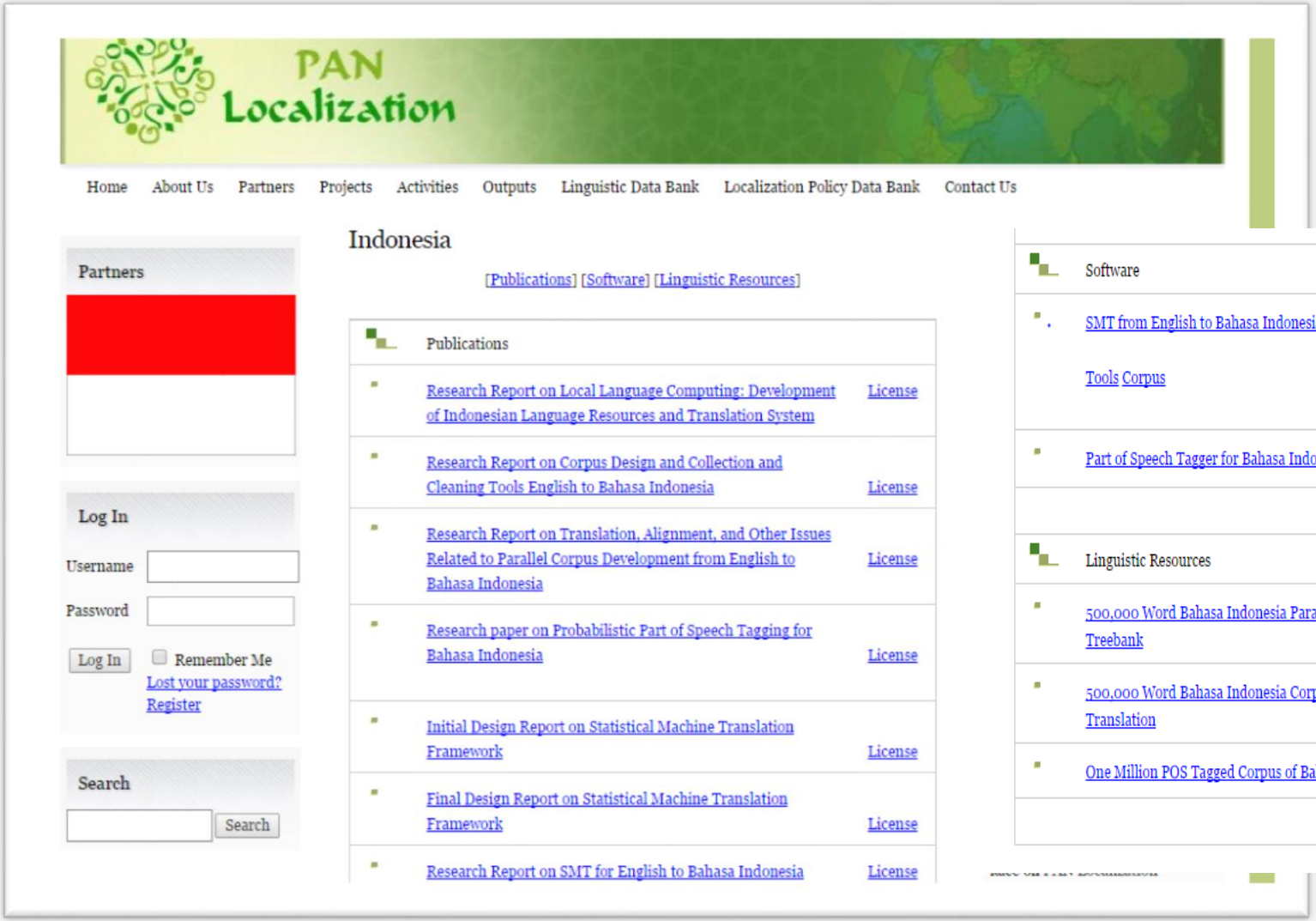


U-STAR

Universal
Speech
Translation
Advanced Research Consortium

30 institutes from
25 countries/regions

SMT Indonesian-English



Translation Technology Application Roadmap

Mobile Perisalah (Cellular OTT)
Transcription
Summarization
System

- **Public Service, Indonesian-English SMT**
- **Speech Translation System (Indonesian-English)**

2013-2014 | **2015-2016**

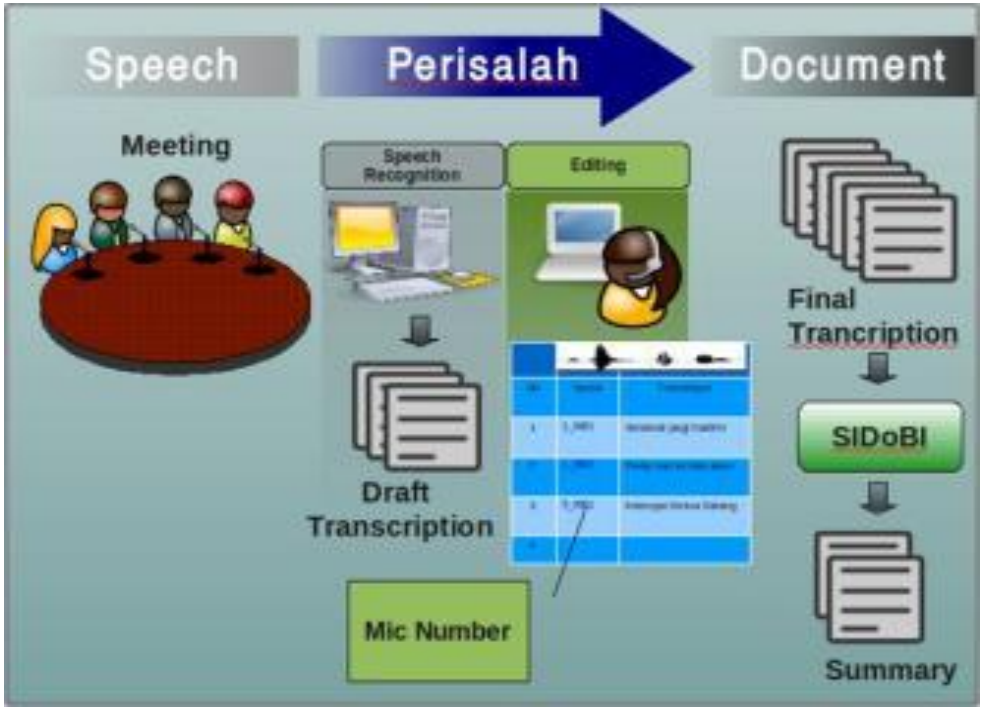
Network-based ASEAN Language Translation Public Service (ASEAN-MT)

Universal Speech Translation Advance Research (U-STAR)

Speech Corpora, Parallel Text Corpora ,TTS, ASR, NLP Tools

BPPT - Digital Signal Processing (DSP) Laboratory

Speech Procesing



Indonesian Language Tools

Institut Teknologi Bandung

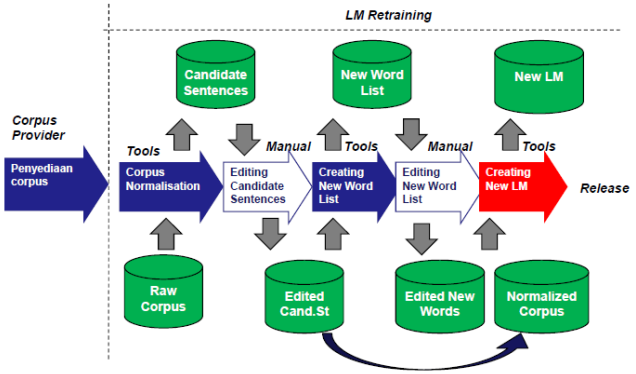
- **Language Processing Tools**
  - Stemmer, POS Tagger
  - Named Entity Tagger, Phrase Chunker
  - Statistical Constituent Parser and Dependency Parser
  - Indonesian Reference Resolution and Semantic Analysis
  - Indonesian MindMap Generator: http://mindmap.kataku.org
  - Game for learning Japanese-Indonesia: http://honyaku.kataku.org
  - Purchase pattern on social media: http://elysis.kataku.org

- **Text Mining**
  - Indonesian Question Answering System
    - Open Domain
    - Closed Domain with ontology
    - Factoid, List Factoid, Non Factoid
  - Indonesian Information Extraction

- **Speech**
  - Indonesian Automatic Speech Recognizer
  - Indonesian Speech Synthesizer
  - Preliminary Research on Indonesian TTS based on "Unit Selection" approach
  - Rebuild of Indonesian Diphone Database for Diphone Concatenation based Indonesian TTS
  - Building Indonesian TTS based on MARY platform
  - Improvement of Indonesian Prosody
  - Indonesian Syllable TTS for special purpose application

Corpus Development 2014

- Perisalah v.3 Speech Corpora
- Perisalah v.3 POS-Tagged Corpus (with Indonesian Language Development Center)
- Corpus Management System



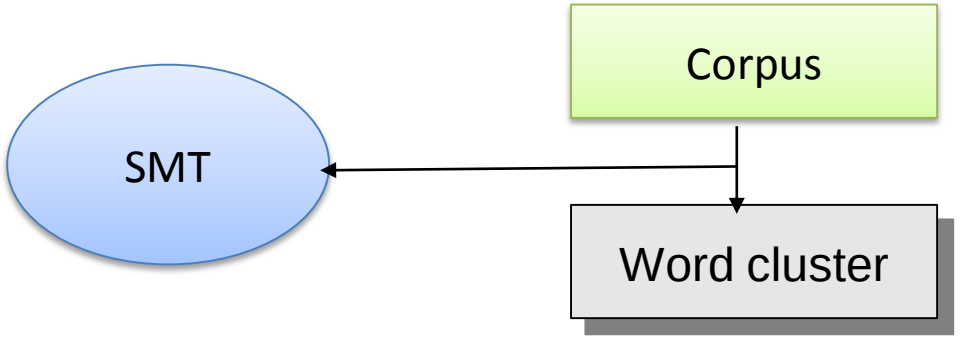
- Indonesian POS Tagged Corpus
- **Extended Word Clustering Algorithm**
- Indonesian Question Answering Using of Indonesian
- TTS for blind operator who work in Call Center
- Indonesian Named Entity Tagged Corpus
- Regional Language Lexical Database
- Indonesian-Japanese Parallel Corpus

Indonesian ASEAN-MT: Improving Statistical Machine Translation with POS Tagged Corpus

Sujaini et.al, Comparison of POS Tagset for improving English-Indonesian SMT, O-COCOSDA, 2014

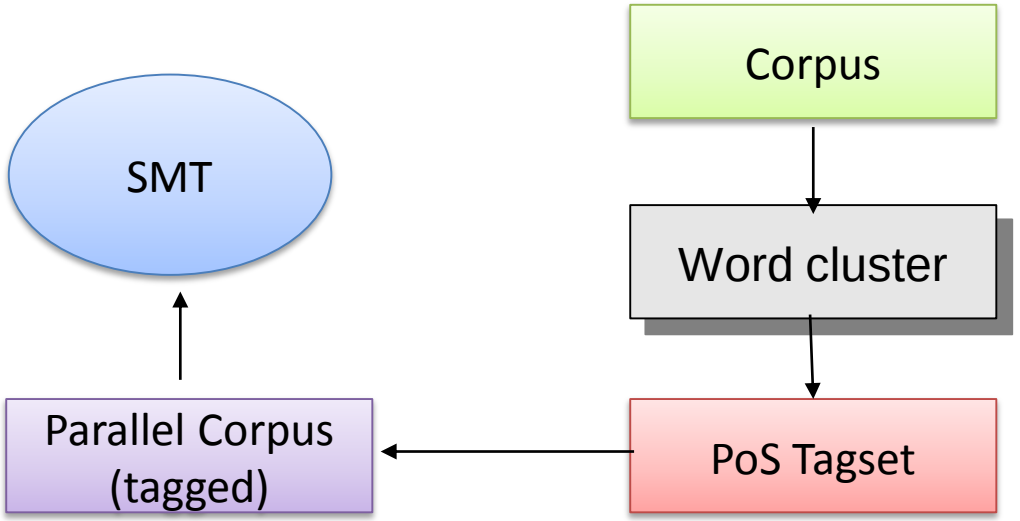
1. Algorithmic improvement

Extended WSB vs WSB
vs MKCLS

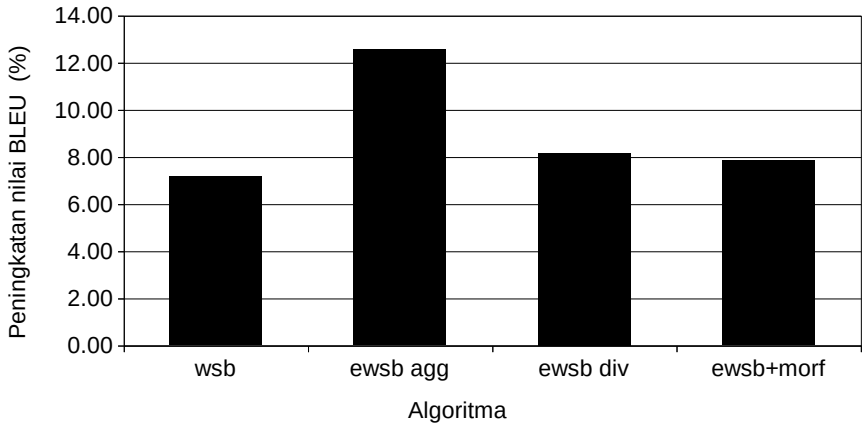


2. POS Tagset

Computed POS
vs Grammar POS
vs without POS



Indonesian ASEAN-MT: Improving Statistical Machine Translation with POS Tagged Corpus



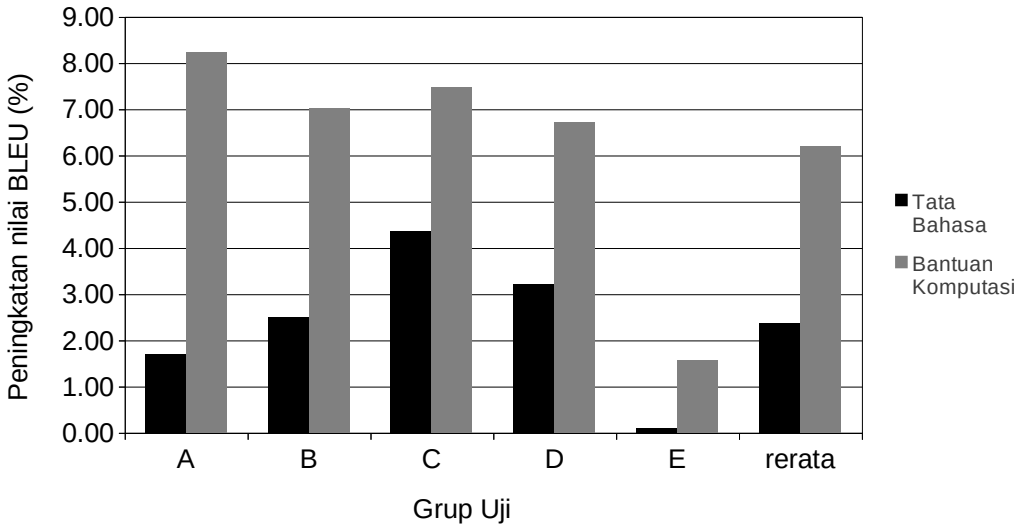
Experiment on WSB Algorithm

Improving BLEU score using WSB Algorithm against mkcls

Base value mkcls = 38,31%

Improving SMT with POS

BLEU score of SMT with 6 test groups

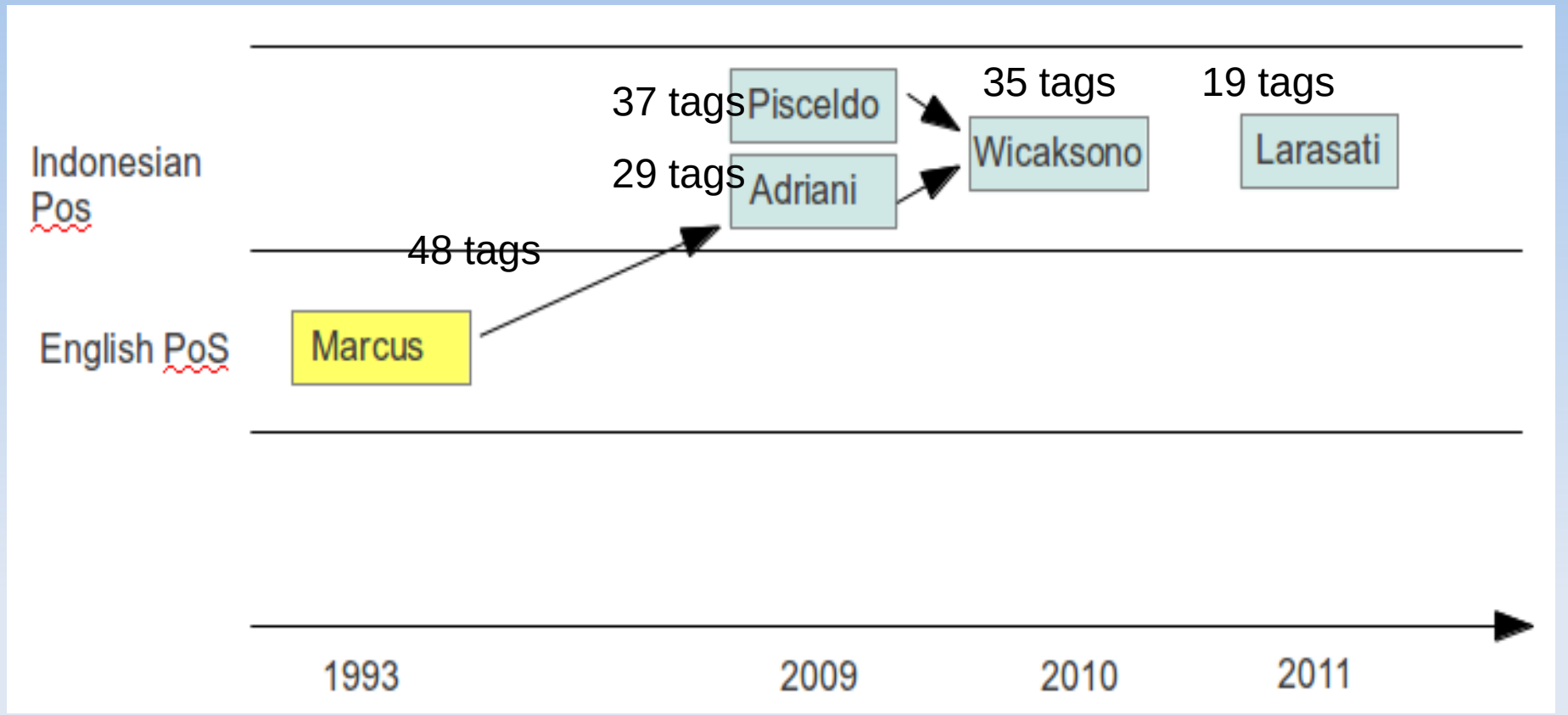


EXTENDED WORD SIMILARITY BASED CLUSTERING ON UNSUPERVISED POS INDUCTION TO IMPROVE ENGLISH-INDONESIAN STATISTICAL MACHINE TRANSLATION

State of the Art Factored based SMT

No	Peneliti	Tahun	Model	Bahasa	Peningkatan nilai BLEU (%)
1	Koehn dan Hieu Hoang	2007	PoS	English–German	0,61
	Koehn dan Hieu Hoang	2007	PoS % morfologis	English–Spanish	3,59
2	Bojar	2007	morfologis	English-Czech	7,75
3	Youssef dkk.	2009	PoS	English–Arabic	4,92
4	Razavian dkk.	2010	Suffix LM	English–Iraqi	5,06
	Razavian dkk.	2010	Suffix LM	Spanish-English	0,95
	Razavian dkk.	2010	Suffix LM	Arabic-English	2,44
5	Wuebker dkk.	2013	WC	French-German	1,40
	Wuebker dkk.	2013	WC	German-English	0,30

PoS Tagset for Bahasa Indonesia



Objectives

- We present the unsupervised Part-of-Speech (PoS) induction algorithm to improve translations quality on statistical machine translation.
- The proposed algorithm is an extension of the algorithm Word-Similarity-Based (WSB) clustering.
- In the clustering, the similarity between words is measured by its grammatical relation with other words. The grammatical relation is represented as the n-gram relation.
- We extend the WSB clustering by take into account for the previous words in measuring the grammatical relation. The clustering results are then used in the English-Indonesia statistical machine translation.

EWSB

$$I(t, w_1, r, w_2) = log \frac{Cnt(t,w_1,r,w_2).Cnt(t,*,r,*)}{Cnt(t,w_1,r,*).Cnt(t,*,r,w_2)}$$

$$S(w_1, w_2) = \frac{\sum_{(t,r,w) \in T, (w_1) \cap T(w_2)} [I(t, w_1, r, w).I(t, w_2, r, w)]}{\sum_{(t,r,w) \in T, (w_1)} I(t, w_1, r, w) + \sum_{(t,r,w) \in T, (w_2)} I(t, w_2, r, w)}$$

$$sim(C_1, C_2) = \frac{1}{N_1 * N_2} \sum_{w_1 \in C_1} \sum_{w_2 \in C_2} sim(w_1, w_2) + \frac{\lambda}{N_1 + N_2}$$

Experiments

The experiments were conducted using seven sets of 2,000 English-Indonesian parallel sentences as the training data for the machine translation and 300 sentences as the testing data.

The machine translation tools used in this research are Moses as decoding tool, SRILM as language model processor, and GIZA++ as phrase translation model processor. BLEU (Bilingual Evaluation Understudy) score is used to evaluate the quality of translation result

There were four clustering algorithms employed in the experiment: mkcls (word clustering provided in Moses), WSB by Jeff, EWSB-Agglomerative and EWSB-Divisive.

The BLEU score

TABLE I. ACCURACY OF MACHINE TRANSLATION

Corpus	MKCLS(%)	WSB(%)	EWSB A(%)	EWSB D (%)
A	68.13	66.66	69.95	68.69
B	69.69	69.65	70.39	70.80
C	64.28	67.35	67.97	67.35
D	34.82	36.84	36.66	35.57
E	28.12	28.08	28.22	28.62
F	38.26	38.68	38.56	37.99
G	77.36	78.70	78.60	79.30
Average	67.37	67.89	69.44	68.95

Notes :
EWSB A = EWSB Agglomerative
EWSB D = EWSB Divisive

Conclusion

Based on Indonesian language characteristics, we extended the word similarity based clustering to enhance the quality of English-Indonesian machine translation. Using 14,000 English-Indonesian sentence pair as the training data and 300 sentences as the testing data, the experimental result showed that our extension gave higher BLEU score compared to the original WSB clustering, and it increased the translation accuracy 2.07%.

Harigato Gozaimasu

THANK YOU