Scholars' Journal
ISSN: 2645-8381
DOI: https://doi.org/10.3126/scholars.v6i1.69993
Published by Scholars' Association of Nepal
A Multidisciplinary Peer Reviewed, Open Access Journal

Digital Implementation of Doteli Dictionary: A Tri-Lingual Dictionary for Doteli Language

Hari Sharan Bhatt
Faculty of Education, Far Western University
h.bhatt908@gmail.com

Abstract

This research article discusses the development and implementation of a digital Doteli dictionary, designed to bridge the linguistic gap between Doteli, Nepali, and English. The trilingual dictionary app operates on Android platforms and offers functionalities such as word meaning searches, antonym/synonym retrieval, pronunciation guides, language translation, and the ability to bookmark words.Physical dictionaries have several limitations, including bulkiness, low portability, time-consuming searches, difficulty in modification, limited accessibility, and the absence of pronunciation features. According to the literature, no digital version of the Doteli dictionary has been developed to date. This research aims to address these limitations by providing a digital version of the Doteli dictionary that includes all the aforementioned features.Drawing inspiration from traditional dictionaries, the digital version seeks to preserve, promote, and make the linguistic richness of the Doteli language more accessible. The development and testing of the app follow the System Development Life Cycle (SDLC) approach, with all sample data sourced from physical dictionaries. The system has been successfully implemented and installed on Android-based mobile devices using Java programming. This work is beneficial for language learners, linguists, researchers, teachers, students, and developers.

Keywords: Doteli language, tri-lingual dictionary, digital implementation, Android application.

Introduction

A dictionary, whether in book form or as an electronic tool, serves as an indispensable resource for understanding and communicating within and across languages. It provides word meanings, antonyms, synonyms, etymologies, and pronunciations, and often acts as a bridge between different linguistic communities (Oxford University Press, n.d.). Throughout history, dictionaries like the Oxford Dictionary, Nepali Dictionary, Hindi Dictionary, and Nepali Birhat Sabdkoshs have played a crucial role in preserving language and facilitating communication. Dictionaries can be broadly categorized into general and specific types. General dictionaries encompass a wide range of words from various domains, offering a comprehensive view of language as it is used in everyday contexts. On the other hand, specific dictionaries focus on terms and meanings related to particular fields, such as medicine, computing, education, or finance. These specialized dictionaries are vital for professionals, researchers, and students who need precise and context-specific information.

Language is dynamic, constantly evolving to reflect changes in society, technology, and culture. In this context, the role of dictionaries extends beyond mere reference; they are instrumental in language formation and development. They standardize spelling, pronunciation, and meaning, providing a common framework that ensures clarity and consistency in communication. However, with the advent of digital technology, the traditional concept of a dictionary has undergone significant transformation. Digital dictionaries offer numerous advantages over their physical counterparts, including portability, ease of access, and the ability to update content quickly. These features are particularly important in regions with diverse linguistic landscapes, where language preservation and accessibility are ongoing challenges.

This article focuses on the digital implementation of a Doteli dictionary—a dictionary specifically designed for the Doteli language, which is spoken by a significant population in the hilly regions of Nepal. Despite its rich linguistic and cultural heritage, the Doteli language has not yet been fully documented or widely accessible in digital form. This poses a risk to its preservation, especially as younger generations increasingly adopt dominant languages like Nepali and English for communication and education.

The lack of a comprehensive digital platform for the various Doteli dialects presents several challenges. Traditional paper-based dictionaries, while valuable, are often inaccessible to the broader public due to their physical limitations. They are bulky, less portable, and time-consuming to navigate. Moreover, they lack features such as easy modification, pronunciation guides, and translation capabilities, which are essential for both language learners and native speakers. These limitations hinder the effective use and preservation of the Doteli language, particularly in a globalized world where digital literacy is rapidly becoming the norm.

This research aims to address the need for a versatile, heritage-sensitive dictionary that overcomes the limitations of traditional paper-based dictionaries. The primary objective is to develop a digital version of the Doteli dictionary that not only preserves the cultural heritage of the Doteli language but also enhances its portability, accessibility, and efficiency. This digital dictionary will include several advanced features: users will be able to search for words and their meanings, find antonyms and synonyms, access pronunciation guides, and translate words between Doteli, Nepali, and English. Additionally, the dictionary will allow users to bookmark frequently used words, making it a practical tool for both everyday communication and academic research.

The digital implementation of the Doteli dictionary is not just a technical project; it is a cultural initiative aimed at preserving and revitalizing a language that is integral to the identity of its speakers. By providing a modern, user-friendly platform, this project seeks to make the Doteli language more accessible to both native speakers and those interested in learning it. It will serve as a valuable resource for linguists, researchers, students, and educators, facilitating further study and preservation of the language.

In today's rapidly changing world, languages are increasingly under threat from globalization and technological advancement. Many indigenous languages, like Doteli, risk being overshadowed by more dominant languages, leading to a loss of cultural diversity and linguistic heritage. The digital implementation of the Doteli dictionary is a response to this challenge. It aims to adapt traditional linguistic resources to modern, accessible formats that meet the needs of contemporary users.

The rationale behind this research is grounded in the belief that language preservation is critical to maintaining cultural diversity. As languages evolve, it is essential to ensure that they are documented, studied, and passed on to future generations. By transforming the Doteli dictionary into a digital format, this project seeks to contribute to the ongoing efforts to preserve the Doteli language. It also aims to provide a practical tool that can be easily updated and expanded, ensuring that the dictionary remains relevant and useful in the face of changing linguistic trends.

Furthermore, this project recognizes the importance of digital literacy in today's educational landscape. By making the Doteli dictionary available in a digital format, this research will empower a new generation of learners and educators to engage with the Doteli language in innovative ways. It will also encourage further research and development in the field of digital linguistics, opening up new possibilities for the study and preservation of other under-documented languages.

In conclusion, the digital implementation of the Doteli dictionary is a significant step forward in the preservation and promotion of the Doteli language. It addresses the limitations of traditional paper-based dictionaries and provides a modern, accessible platform for language learning and research. This project is not only a technical achieve-

ment but also a cultural initiative that underscores the importance of preserving linguistic diversity in a rapidly changing world

Literature Review

History of the Doteli Language

According to the literature, Doteli, or Dotyali (डोटेली), is an Indo-Aryan language spoken by approximately 800,000 people, most of whom live in the far-western region of Nepal. It is a dialect of Khas, an ancient form of the modern Nepali language, and is written in the Devanagari script (Wikipedia, 2023). Doteli holds official status in Nepal as per Part 1, Section 6 of the Constitution of Nepal 2072 (2015) (Constitution Bill of Nepal, 2072). There are four main dialects of Doteli: Baitadeli, Bajhangi Nepali, Darchuli, and Doteli (Eichentopf, 2014). The mutual intelligibility among these dialects is high, allowing them to share language-based materials. The Language Commission of Nepal has recommended Dotyali as an official language in Sudurpashchim Province (Language Commission, 2021).

According to Sankrityayan, Doteli or Dotyali is a dialect of the Kumaoni language, which was brought to Doti by a section of the Katyuri dynasty of Kumaon, who ruled over Doti until 1790. The Doti kingdom was formed after the Katyuri kingdom fragmented into eight different princely states (Vaidya, 2005). In Nepal, Doteli is considered a dialect of Nepali. In 2012, Dotyali was reclassified by Ethnologue as a distinct language of Nepal and assigned the ISO code 639-3 dty (Eichentopf, 2014).

There have been few studies focusing on the sociolinguistics of the Doteli language, concentrating on its history, commonalities across its dialects, and lexical variations. However, no significant efforts have been made to develop a digital dictionary for the Doteli language.

Review of Online Dictionaries

There are numerous online dictionaries available on the web, each with its purpose of promoting language and culture. Some notable examples include:

The Oxford Online Dictionary, which is the largest dictionary in the world. It provides the usage of 500,000 words and phrases, past and present, from across the English-speaking world. It is a monolingual dictionary, meaning it only provides meanings, antonyms, synonyms, and pronunciations of English words(Oxford University Press, n.d.).

In the context of Nepal, several online dictionaries are available, primarily focused on providing word meanings between Nepali and English. Some examples include:

The English-Nepali.com English to Nepali Dictionary (2023) offers meanings in English to English, English to Nepali, Nepali to English, and Nepali to Nepali. It also provides antonyms, synonyms, and translations between English and Nepali. The dictionary

contains more than 500,000 word meanings (English-Nepali.com, 2023).

Another example is the Nepali Expert Nepali to English Dictionary, which is a simple translator that converts Nepali words into English(nepaliexpert.com).

The Shabdakosh English-Nepali Bilingual Dictionary provides meanings and translations for English and Nepali languages. It contains more than 30,000 English and Nepali words (Shabdakosh, n.d.).

A Dotyali Multilingual Dictionary, which is a paper-based resource, provides word search functionality, antonym and synonym checkers, and translations between Doteli, Nepali, and English (Joshi, Tiwari, Negi, Biyogi, Khatiwada, Badu, & Joshi, 2022).

Research Gap

While there have been successful efforts to digitize Nepali to English and English to Nepali dictionaries, there has been no significant work on digitalizing the Doteli dictionary or translating Doteli words into Nepali and English, and vice versa. This research seeks to bridge this gap by transforming the traditional Doteli dictionary into a dynamic, interactive Android application. This digital transformation aims to overcome the limitations of physical dictionaries, such as bulkiness, lack of portability and accessibility, difficulty in modification, risk of physical damage, high searching costs, and the absence of pronunciation and bookmarking features.

Research Methodology

Development Methodology

The Software Development Life Cycle (SDLC) approach was followed in this research. According to Martin (2008), the SDLC involves the analysis, design, implementation, and maintenance of a system. In the analysis phase, the existing system is studied to identify reasons for failure or areas for improvement. This phase involves consulting with end-users to identify the system's requirements, constraints, and goals. Requirements refer to the services provided by the system and are classified into two categories: functional and non-functional.

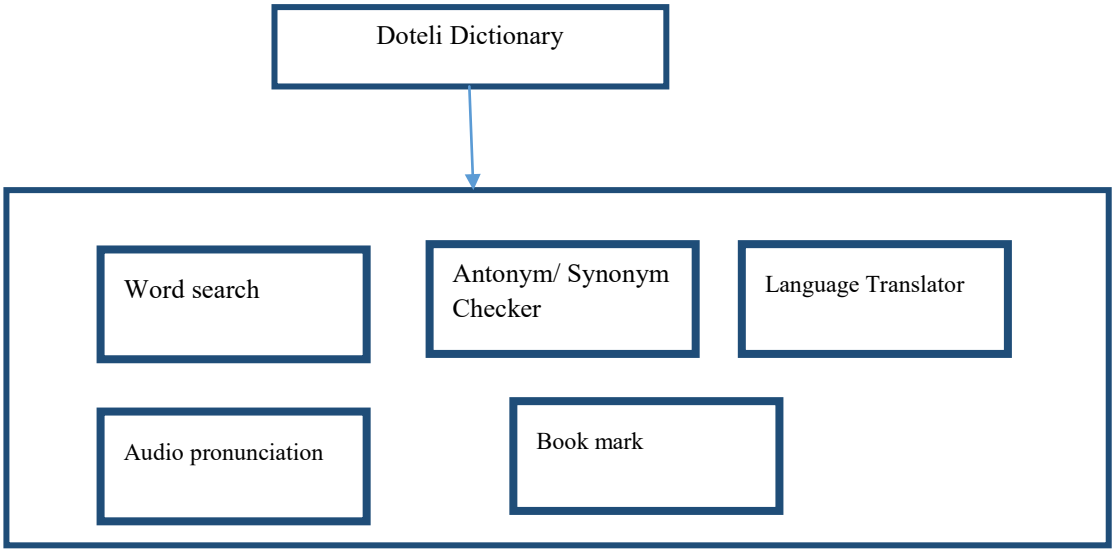
Functional requirements are directly related to the system's functions specifically-the services the system should provide to end-users or what the end-users expect from the new system. Non-functional requirements refer to operational constraints, such as safety, security, and efficiency. These requirements are gathered through various methods, including user interviews, direct observations in the working environment of the existing system, and reviewing existing documents. For this research, the requirements of the Doteli dictionary were first identified by studying the limitations of the physical dictionary. The functional requirements of this system include enabling word searches, providing meanings in different languages (Doteli, Nepali, and English), offering antonyms and synonyms for each word, providing pronunciation in all three languages, and offering a

bookmark feature.

Once the system has been analyzed, the design phase begins. The design phase involves creating the overall architecture of the system, which serves as a blueprint for the entire system. This phase maps out the system, showing the components and their interrelationships. During the design phase, various aspects of the system are planned, including input/output design, form design, database design, and interface design. Additionally, algorithms for each module or component are developed (Rath & Mohapatra, 2020). Several tools, such as context diagrams, data flow diagrams, and use case diagrams can be used to represent the system's design. The logical design of the Doteli dictionary is visualized in Figure 1 below. The overall components are shown in a block diagram, and the subsequent section details the algorithm of each component, explaining how they work and are implemented.

Figure 1

Main modules of Doteli dictionary.



Module Description

Word Search: This module is used to search for words in the dictionary database. It lists multiple words from the dictionary for the user. The working mechanism of this module is shown below.

Algorithm for Word Search:

1. Start
2. Enter a word
3. Compare the entered word with dictionary words stored in the dictionary database
4. If the word matches, list the words

5. End

Language Translator: This module translates Doteli words into Nepali and English and vice versa. The working mechanism of this module is shown below.

Algorithm for Language Translator:

1. Start
2. Enter a word
3. Match the entered word with dictionary words stored in the dictionary database
4. If the word matches, choose a translation option:
5. Doteli to English
6. Doteli to Nepali and vice versa
7. End

Bookmark: This feature stores frequently searched words. When a word is searched and the user wants to add it to the bookmark, it is easily added and stored until cleared by the user. It reduces the search cost for words; rather than searching through the entire dictionary, the user can retrieve the word from the bookmark once it is added. The working mechanism of this module is shown below.

Algorithm for Bookmark:

1. Start
2. Select the word from the dictionary and click the "Add to Bookmark" option
3. The word is added to the bookmark
4. If the same word needs to be searched again, the user can easily find it in the bookmark file
5. End

Pronunciation: This module provides the pronunciation of words in any language, i.e., Doteli, English, and Nepali. The working mechanism of this module is shown below.

Algorithm for Pronunciation:

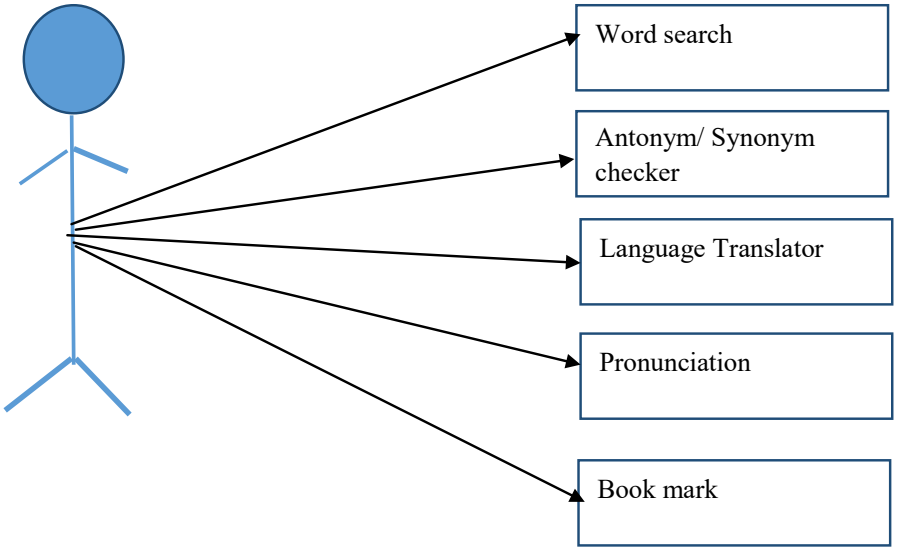
1. Start
2. Select the word
3. Click on the audio button
4. End

Use Case Diagram of the Doteli Dictionary

A use case diagram visually represents how users interact with a system. It includes actors, who can be individuals or external entities that engage with the system, and use cases, which are the functional components of the system that process user inputs and generate responses. The use case diagram for the Doteli dictionary, shown in Figure 2, illustrates these interactions clearly.

Figure 2

Use case diagram of Doteli dictionary



Activity Diagram of the Doteli Dictionary

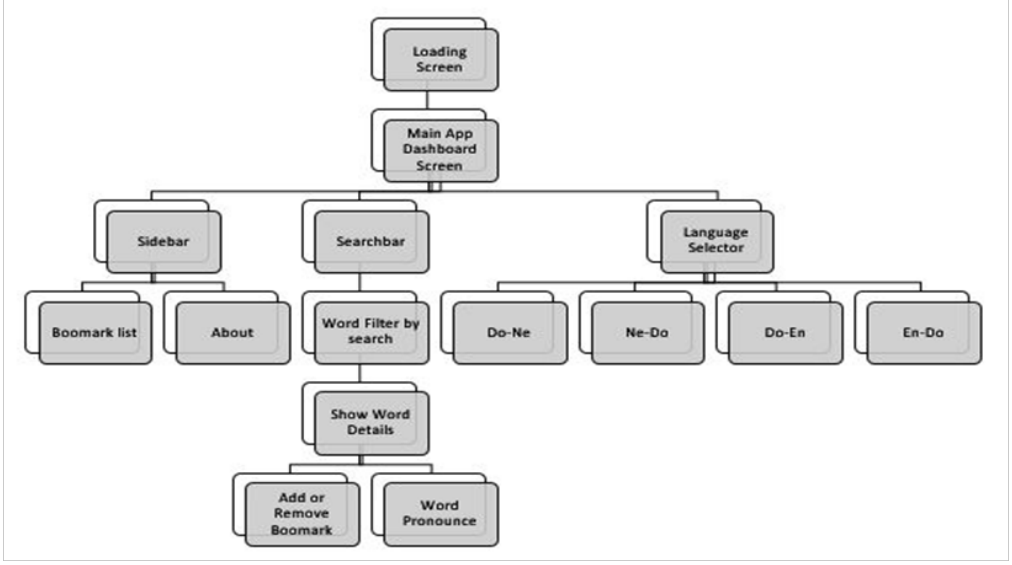
Activity diagrams are essential for visualizing the sequence of actions within a process. They help clarify complex workflows, business processes, or software functionalities, making them valuable in software engineering, business analysis, and system design. The activity diagram for the Doteli dictionary, shown in Figure 3, outlines the system's workflow.

Initially, the app screen loads. Once opened, users are presented with three main options:

1. Sidebar: Located at the top left corner, this contains options for the bookmark list and information about the app.
2. Search Bar: Users can search for words, add searched words to the bookmark, and listen to their pronunciation by clicking the audio button.
3. Language Selector/Translator: This feature offers four translation options: Doteli to Nepali, Nepali to Doteli, Doteli to English, and English to Doteli.

Figure 3

Activity diagram of Doteli dictionary



Implementation

In the SDLC, after the system design phase, the next step is system implementation. During this phase, the system is coded, tested, and installed.

In the coding phase, the system's architecture is translated into a set of programs or software that operates on a device, whether a computer or mobile device. This system is developed using Android Studio with Java programming for the front end and SQLite for the back end.

Sample data for coding the system was obtained from the physical Doteli dictionary named Dotyali Multilingual Dictionary(Joshi, Tiwari, Negi, Biyogi, Khatiwada, Badu, & Joshi, 2022). The sample data are presented in Table 1 and Table 2.

Table 1

Data Set for Doteli to English

Key	Value	Synonym	Antonym
अइल	now	Today	then
अकड्	stubborn	Difficult	compliant
अकरो	expensive	Costly	cheap
अकलदार	wise	Intelligent	stupid
अकस्मात्	unexpected	Unpredicted	expected
आँउ	diarrhoea	Dysentery	constipation

आँकडा	figure	Statistic	
आँखा	eye		
आँखागेडी	iris		
आँटी	courageous	Bold	cowardly
इकलो	alone	Lonely	fondness
इख	jealousy	Mistrust	trust
इखु	sugar cane		
इङ्गलिस	english		
इच्छया	wish	Want	unwanted
उइ	that		
उइका	his		
उइकी	her		
उइलोक	heaven	Swarga	hell
उकल्लु	climb	Mount	descend
एक	one		
एकदम	immediately	Instantly	
एकनास	evergreen	Endless	random
एकट्टा	united	Combined	divided
एकाग्र	concentrated	Focus	daydream
ऐंठन	oppression	Suppression	freedom
ऐना	mirror		
ऐब	blame	Criticize	innocent
ऐबि	accused		
ऐंराल	wasp		
ओखदो	medicine	Cure	
ओगट्टु	capture	Catch	free
ओगल्या	buckwheat		
ओडानो	playful		shy
ओत	shelter	Shade	

Table 2

Dataset for Doteli to Nepali

Key	Value	Synonym	Antonym

अइल	अहिले	ऋाज	पहिले
अकड्	अड्डी	जिद्दी	अनुरुप
अकरो	महङ्गो	बहुमुल्य	सस्तो
अकलदार	चनाखो	होसियार	मुर्ख
अकस्मात्	अचानक	अपर्फट	अपेक्षित
आँउ	आँउ	मासी	कब्जियत
आँकडा	तथ्य	तथ्याङ्क	
आँखा	आँखा	न्यन	
आँखागेडी	आँखीगेडी	लालगेडी	
आँटी	साहसी	आँटिलो	कायर
इकलो	एकलो	एक्लो	स्नेह
इख	डाहा	द्वेष	विश्वास
इखु	उखु	लिखु	
इङ्गालिस	अङ्ग्रेजी		
इच्छया	इच्छा	चहना	नचाहिने
उइ	उही		
उइका	उसका		
उइकी	उसकी		
उइलोक	स्वर्ग	परलोक	नरक
उकल्लु	उक्लनु	चढ्नु	अवतरण
एक	एक		
एकदम	तत्काल	झट्ट	
एकनास	समस्वभाव	अन्तहिन	अनियमित
एकट्टा	एकत्र	जमघट	विभाजित
एकाग्र	एकचित	ध्यान	दिवास्वप्न
ऐंठन	दबाव	थिचाइ	स्वतन्त्रता
ऐना	दर्पण		
ऐब	दोष	आलोचना	निर्दोष
ऐबि	खोटो		
ऐंराल	अरिङ्गाल		
ओखदो	ओखती	औषधी	
ओगट्टु	ओगट्नु	समात्नु	स्वतन्त्र
ओगल्या	फापर		
ओडानो	चञ्चल		लजालु

ओत	ओत	छहारी

After the system is coded, it will be tested to ensure it performs the required functions. The system has been tested using the data collected earlier, and it functions as expected. Snapshots of the testing results are shown below.

Step 1: First, the icon of the app will appear on the computer screen as shown in Figure 6

Figure 4

Icon of Dotlei dictionary

Step 2: Next, the system is started by clicking on the icon. After clicking the icon, the screen loading process will be displayed on the device, as shown below. In this article, this process is referred to as the Splash Activity.

Figure 5

Splash Activity or screen loading process

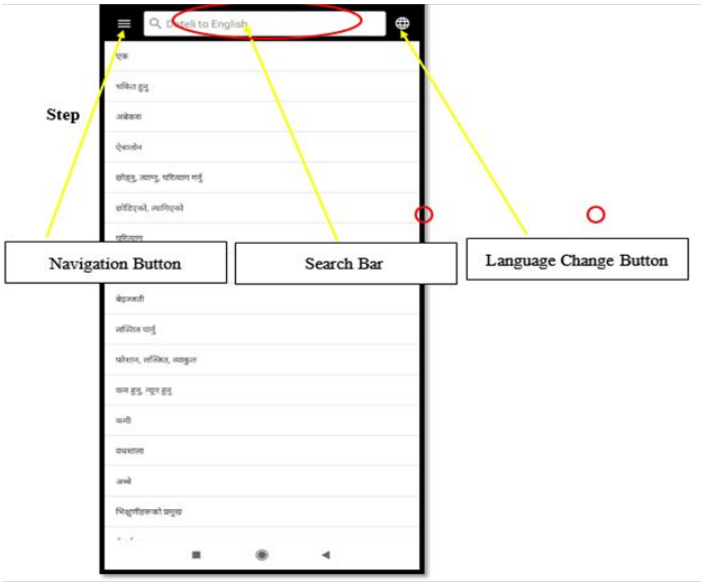
Step 3: After the Splash Activity is completed, the Main Activity will be displayed on the screen. This screen includes the Navigation Button, Search Bar, and Language Change Button, as shown in Figure 6.

In the Search Bar, users can enter a word to search the dictionary. Once a word is

entered, the system will list possible matches from the dictionary database.

Figure 6

Main activity of Doteli dictionary



Step 4: After selecting a word, the Detail Activity window will open, displaying the word's meaning in another language, definition, synonyms, and antonyms. From this Detail Activity, users can bookmark the word using the Bookmark Button and hear the pronunciation using the Pronunciation Button. The visual representation of this process is shown in Figure 7.

Figure 7

Detail activity window

The steps outlined above indicate that all testing has been completed. Following the testing phase, the next step in the implementation process is installation. During the installation phase, the system is deployed on the organization's devices for which it was designed. The system, intended for Android-based mobile devices, has been successfully installed and operates perfectly.

Results and Discussion

The system has been successfully coded, tested, and installed on Android-based devices. Testing has confirmed that the system performs as intended, executing all its functions effectively. Users can search for words and their meanings, find antonyms and synonyms, translate words between Doteli, English, and Nepali, hear pronunciations, and bookmark words.

However, the system is not a complete solution as the Doteli language encompasses a vast array of words, dialects, and variations influenced by different geographical areas and social norms. Nevertheless, the system can be expanded to accommodate various regions within the far-western province. Future developments could include extending the dictionary to a multilingual format, rather than just trilingual, and converting it into a web-based application.

Conclusion

This article focuses on the digital implementation of the Doteli dictionary, a crucial tool for preserving the linguistic and cultural heritage of the Doteli language, spoken predominantly in the Far-Western Province of Nepal. As English and other global languages gain prominence, Doteli faces the risk of becoming endangered, underscoring the need to safeguard its vocabulary and cultural significance.

While there have been efforts to study and protect the Doteli language, these have largely been limited to paper-based systems. This article specifically addresses the transition of the Doteli dictionary to a digital format. Traditional paper dictionaries are often bulky, less portable, difficult to modify, inefficient, and prone to physical damage. To address these issues, this research has developed a digital version of the Doteli dictionary for Android-based systems.

The digital dictionary was developed using Java programming and follows the System Development Life Cycle (SDLC) methodology. Data for the implementation were sourced from the physical Dotyali Multilingual Dictionary (Tiwari, T. D., Negi, A. S., et al., 2022). The digital version supports functionalities such as word search, meaning retrieval, antonym and synonym lookup, translation between Doteli, English, and Nepali, pronunciation, and bookmarking.

Beyond these features, the digital dictionary contributes to archiving Doteli linguistic heritage. It serves as a valuable resource for language learners, linguists, researchers,

teachers, students, and developers. Future enhancements could include expanding the dictionary to a multilingual format covering various Doteli dialects and other languages such as Hindi, Chinese and Japanese and converting it into a web-based application.

References

Constitution Bill of Nepal 2072. (2017, April 29). Retrieved from https://daobhaktapur.moha.gov.np/en/post/constitution-of-nepal-2072

Dabit, N. (2018). *React native in action*. Manning Publications.

Eichentopf, S. (2014). *Ethnologue: Languages of the world (17th ed.)*. SIL International.

English-Nepali Dictionary. (2023). Retrieved from https://www.english-nepali.com

Ethnologue. (2015). *Doteli at Ethnologue*. In Ethnologue: Languages of the World (18th ed.).

Horton, J. (2015). *Android programming for beginners: Learn all the Java and Android skills you need to start making powerful mobile applications*. Packt Publishing.

Joshi, B., Tiwari, T. D., Negi, A. S., Biyogi, K. N., Khatiwada, H. P., Badu, B., & Joshi, H. P. (2022). *Dotyali multilingual dictionary*. Mahakali Sahitya Sangam.

Language Commission. (2021). *सरकारी कामकाजको भाषाका आधारहरुको निर्धारण तथा भाषासम्बन्धी सिफारिसहरु (पञ्चवर्षीय प्रतिवेदन(सारांश) २०७८* [Determination of the basis of language for government work and language-related recommendations (Five-Year Report Summary 2078)]. [PDF file]. Language Commission.

Martin, R. C. (2008). *Clean code: A handbook of agile software craftsmanship*. Prentice Hall.

Nepali Expert Dictionary. (n.d.). *Nepali-English dictionary*. Retrieved from https://dictionary.nepaliexpert.com

Oxford English Dictionary. (n.d.). *Oxford English Dictionary.* Retrieved from https://www.oed.com

Philips, B., Stewart, C., & Marsicano, K. (2020). *Android programming*. Pearson Technology Group

Rath, A. K., & Mohapatra, H. (2020). *Fundamentals of software engineering: Designed to provide an insight into the software engineering concepts* (English ed.). BPB PUBN.

raywenderlich.com Team. (2021). *SwiftUI by tutorials*. Razeware LLC.

Schildt, H. (2018). *Java: A beginner's guide (8th ed.)*. McGraw Hill LLC.

Shabdakosh. (n.d.). *English-Nepali bilingual dictionary*. Retrieved from https://www.

shabdakosh.com.np

Smith, J. (2017). *Effective Java*. Addison-Wesley Professional.

Vaidya, T. R. (2005, February 9). *Advanced history of Nepal*. Educational Publising House

Wikipedia. (2023). *Dictionary*. Retrieved from https://www.wikipedia.org

Wikipedia. (2023). *Doteli*. Retrieved from https://www.wikipedia.org

Yu, A. (2020). *The complete iOS app development bootcamp*. Udemy