Intelligent tutoring system: a proposed approach to Javanese language learning in Indonesia

Aji Prasetya Wibawa† & Andrew Nafalski‡

Universitas Negeri Malang, Malang, Indonesia†
University of South Australia, Adelaide, Australia‡

ABSTRACT: The Javanese language is becoming endangered, even though it is one of the compulsory subjects taught at Javanese schools. Students become unmotivated when they learn the language at school because of boring and irrelevant teaching and learning materials. Furthermore, their closest mentors such as teachers, parents and relatives cannot provide motivating conditions to learn the Javanese language. In order to preserve the Javanese language through education at schools, an Intelligent Tutoring System (ITS) is proposed for Javanese language learning. The student can learn the usage of Javanese language at a proper level of politeness through a natural dialog with the Artificial Javanese Intelligent Tutor (AJI-Tutor).

INTRODUCTION

The Javanese language - one of 672 traditional languages in Indonesia is a native language of more than 75 million people [1]. However, most of its native speakers cannot use the language in a proper manner. Recent research on Javanese language proficiency of students found that the Javanese youngsters can not apply correct *Krama* vocabularies in formal dialogues based on context since the language is rarely used at home or in social organisations [2]. Therefore, the Javanese language should be used in daily activities to protect the language from becoming an endangered language.

Language preservation can be viewed from various perspectives, one of them is education. Regional languages, including Javanese, have been made compulsory in the school curricula. However, Javanese language learning today is deplorable. Students tend to prefer to learn Bahasa Indonesia and English rather than Javanese since those languages are more relevant in the era of globalisation.

An appropriate solution should be applied to solve the problems of Javanese language learning in the era of information technology. This article will discuss the design of AJI-tutor, an Intelligent Tutoring systems (ITS) for helping students to learn the Javanese language independently. AJI-tutor provides an exciting learning environment, where students can communicate with the system in the context of everyday life. This method is expected to increase the students' proficiency in using Javanese naturally.

JAVANESE LANGUAGE LEARNING IN INDONESIA

Javanese language and literature learning are compulsory in Indonesian primary and secondary schools. Students must learn the language for six years in primary school and for three years in secondary school. However, Javanese language learning in schools has many obstacles.

The first problem is inadequate time for Javanese language learning in schools because students have to learn other languages such as Bahasa Indonesia as the main language for learning all subjects in schools, and English as a foreign language. Second, the materials of Javanese language learning are too complex and are not interesting for students. For example, students must remember the names of parts of certain plants, little animals and other uncommon vocabularies which are difficult to find in society, and that are rarely used in daily communication. In addition, there is a negative opinion among students that the Javanese language is just for old people and not suitable for global education. Therefore, those learning and motivational difficulties may lead to the Javanese language becoming extinct.

THE LEVELS OF POLITENESS AND JAVANESE LANGUAGE STRUCTURE

The levels of the language politeness were initiated in the Java Island around the 7th Century when Mataram, the biggest kingdom, was ruled by the Sultan Agung [1][2]. These levels have specific vocabularies which are classified by the difference of age and social status of Javanese speakers and people who are spoken to. The *Ngoko* is used in unofficial speech between friends and close relatives. *Madya* is the intermediate level of politeness for communication between people of the same age. Once younger talks to older people, they should use *Krama* - the polite and formal style. Javanese people will typically assume that someone who speaks without a proper level of politeness is a rude person.

Table 1: Examples of *Ngoko*, *Madya* and *Krama* vocabularies.

Ngoko	Madya	Krama	English meaning
kowe	sampeyan	panjenengan	you
gelem	purun	kersa	want
mangan	nedha	dhahar	eat

SVO (Subject, Verb, Object) is a basic structure of Javanese language. For example *aku* (S) *numpak* (V) *sepeda* (O) or *kula* (S), *nitih* (V) *sepeda* (O) means *I ride a bike* in *Ngoko* and *Krama,* respectively. There are possible combinations using prepositions (prep), adjectives (adj) and adverbs (adv) to produce more complex sentences such as *aku* (S) *numpak* (V) *sepeda* (O) *anyar* (adj) *menyang* (prep) *pasar* (place) or *kula* (S) *nitih* (V) *sepeda* (O) *enggal* (adj) *dateng* (prep) *peken* (place) for saying *I ride a new bike to the market*, again in *Ngoko* and *Krama,* respectively.

AJI-TUTOR AN INTELLIGENT TUTORING SYSTEM FOR LEARNING JAVANESE LANGUAGE

Intelligent Tutoring System (ITS) is an expert system [3], which provides individualised tutoring [4] or Web-based instruction for students and is based on intelligent agents [5]. Research and innovative solutions in the area of ITS to facilitate language learning, were conducted by scientists in many languages such as English, Japanese, Chinese and Indian. FLUENT [6] and Hyper English [7] are examples of ITS applications in learning English.

Scientists and engineers who speak English can use the Nihongo Tutorial System that is a specific ITS to improve their Japanese reading proficiency [4]. In addition, students can use Intelligent Chinese-Teaching Systems [3] for analysing, evaluating and correcting their Chinese language homework. However, none of these systems is used to preserve endangered languages through the learning process. AJI-Tutor is designed to assist learners who want to learn the Javanese language at a correct level of politeness. Figure 1 shows the architecture of AJI-Tutor, which consists of student, teacher, expert and communication modules [4][5][8].
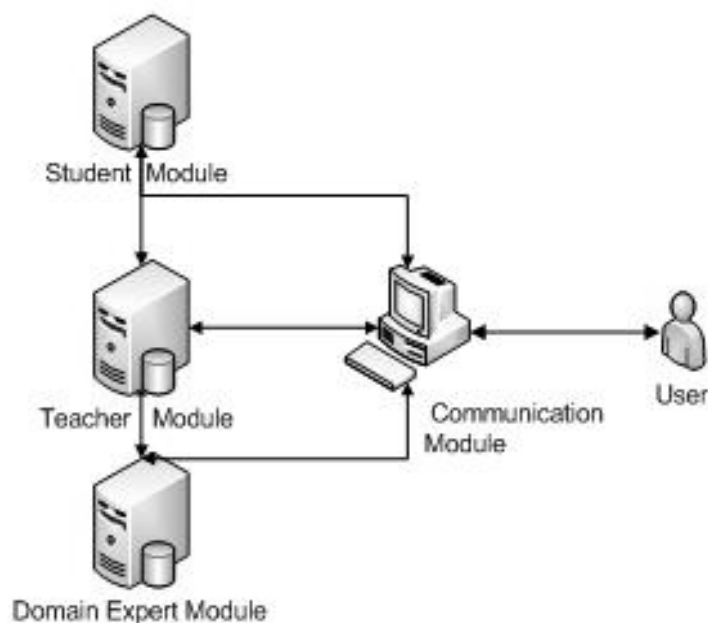

Figure 1: Architecture of AJI-Tutor.

The first module in AJI-Tutor is the domain of the expert module. The content of this module contains sets of facts and rules, the curriculum, the objectives of teaching and all of the materials created by experts or language teachers. Another function of this module is evaluating the student's performance. To create the provision of the knowledge for

the system, domain knowledge in AJI-Tutor should cover levels of politeness with its vocabularies, grammars and story lines for contextual learning. The design of domain knowledge is represented by the Class Diagram in Figure 2. The asterisk (*) in Figure 2 shows many relationships between classes (users, actions or other objects); for example, numerous experts can create many domain knowledge sets.
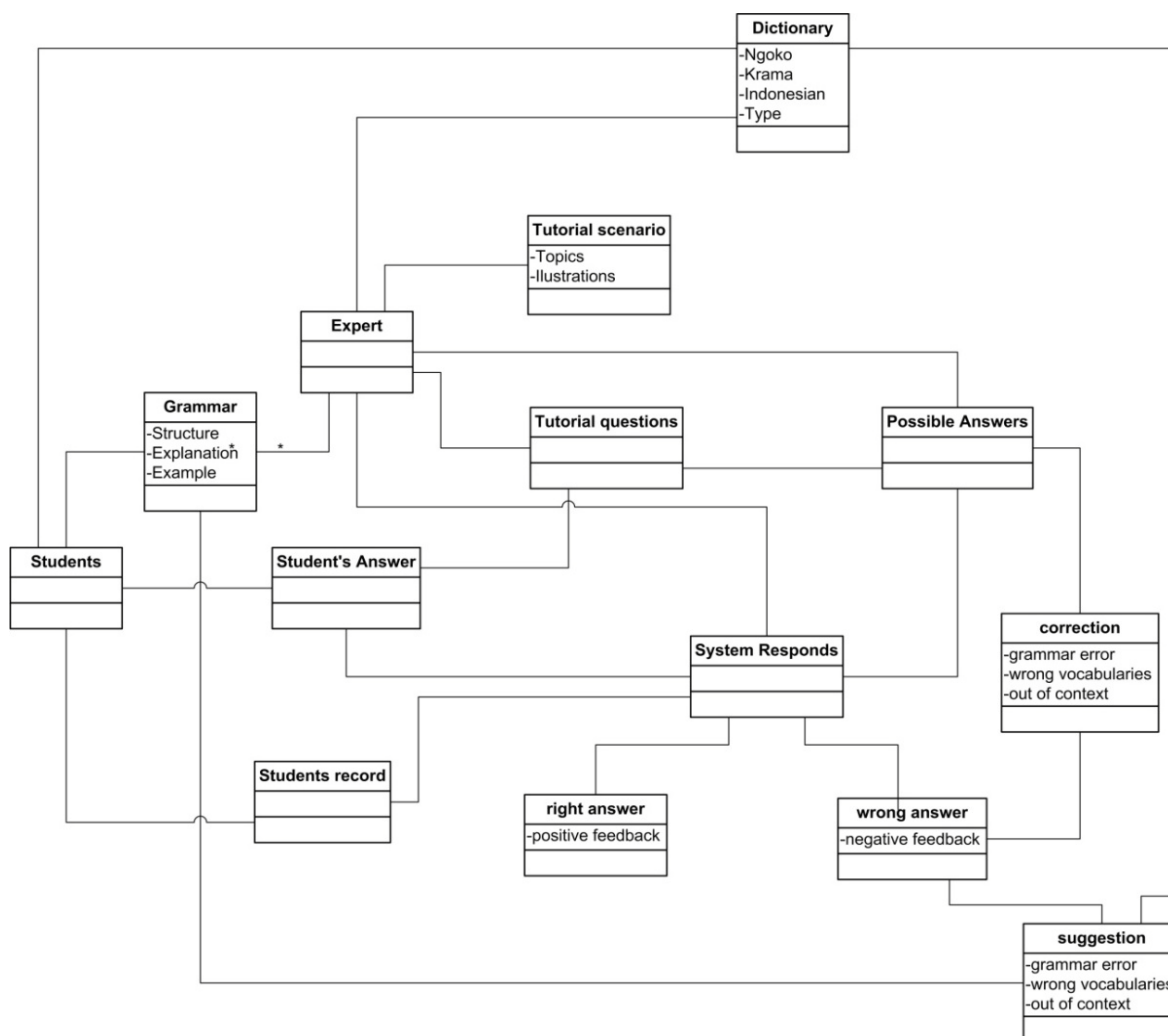

Figure 2: Class Diagram of AJI-Tutor.

The student module is the second. The module needs to be capable of modelling the student profile. This modelling constitutes the basis for adaptive feedbacks [9] given to the student and for a decision about the next lesson for him/her. Students can choose tutorial materials from the domain expert module and they will get questions based on the selected topic. The AJI-Tutor student module should respond to the student adaptively. A student will get a positive response if he/she replies to the problem properly. If the answer is incorrect, for example in respect of an incorrect level of politeness, the system will give a suggestion and correction or a negative response.

The Sequence Diagram in Figure 3 shows the procedures when students answer questions from the AJI-Tutor. The system provides grammar explanations and dictionaries to help students who have difficulties during tutorials. The teacher module refers to the teacher or instructor who teaches the student. This module also represents the instructor's strategies for teaching, guiding or tutoring the student. In AJI-Tutor, the teacher module combines contextual learning and constructivism methods for Javanese language learning. The context is usually neglected by traditional language learning since the conventional approach focuses more on the structure and the terminology of the languages [7].

There is a possibility that students' learning activities will be stimulated by their experience of using the language in a social context dialogue. The contextual learning using daily activities simulation can increase students' motivation. On the other hand, the constructivist approach is focussed on the personal experience of students when they investigate and observe the knowledge through the learning environment [8]. Combination of the constructivism theory may create a better teaching module, which can guide students to construct a knowledge-based system on their experience in daily life activities.
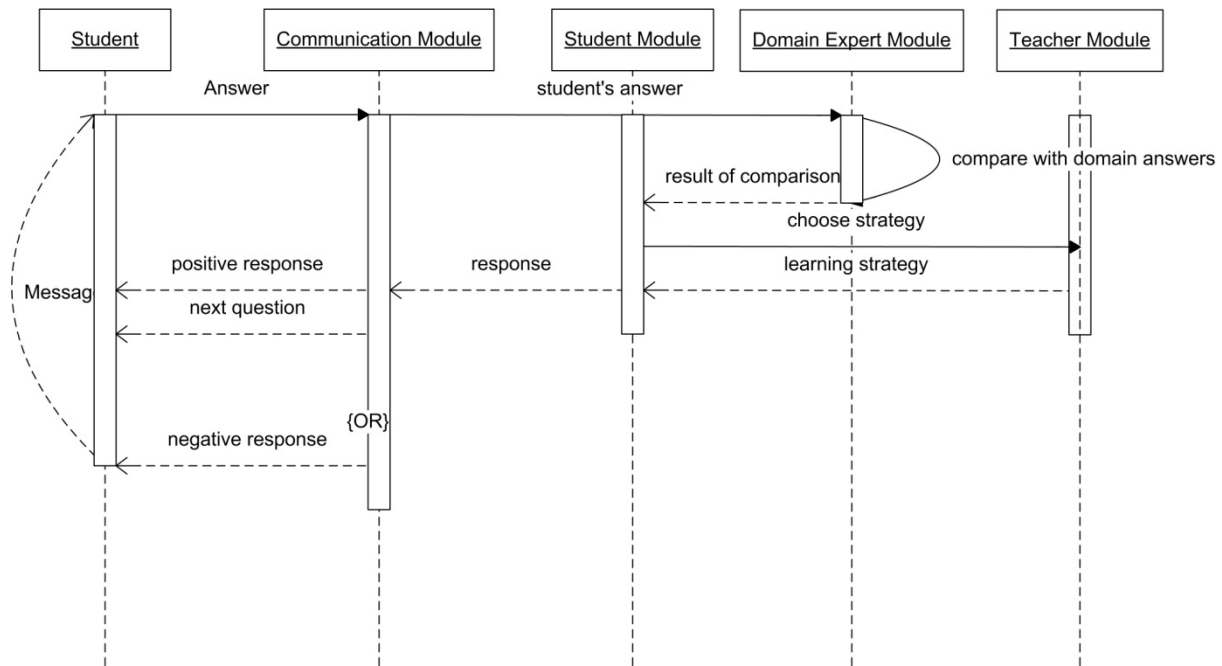
Figure 3: Sequence Diagram of student when answering AJI-Tutor's question.

The last module is the interface or communication module which has the role of a communication bridge between the ITS and the student/learner. The interface becomes a very important part of an ITS. Natural communication between the system and its users should be generated to learn language implicitly and naturally to produce more convenient interaction between human and computer [3][6].

The natural language dialog will be effective if implemented in a system which requires an accurate answer for the dialogue such as a qualitative and verbal tutoring environment [9]. In AJI-Tutor, the student will have a conversation with his/her grandfather about daily life activities such as shopping at the market, answering the telephone and raising cattle. The students are motivated to use *Krama* to speak with their grandfather. If they use the language improperly, their *grandpa will tell them the truth*. This conversation below shows the design of conversational features of AJI-Tutor.
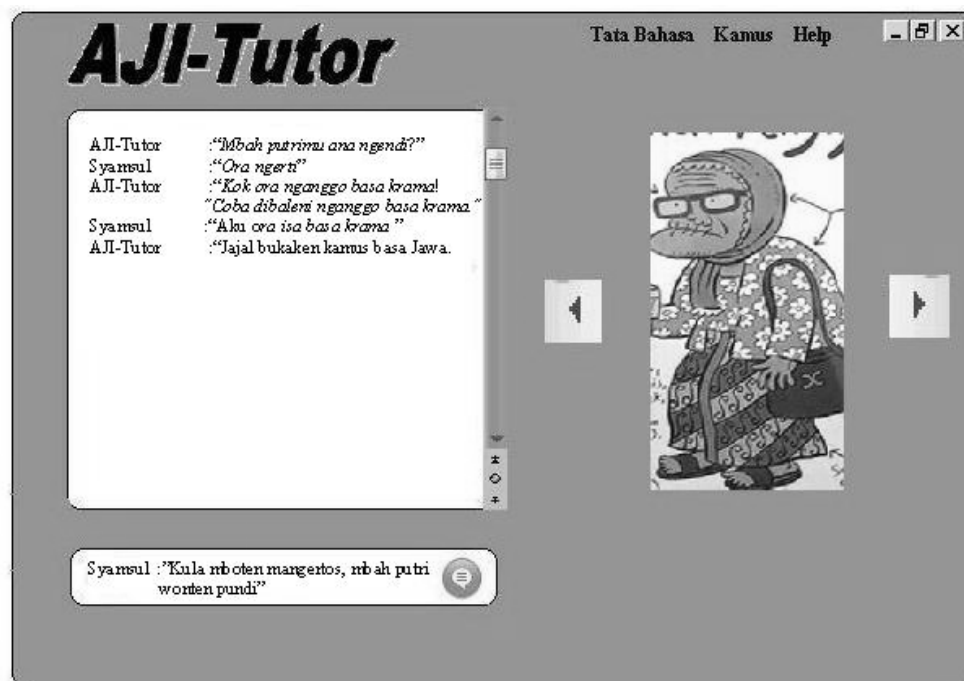

Figure 4: Design of GUI for AJI-Tutor.

The Javanese conversations use italic fonts, the explanations are in brackets and capitals are for system's actions and normal font is used for the English translation, as showed by the example:

AJI-Tutor: *Mbah putrimu ana ngendi?* (MAIN QUESTION: Where is your grandma?)
Student: *Ora ngerti* (I don't know) ANSWER IN NGOKO.
AJI-Tutor: *Kok ora nganggo basa krama!* (NEGATIVE FEEDBACK: Why you didn't use *Krama*!) *Coba dibaleni nganggo basa krama.* (HINT: please say it again using *Krama*)
Student: *Aku ora isa basa krama* (I can't use *Krama*) ANSWER IN NGOKO.
AJI-Tutor: *Jajal bukaken kamus basa Jawa.* (HINT: Please open the Javanese dictionaries)
Student: *Kula mboten mangertos, mbah putri wonten pundi* (I didn't know, where is grandma)
AJI-Tutor: *Bocah pinter!* (POSITIVE RESPONSE: smart boy!), *Yen tak takoni, kudu mangsuli nganggo basa krama* (SUMMARISE: you should use *Krama* to answer my question).

Figure 4 presents the design of the Graphical User Interface (GUI) of AJI-Tutor. The design should be simple, user friendly and attractive because the users of the system are primary and secondary school students. The students can type their answer or response in the dialog form then press Enter to get a response from the system. The records of the dialog between the student and the tutor are displayed in the dialog box. Students can read their previous dialogs with the computer by using a scroll bar. The picture or illustration may help students to focus on the tutorial topic, which can be changed by pressing the arrow buttons in the left and right of the picture. There are toolbars such as *Tata Bahasa* (grammar), *Kamus* (dictionaries) and *Help* (user's guide), which can help students to deal with any difficulties when they operate the program. The dialogue language between the student and the AJI-Tutor is in the Javanese language, the user's guide is in Bahasa Indonesia since most of users know the Indonesian language better than they know the Javanese language.

CONCLUSION

Preserving the Javanese language through education is the goal of creating the AJI-Tutor. Learning environments of the AJI-Tutor are designed for better efficiency than conventional Javanese learning approaches in that there is more consideration of the language's grammatical rules. As a result, students will be more motivated to learn the language through interactive and natural conversations with the intelligent tutoring system, and will become more successful learners.

REFERENCES

1. Wedhawati, W., Nurlina, W.E.S., Setiyanto, E. and Sukesti, R., Latest Structure of Javanese Language. Yogyakarta: Kanisius (2006).
2. Subroto, D.E., Rahardjo, M.D. and Setiawan, B., Endangered Krama and Krama Inggil varieties of the Javanese language. *Linguistik Indonesia*, 26, **1**, 89-96 (2008).
3. Zhang, J., Ren, F. and Chen, T., Intelligent tutoring systems: research status and its development in China. *Proc. Natural Language Processing and Knowledge Engineering*, Wuhan, China 683-689 (2005).
4. Maciejewski, A.A. and Kang, Y-S., A student model of katakana reading proficiency for a Japanese language intelligent tutoring system. *IEEE Transactions on Systems, Man and Cybernetics*, 24, **9**, 1347-1357 (1994).
5. Rosic, M., Glavinic, V. and Stankov, S., Intelligent tutoring interoperability for the new web. *Telecommunication Systems*, 32, **2-3**, 193-207 (2006).
6. Schoelles, M. and Hamburger, H., The NLP role in animated conversation for CALL. *Proc. 5th Conf. on Applied Natural Language Processing*, Washington DC, 127-134 (1997).
7. Plantamura, V.L., Gentile, E. and Angelini, A., Intelligent interaction for linguistic learning. *Proc. Affective Computing and Intelligent Interaction*, Beijing, China, 947-955 (2005).
8. Joshi, A.R. and Sasikumar, M., A constructivist approach to teaching sentences in Indian languages. *ICAC3, Mumbai, India*, 14-19 (2009).
9. Greasser, A.C., Lu, S., Jackson, G.T., Mitchell, H.H., Ventura, M., Olney, A. and Louwerse, M.M., AutoTutor: a tutor with dialogue in natural language. *Behavior Research Methods, Instruments & Computers*, 36, **2**, 180-192(2004).