

## **Improvement of German Vocabulary in Tourism Through an Optical Recognition (OCR) and Speech Recognition-Based Digital Dictionary**

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**Abstract:** This paper attempts to describe teaching materials in the form of a bilingual (Indonesian-German, German-Indonesian) German dictionary application in the field of tourism using Optical Character Recognition (OCR) and Android-based Speech Recognition which can later be used as a guide for German students as well as a guide for tour guides (*ReiseführerIn*) which is very useful for improving competence and practical German language skills, especially in the field of tourism. This research is a research using literature study method or literature review. Through a digital dictionary based on OCR and Android-based Speech Recognition, it is hoped that there will be an increase in student competencies and skills in the field of tourism professionally who are able to identify, explain and provide information related to local wisdom. Through this learning media, students and German language learners as well as the general public can learn independently and be guided in bilingual communication, because the learning media is presented interactively with OCR and Speech Recognition features, but does not reduce the essence of the contents of the dictionary, so that motivation and understanding in learning German, especially related to tourism and local wisdom can be more intact.

**Keywords:** German vocabulary in tourism, Optical Character Recognition (OCR), Android-based Speech Recognition

### **Introduction**

Tourism learning is very important to be applied to the German Language Education Program, considering that from year to year the number of students and graduates who work part-time and full-time as tour guides increases. Tourism learning is more active if it can be practiced in real terms and directly go to the location of the tourist attraction or to the destination to be visited to experience firsthand how to identify, explain and provide real information related to the tourist objects visited. The results of this learning will become the thoughts and knowledge of students to be better able to know and be able to explain a tourist attraction based on the actual condition of the tourist attraction itself. Tourist objects have a very important role for tour guides, namely providing clear information about these attractions to visiting tourists. In addition, students must be taught about local culture and its relationship with German culture so that there are no misunderstandings between the surrounding community and German speakers of Indonesians against the interlocutors of native German speakers because of different cultural backgrounds. Therefore, knowledge of local wisdom, both language, culture, including customs, traditional foods, and tourist attractions, is very important to be taught to students so that they know how to communicate well with native German speakers so that there are no misunderstandings so that communication can occur. can run well as expected, identify, explain and provide information related to tourism objects (tourist attractions) as a whole.

In the German Language Education Study Program, the courses offered are not only related to language skills, but also about the literary and cultural aspects of the people who use the language, as well as other supporting knowledge. To be able to produce graduates who are not only educators, but can become experts in various fields, such as the field of tourism, the German language education study program provides students the opportunity to learn more deeply about

knowledge in the field of tourism, through the *Deutsch für Tourismus* course. *Deutsch für Tourismus* is a course that focuses not only on developing students' knowledge and advanced German language skills, but also on improving practical language skills in the tourism sector. In the *Deutsch für Tourismus* course students are required to be able to understand the nature of tourism, identify, explain and provide information related to tourism objects (tourist attractions) and local wisdom in the surrounding environment.

The development of *Deutsch für Tourismus* teaching materials in the form of a bilingual (Indonesian-German, German-Indonesian) German dictionary application in the field of tourism using the Optical Character Recognition (OCR) feature and the Android-based Speech Recognition feature is not only one of the solutions offered to overcome the problem of limited space. The scope of work for German Language Education alumni is to be wider, but also the development of the digital dictionary can increase the provision of knowledge, skills and practical linguistic behavior to students so that they have a more thorough insight in German, not only about the environmental conditions of tourist attractions in Sumatra but also able to identify between the needs of German-speaking tourists and the community in accordance with the values/rules that apply in North Sumatra and support regional development and national development, not only in the field of tourism objects, but also local wisdom set four, namely North Sumatra. An Android-based digital dictionary with Optical Character Recognition (OCR) and Speech Recognition technology is an instrument (tool) for translating vocabulary in the tourism sector and contains expressions related to tourism potential in Indonesia and local local wisdom that are arranged in a systematic, operational, and measurable manner. and able to make users more active and motivated to learn independently or in groups. Students can study topics in digital dictionaries first so that lecturers no longer need to provide teaching materials in front of the class using conventional methods. Change the role of educators to facilitators. The existence of these digital dictionary application teaching materials makes the role of educators only facilitate students rather than delivering material. Improve effective and interactive learning processes, because lecturers have more time to guide students in understanding a learning topic and also the methods used are more varied and interactive because lecturers do not tend to lecture.

The application of a digital German dictionary in the field of tourism that can be developed to improve the mastery of German vocabulary in the field of tourism is by several interactive features, such as the OCR feature. Optical character recognition (OCR) is a technology for converting images into text, using the tess two library. The development of this application uses the RAD method. In addition to the OCR application, a dictionary application will also be developed using images as input using OCR technology and database processing for the translation process. The next feature that will be available to strengthen the German vocabulary in tourism in the digital dictionary is speech or voice recognition. Speech recognition is a technique that allows a computer system to receive input in the form of spoken words. The words are converted into digital signals by converting sound waves into a set of numbers and then adjusted to certain codes and matched with a pattern stored in a device. In designing the dictionary application that the author made, there are several advantages, namely features in more complete applications such as the OCR feature in the application that the author makes, which can recognize writing in any font and can recognize text characters on backgrounds that are not plain or patterned. Furthermore, the advantages offered are the use of the Google Cloud Vision API system on OCR which in previous research still uses the tesseract system.

The usefulness of the German digital dictionary application in the tourism sector is able to add insight regarding tourism potential and local wisdom in Indonesia for students and the general public who are interested in the German language with a specific goal, namely the tourism sector. Applications with these features can also be used as teaching materials to support German language learning for tour guides (Reiseleiter), considering that based on the results of the ten main markets for foreign tourists who come to Indonesia, Malaysia is dominated by 47.46%, Singapore 7.21%, China 2.32%, Australia 1.88%, Taiwan 1.61%, Germany 1.42%, United States 1.20%, UK 1.02%, India 1.02% and finally the Netherlands 0.94% (source from the ministry of tourism and

creative economy of Indonesia 2021). From this percentage, tourists from Germany are ranked sixth with the most tourists traveling to Indonesia and the number is increasing every year. This shows how important German is to be studied by foreign language learners at various levels of educational institutions in order to participate in promoting tourism in Indonesia in general and in the province of North Sumatra in particular. Tour guides are not only equipped with knowledge of the German language, but also knowledge about tourism potential and local wisdom from the North Sumatra area, so that if one day they go on a tour and meet German-speaking tourists, they can be more active in communicating about things, which is more concrete and able to encourage Indonesia's economic growth and can indirectly preserve the local wisdom of the local area itself with Redemittel (language expressions) contained in the Android-based digital dictionary. Therefore, this paper seeks to introduce and describe the development of a German dictionary application in the tourism sector using Optical Character Recognition (OCR) and Android-Based Speech Recognition.

### Literature Review

According to Buyens (2019: 55) mobile application comes from the words application and mobile. Application which means the application, application, use. In terms of application, an application is a ready-to-use program designed to carry out a function for other users or applications and can be used by the intended target, while mobile can be interpreted as moving from one place to another. So, a mobile application can be interpreted as an application program that can be run or used even though the user moves from one place to another and has a small size. This mobile application can be accessed via wireless devices, pagers, PDAs, cellular phones, smartphones, and similar devices.

According to the Big Indonesian Dictionary, the definition of a dictionary is a reference book that contains words and expressions which are usually arranged alphabetically along with explanations of their meaning, usage and translation. Dictionaries can also be used as reference books that explain the meaning of words that serve to help someone recognize new words. Labrousse (2020: 70) states that a dictionary is a book containing a collection of words of a language arranged alphabetically, followed by their definitions or translations in other languages. Keraf (2019:145) defines a dictionary as a reference book, containing a list of words contained in a language, arranged alphabetically, accompanied by an explanation of how to use the word. This definition concerns the main forms/types of dictionaries dealing with lexical meaning.

Optical character recognition (OCR) is the process of converting letter images into ASCII characters that are recognized by computers. The image of the letter in question can be in the form of scanned documents, print-screen results of web pages, photos, and others (Mohammad et al, 2021: 69). The working principle of the OCR application according to Manik (2019: 231) is as follows: (1) Taking an object in the form of text using a camera so that an image file is obtained, (2) The image file is processed using text recognition application software, where this device performs the recognition process. of the characters in the image file, and (4) The output of this text recognition application software is in the form of a text file that contains characters that have been recognized and are ready for further processing.

Speech Recognition or commonly known as automatic speech recognition (ASR) is a development of techniques and systems that allow computers to receive input in the form of spoken words (Manik,2019: 250)). This technology allows a device to recognize and understand spoken words by digitizing the words and matching the digital signal with a certain pattern stored in a device. The spoken words are converted into digital signals by converting sound waves into a set of numbers which are then adjusted with certain codes to identify the words. The results of the identification of spoken words can be displayed in written form or can be read by technological devices as a command to do a job, for example pressing a button on a mobile phone which is done automatically with voice commands.



The Android SDK is an API (Application Programming Interface) tool needed to start developing applications on the Android platform using the Java programming language. Android is a subset of software for mobile phones that includes an operating system, middleware and key applications released by Google. Currently, the Android SDK (Software Development Kit) is provided as a tool and API to start developing applications on the Android platform using the Java programming language. As an application-neutral platform, Android gives you the opportunity to create applications that we need that are not the default applications for Mobile/Smartphones. The Android SDK source can be viewed and downloaded directly on the official Android SDK developer website at <http://tutnu.developer.android.com> or the Android SDK is also on the CD which is included in this book, both the Windows version and the Linux version. , because the Android SDK is free and freely distributed (Nazaruddin, 2019: 105).

## Research Method

This research is a research using literature study method or literature review. A literature review is a comprehensive overview of the research that has been done on a specific topic to show the reader what is already known about the topic and what is not known, to seek rationale from research that has been done or for further research ideas. The literature study used in this research was obtained from various sources, both journals, books, documentation, internet and libraries. The literature study method is a series of activities related to the methods of collecting library data, reading and taking notes, and managing writing materials. The type of writing used is a literature review study that focuses on the results of writing related to the topic or variable of writing.

## Result and Discussion

Before developing an application based on OCR and Speech Recognition, needs must be determined and collect various information related to the product to be developed. The activities in this stage are initial-late analysis, needs analysis of tour guides, analysis of student needs, concept analysis, task analysis, and specification of learning objectives. Analytical activities were carried out to determine the basic problems needed in developing a bilingual tourism application in the German language dictionary (Indonesian-German, German-Indonesian) to improve student competence in the field of tourism. At this stage, an analysis of the subject matter is carried out in accordance with the needs required by tour guides in serving tourists, the facts of the learning process in the field, learning approaches that are relevant to future challenges in the field of tourism so that a description of the learning patterns that are considered most suitable can be implemented.

The subject matter of the digital dictionary application for the Deutsch für Touristmus course based on Optical Character Recognition (OCR) and the Speech Recognition feature to improve student competence in the tourism sector consists of several language subjects, namely; i) The meaning of affixes in Indonesian, ii) German spelling guidelines, iii) Abbreviations in the dictionary, iv) German phonetic symbols, v) Pronunciation of the German alphabet, vi) German – Indonesian dictionary, vii) Indonesian dictionary – German, viii) Numerals (*Zahlwörter*), ix) Important phrases of conversation in German (*wichtige deutsche Redewendung*), x) German terms commonly used in SMS, xi) German holidays and traditions (*Deutsche Feiertage und Tradition*), xii) German grammar point of view (*Deutsche Grammatik im Überblick*), xiii) German irregular verbs and their conjunctions.

Learning Deutsch für Touristmus is in dire need of a dictionary. The use of conventional dictionaries without a special approach in the field of tourism currently does not support students' mastery of technology, techniques, and critical thinking skills in accordance with the facts that occur in the field, because the books used in the previous Deutsch für Touristmus course are not listed in detail. Vocabulary material is related to expressions on how to pick up tourists from the airport, take tourists to hotels or inns, bring tourists to visit tourist attractions in North Sumatra, take tourists to restaurants, introduce the culture of North Sumatra, and take tourists back to the

airport. Even though these expressions are closely related to the main tasks of a tour guide and really need to be known.

These expressions in the world of tour guide work, for example, will affect the quality of service to tourists as a whole. In addition, the absence of teaching materials that contain such expressions in the field of tourism using the German language also causes a lack of student mastery of techniques to serve tourists who come to North Sumatra, even though studying the field of tourism is not enough with general theory alone. Mastery of the techniques of being a tour guide is also needed in studying the field of tourism so as to help students understand the concepts in tourism itself. Mastery of technology and techniques in a field of science will encourage higher-order thinking skills because students are required to be critical of technological developments as well as be creative in utilizing techniques in a field of science including tourism science. Therefore, mastery of technology and techniques to become a tour guide and German expressions related to tourism is absolutely necessary to realize high-level thinking skills in students.

In addition, creative and critical thinking skills are also needed to train higher-order thinking skills. The fact is that the books used so far have not included teaching materials related to expressions on how to pick up tourists from the airport, take tourists to hotels or inns, bring tourists to visit tourist attractions in North Sumatra, take tourists to restaurants, introduce the culture of North Sumatra, until the return of tourists to the airport. as well as practice questions that require critical and creative thinking skills in this regard. The challenges of students in the future will continue to increase. The industrial revolution 4.0 and the application of the independent learning campus curriculum requires students to have mastery of technology and techniques in order to become quality and productive human beings. Based on this, the appropriate learning approach to support students' mastery of technology, techniques and critical and creative thinking skills in the tourism sector is one of the German language dictionaries based on Optical Character Recognition (OCR) and the Speech Recognition feature. The dictionary developed in this study will then be based on Optical Character Recognition (OCR) and Speech Recognition features after going through the expert and material validation process as an effort to improve the quality of German language learning in the tourism sector.

Optical Character Recognition (OCR) is reading activity of the typed character, computer printouts, or handwriting text from any regular documents then translate those image document to be a form which can be processed by computer. The simple definition of OCR is recognition process of printed text, handwriting text, typewriting text, etc., from hard copy document to digital document. OCR is used for any activities related to image documentation such as book pages image, legitimate document, medical record, and so on. Morphological difference in character forms can be difficult or impossible to detect, particularly in the presence of printing and scanning artifact. OCR result may contain segmentation as well as classification error due to low image quality. The better quality of the input data, then the OCR performance will approach the human ability for recognizing the character, on the other side, OCR will be very difficult and even fail on doing any detection. The OCR systems have some common steps that can be seen on Figure 1.

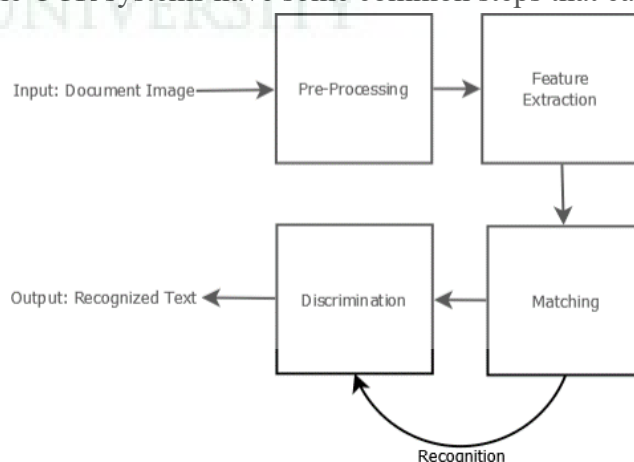


Figure 1. Flowchart of General Stages of OCR System

Speech Recognition is defined as conversion process from sound signals into machine linguistic in the form of digital data (usually in the form of simple text). In the other words, speech recognition states the ability of pattern matching given from the vocabulary of sound signals into the right form. Another definition of speech recognition is a process where the computer (other types of machine) able to recognize the words spoken by human. This process is also called as interpretation of human speech in computer. The voice recognition programs are made for recognizing the vocabulary of words from pre-programmed words. Google Tesseract is Optical Character Recognition (OCR) engine for any operating system which was originally developed by Hewlet Packard since 1985 to 1995. After 2006 Tesseract is released to be used freely, since the Tesseract is being developed widely by Google and released under Apache 2.0 license. Smith in ICDAR Conference said that Tesseract is combining both matrix matching algorithm and feature extraction algorithm. Tesseract requires less training data and using both statistic classifier and adaptive classifier to enable the machine to train itself on the analyzed document. Flow process of Tesseract engine shown in Figure 2.

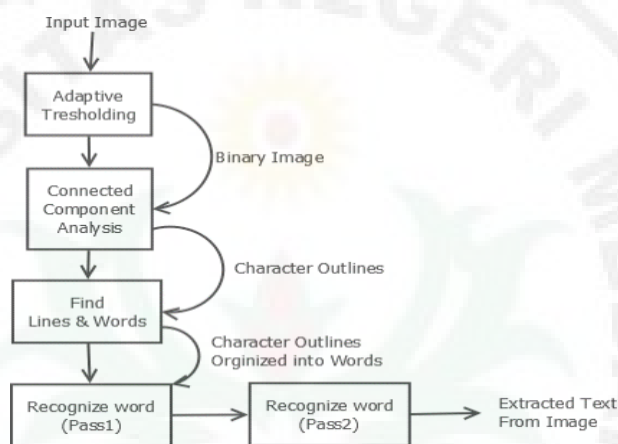


Figure 2. Flow Process of Tesseract Engine

Google speech API or Google Voice search was released on 2008 in USA for some type of smartphone. Google Speech API is a framework developed by Google to recognize the voice, convert it into string (text) and insert it to Google search page until the result appears based on the voice input. Voice recognition is done in Google server, which means the input that is accepted by the Android device (smartphone) will be sent to Google server, then Google server will recognize and convert it into the text using Hidden Markov Model Algorithm. After that, the result of voice conversion will be inserted into Google search page, then Google server will send the search result to the Android device.

The search page interface provides all types of information and service in internet, but user must search through the result list first to get the desire result. Development of voice-based search has some advantages. The advantages will be described as follows:

1. Allows to call certain application on terminal or web service.
2. Using the language processing technology and classification formula to automatically determine which categories belong to user speech and suggest the right application.
3. Combine layers that provide easy access to other applications in other categories related to speech.

Google Translate is an online multi language translation service. Google uses Google bot to support this service. Compared with Google Dictionary, Google Translate able to translate a whole page of a book at a time. Google gives the discretion to the user to edit the translation result according to the standards language rules. Java is a programming language which can be run on any kind of computers and operating systems including mobile phones. Java is developed by Sun Microsystems and released in 1995. Java is a software technology which is categorized as multi-platform. In addition, Java is a platform which has virtual machine and library needed for writing and running a program. The advantages of Java programming language will be described as follows:

1. The main advantage of Java programming language is it can be run on multiple platform or computer operating system, along with the principle 'writing once, run anywhere'.
2. Object Oriented Programming (OOP): Java is one of the natural object-oriented programming languages. All data types are being inherited from the base class called Object.
3. The completeness of the library and the existence of a great Java community which is constantly making new libraries for covering the needs of application developer.
4. Automatic Garbage Collection: Java has memory usage control so that the programmers do not need to directly set the memory.

## Conclusion

Bilingual (Indonesian-German, German-Indonesian) German language dictionary application in the field of tourism that uses the Optical Character Recognition (OCR) feature that is able to convert images into text, uses the tess two library and the Speech Recognition feature that is able to recognize speech or sound. The existence of this digital German language dictionary in the tourism sector can not only help to meet the needs in providing learning facilities and increasing German vocabulary in a more interactive way, but also can raise local wisdom of the people of North Sumatra and the government's mission in advancing the tourism potential of the local area.

Through the digital dictionary, it is hoped that there will be an increase in the competence and skills of students in the field of tourism professionally who are able to identify, explain and provide information related to local wisdom in North Sumatra. This learning media can also be used as a guide for *ReiseleiterIn* (tour guides) in the North Sumatra area and the general public who are interested in German and the local wisdom of the North Sumatra area so that they are able to know better forms of local wisdom in a more complete and interesting way and are able to hone language skills at the same time.

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