# Readables

An Automatic Reading Tutor for Non-reading Adults

A Special Problem
Presented to
the Faculty of the Division of Physical Sciences and Mathematics
College of Arts and Sciences
University of the Philippines Visayas
Miag-ao, Iloilo

In Partial Fulfillment
of the Requirements for the Degree of
Bachelor of Science in Computer Science by

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**Abstract**

From 150 to 200 words of short, direct and complete sentences, the abstract should be informative enough to serve as a substitute for reading the entire SP document itself. It states the rationale and the objectives of the research. In the final Special Problem document (i.e., the document you'll submit for your final defense), the abstract should also contain a description of your research results, findings, and contribution(s).

Suggested keywords based on ACM Computing Classification system can be found at `https://dl.acm.org/ccs/ccs_flat.cfm`

**Keywords:**   Keyword 1, keyword 2, keyword 3, keyword 4, etc.

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# Chapter 1

# Introduction

## 1.1   Overview of the Current State of Technology

The ability to read is a fundamental skill that is necessary for success in many areas of life. Unfortunately, there are many adults in the Philippines who have never learned to read or who have difficulty reading due to various reasons such as illiteracy, limited education, or learning disabilities. These individuals often face significant barriers to employment, education, and social participation, leading to a cycle of poverty and marginalization.

In 2019, the Philippines achieved a literacy rate of 96.5 % for the segment of the population aged 10 and over according to the PSA's Functional Literacy, Education and Mass Media Survey (FLEMMS), as reported in an article from Business World entitled, "Literacy rate estimated at 93.8% among 5 year olds or older — PSA." Literacy was defined as the ability to read and write "with understanding of simple messages in any language or dialect." However, the same article notes that this was the same rate observed in 2013, a matter described as alarming by University of Asia and the Pacific Senior Economist Cid L. Terosa, stating that even minimal improvements should be expected especially after six years.

More recently, according to a report published by UNICEF in collaboration with UNESCO and the World Bank, the percentage of 10-year-olds in low- and middle-income countries who are unable to read is as high as 70%. This figure has likely been affected by school closures brought about by the COVID-19 pandemic. The same report also stated that only 10% of children in the Philippines were able to read simple text as of March 2022. Alarmingly, a separate report

published by the World Bank in 2021 found that the rate of learning poverty - defined as the inability to read simple text by age 10 - in the Philippines was at 90%. These statistics highlight the urgent need to address the education crisis in the Philippines and the need to further augment the country's current literacy situation.

To address this problem, we propose the development of an automatic reading miscue detection system called Readable, specifically targeting the Hiligaynon language. Hiligaynon, also known as Ilonggo, is an Austronesian language spoken in the Western Visayas region of the Philippines, particularly in the provinces of Iloilo, Guimaras, Negros Occidental, and Capiz. It is one of the major languages of the Philippines, spoken by millions of people as a first or second language. Our reading miscue detection system will utilize machine learning techniques including automatic speech recognition (ASR). ASR is a technology that allows computers to automatically recognize and transcribe spoken language, and it has made significant advances in recent years. However, it can still be challenging to achieve high levels of accuracy for some languages and accents, especially those that are underrepresented in ASR training data. By targeting local languages like Hiligaynon and designing our ASR system to work well for these languages, we can help ensure that our reading tutor is accessible and effective for non-reading adults in the Philippines.

While there are some similar applications like Google Read Along available for reading instruction, they may not be accessible or relevant for many non-reading adults in the Philippines due to language barriers or lack of internet connectivity. By targeting local languages like Hiligaynon and utilizing the benefits of natural language processing and machine learning techniques, our automatic reading tutor can provide personalized and effective reading instruction that is accessible and relevant for non-reading adults in the Philippines. By providing accessible, effective, and scalable reading education in Hiligaynon, we hope to improve the lives and prospects of non-reading adults in the Philippines and break the cycle of poverty and illiteracy. Children with strong literacy skills grow more consistently and confidently in their studies, and reading literacy is a crucial gateway to other learning areas such as the humanities, mathematics, and the sciences. By addressing learning poverty and promoting reading literacy, we can help ensure that children in the Philippines have the opportunity to reach their full potential and succeed in their studies.

Some notes on citing references. When using APA format, the author-date method of citation is followed. This means that the author's last name and the year of publication for the source should appear in the text, and a complete reference should appear in the reference list.
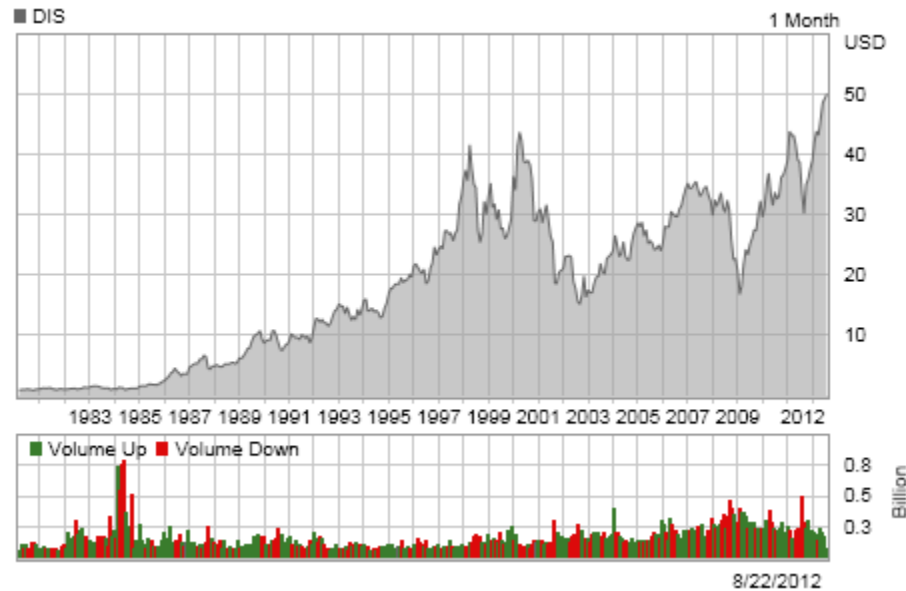
Figure 1.1: This is the figure's caption – Disney stock chart. Captions should fully describe the figure in a concise manner such that there is not need to refer to the text when figuring out the graphic.

Here are some examples on how to do the referencing (note author's name and years are different from commented examples). For APA citation details, refer to `http://www.ctan.org/tex-archive/biblio/bibtex/contrib/apacite/`.

- Kartch (2000) compared reaction times...

- In a recent study of reaction times (Kartch, 2000)...

- In 2000, Kartch compared reaction times...

- Fedkiw et al. (2001) compared reaction times...

- In a recent study of reaction times (Fedkiw et al., 2001)...

- In 2001, Fedkiw et al., compared reaction times...

The following are references from journal articles (Park, Linsen, Kreylos, Owens, & Hamann, 2006; Pellacini et al., 2005; Sako & Fujimura, 2000). Here's an MS thesis document (Yee, 2000), and this is from PhD dissertation (Kartch, 2000). For a book, reference is given as (Parke & Waters, 1996). Proceedings from a conference samples are (Jobson, Rahman, & Woodell, 1995; Fedkiw et al., 2001; Levoy et al., 2000). The sample bibliography file named **myreferences.bib**

is from the SIGGRAPH LaTeX template. You can use a text editor to view the contents of the bib file. It is your task to create your own bibliography file. For those who downloaded papers from ACM or IEEE sites, there is a BibTeX link that you can click; thereafter, you just simply need to copy and paste the BibTeX entry into your own bibliography file.

The following shows how to include a program source code (or algorithm). The verbatim environment, as the name suggests, outputs text (including white spaces) as is...

```
#include <stdio.h>
main()
{
    printf("Hello world!\n");
}
```

## 1.2   Problem Statement

DO NOT FORGET to write the statement of the research problem here, i.e., before the Research Objectives.

A problem statement is your research problem written explicitly. The problem statement should do four things:

1. Specify and describe the problem (with appropriate citations)

2. Provide evidence of the problem's existence

3. Explain the consequences of NOT solving the problem

4. Identify what is not known about the problem that should be known.

## 1.3   Research Objectives

### 1.3.1   General Objective

The aim of this project is to develop a reading miscue detection system that would determine the acceptability of an input speech relative to a reference speech pattern.

### 1.3.2  Specific Objectives

Specifically, the project targets to:

1. Train and model a DNN-based acoustic model for Hiligaynon.

2. Use the developed acoustic model to derive phonemic transcriptions of the input speeches/audio.

3. Determine the acceptability of a user's speech input, given a set of predetermined words to read, in terms of its deviation from reference transcriptions via forced alignment; judging is based on a set threshold score.

## 1.4  Scope and Limitations of the Research

The system is specific to the Hiligaynon language. The words used in the audio data are limited to 2-3 syllable Hiligaynon words from the book "Hiligaynon Lessons" by Cecille L. Motus. Deviations are only measured word-by-word. In terms of the toolkit, the system is limited by the features offered by Kaldi - an open source speech recognition toolkit for speech recognition and signal processing.

## 1.5  Significance of the Research

This project aims to take one step towards developing a solution for improving the reading skill of Filipinos, particularly non reading adults. The authors also aim to contribute to the growing efforts of including Philippine local languages, specifically, Hiligaynon in literatures related to speech processing, particularly those relevant to the development of automated reading tutors.

# Chapter 2

# Review of Related Literature

This chapter discusses the features, capabilities, and limitations of existing research, algorithms, or software that are related/similar to the Special Problem.

The reviewed works and software must be arranged either in chronological order, or by area (from general to specific). Observe a consistent format when presenting each of the reviewed works. This must be selected in consultation with the adviser.

DO NOT FORGET to cite your references.

## 2.1   Theme 1 Title

This chapter contains a review of research papers that:

- Describes work on a research area that is similar or relevant to yours

- Describes work on a domain that is similar or relevant to yours

- Uses an algorithm that may be useful to your work

- Uses a software / tool that may be useful to your work

It also contains a review of software systems that:

- Belongs to a research area similar to yours

- Addresses a need or domain similar to yours

- Is your predecessor

## 2.2 Theme 2 Title

# Chapter 3

# Research Methodology

This chapter lists and discusses the specific steps and activities that will be performed to accomplish the project. The discussion covers the activities from pre-proposal to Final SP Writing.

## 3.1 Research Activities

Research activities include inquiry, survey, research, brainstorming, canvassing, consultation, review, interview, observe, experiment, design, test, document, etc. Be sure that for each method, process, or algorithm used, there is a justification why that method was chosen. The methodology also includes the following information:

- who is responsible for the task

- the resource person to be contacted

- what will be done

- when and how long will the activity be done

- where will it be done

- why should be activity be done

## 3.2 Calendar of Activities

A Gantt chart showing the schedule of the activities should be included as a table. For example:

Table 3.1 shows a Gantt chart of the activities. Each bullet represents approximately one week worth of activity.

Table 3.1: Timetable of Activities

| Activities (2009) | Jan | Feb | Mar | Apr | May | Jun | Jul |
|---|---|---|---|---|---|---|---|
| Study on Prerequisite Knowledge | | | ●● | ●●●● | | | |
| Review of Existing Racing Strategies | ●● | ●●●● | ●●●● | ●●●● | | | |
| Identification of Best Features | | | | ●●●● | ●● | | |
| Development of Racing Strategies | | | | ●● | ●●●● | ●● | |
| Simulation of Racing Strategies | | | | ●● | ●●●● | ●●● | |
| Analysis and Interpretation of the Results | | | | | ●●●● | ●●●● | ● |
| Documentation | ●● | ●●●● | ●●●● | ●●●● | ●●●● | ●●●● | ●● |

# Chapter 4

# Preliminary Results/System Prototype

This chapter presents the preliminary results or the system prototype of your SP. Include screenhots, tables, or graphs and provide the discussion of results.

# Appendix A

# Appendix

# Appendix B

# Resource Persons

**Dr. Firstname1 Lastname1**
Adviser
Affiliation1
`emailaddr@domain.com`

**Mr. Firstname2 Lastname2**
Role2
Affiliation2
`emailaddr2@domain.com`

**Ms. Firstname3 Lastname3**
Role3
Affiliation3
`emailaddr3@domain.net`

# References

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