

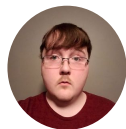
Design Presentation

Crystal CLEAR

Continuous Language Education through Augmented Reality

Team Crystal
Old Dominion University
CS 410, Fall 2017
December 8, 2017

Meet Team Crystal



Jeffrey Baxter



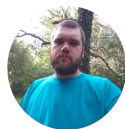
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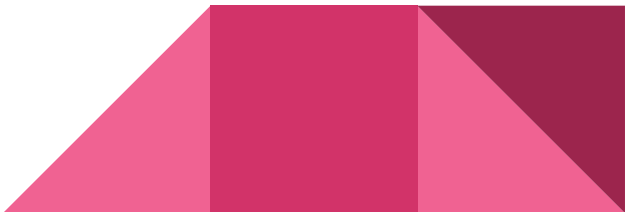
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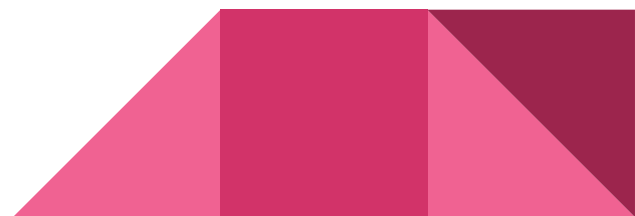
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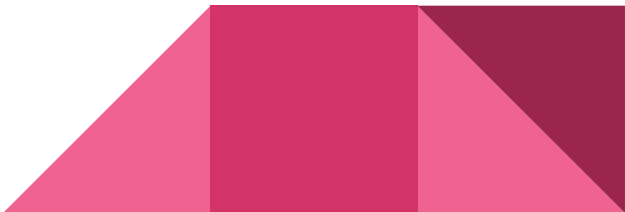
Problem Background

- Communication is difficult, even in a speaker's native language.
- When it comes to travel, many tourists feel like they will be unable to understand or communicate with locals.
- When learning a new language, it can quickly become arduous to memorize different objects and vocabulary words.
- Students can quickly fall behind if their native language is not the same as the language they are taught in.



Problem Statement

Learning languages is a complex process that can be difficult when attempting to overcome language barriers. Identifying objects and using vocabulary correctly is difficult in a new or unknown language.



Current Process Flow

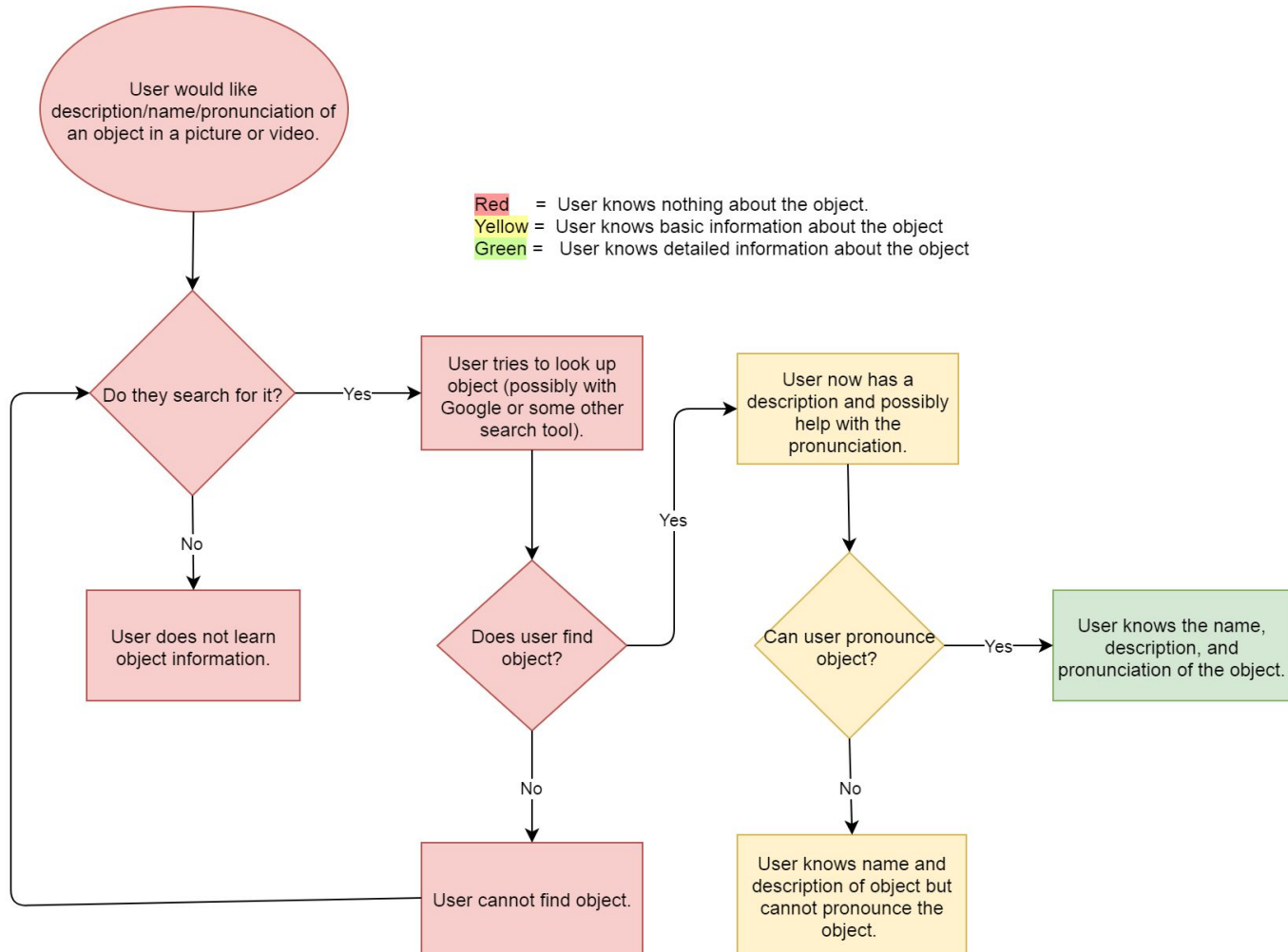
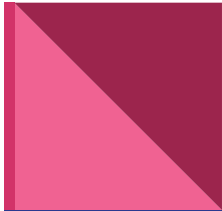


Fig. 1



Our Solution

Crystal CLEAR

Continuous Language Education through **Augmented Reality**

What will Crystal CLEAR do?

The Program Will:

Identify a Selected Object

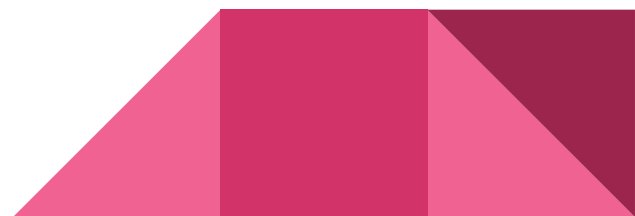
Display Pertinent Information for the
Object

Provide a Pronunciation Example

Give an Example or Phrase

The Program Will Not:

Translate Text



How Does Crystal CLEAR work?

1. Capture Video or Image
2. Select Area
3. Identify and Label Object
4. Provide Object Information

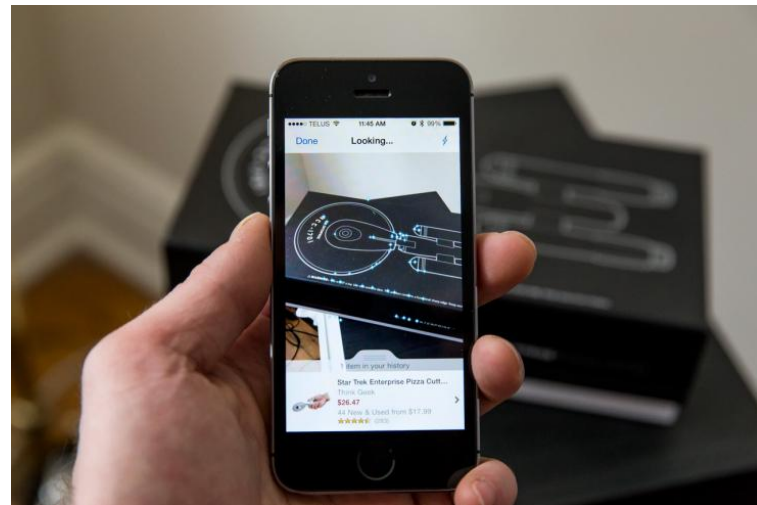


Fig. 2

Solution Goals and Objectives

The use of Crystal CLEAR will

Allow for Users to:

Learn Effectively

Travel Confidently

AND

Make Different Languages:

Accessible to Users

Available Anywhere



Solution Process Flow

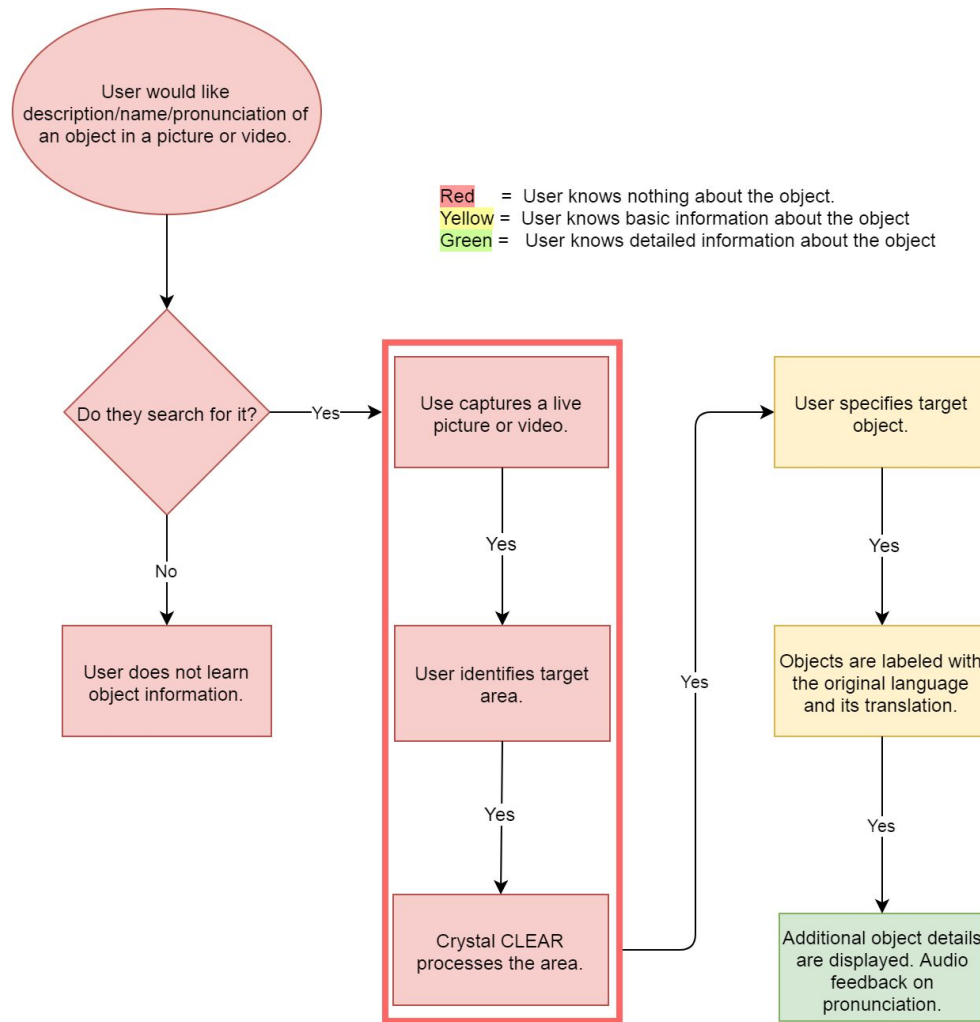


Fig. 3

Major Functional Components

Smart Phone with Camera

Computer Vision API

Translation Engine

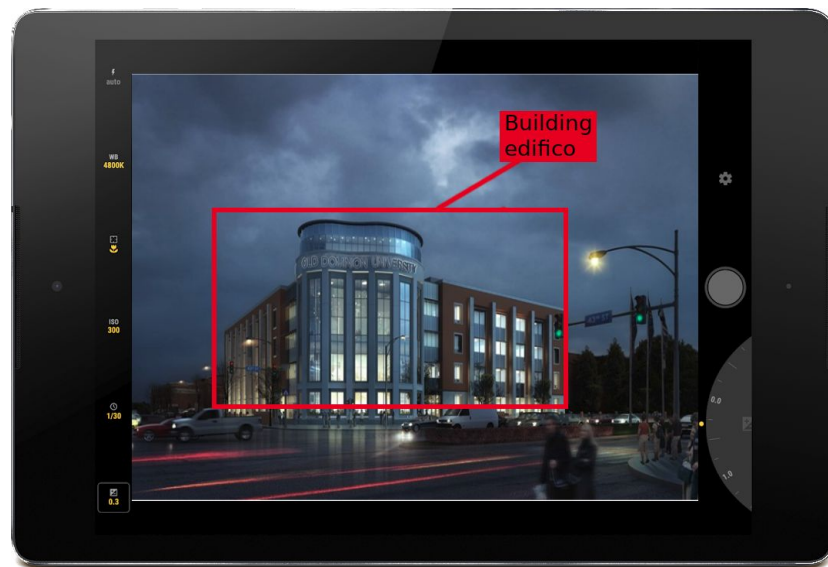
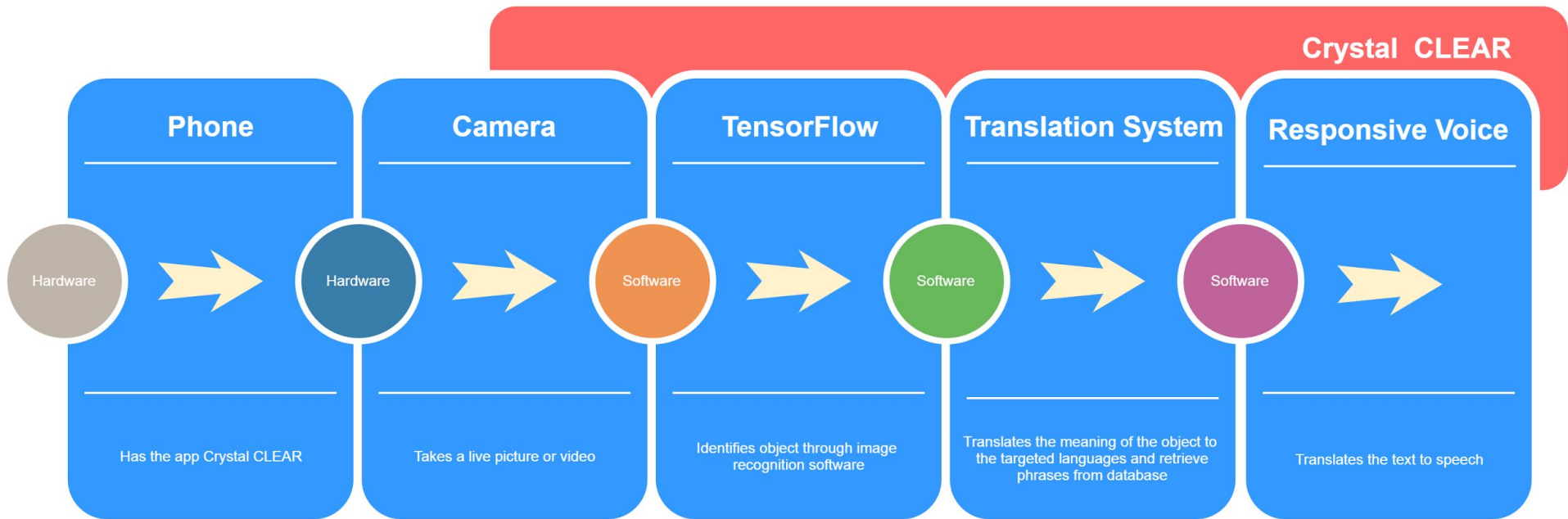


Fig. 4

Major Functional Components Diagram

Fig. 5



Identification of Software Development



Programming Languages:

Python

Java



Google TensorFlow

How Does This Work?

Image Recognition

Positive Reinforcement

Deep Learning

Why Are We Using This?

Open Source

Credible

Flexible



Fig. 8

Project Management Tools



Fig. 9



Jenkins

Fig. 10



git

Fig. 11



PyDOC

<http://www.cleltonbueno.com>

Fig. 12

Marketing Plan

Customer Base:

Educational Facilities

International Businesses

Travel Agencies

Distribution:



Fig. 13



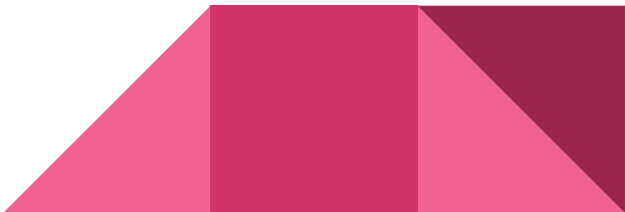
Fig. 14

End Users

Individuals Learning a New Language

Educators Teaching a New Language

Individuals Travelling Abroad



Marketing Plan: Competition Matrix

Characteristics	Crystal CLEAR	Blippar	Aipoly	Google Translate	Google Lens
Database of Objects	✓	✓	✓	✓	✓
Description of Target Object	✓	✓		✓	✓
Pronunciation of Target Object	✓		✓	✓	✓
Sentences or Phrases Using Target Object	✓	✓			
Multiple Language Support	✓			✓	✓

Fig. 15

Competition: Google



Google Translate

Fig. 16

Translates Text

Translates Audio

Translates Images

2015: Acquired World Lens

2017: Announced Google Lens

Benefits to End Users

For Travellers:

Aid in Situations Where User is Lost

Allow Added Ease for
Communication

Avoid Unintentionally Offensive
Actions or Words

For Educators:

Mitigate Typical Barriers to Learning

Impart Meaningful and Real Time
Examples

Provide an Added Level of Accessibility to
Language



Software Details and Logical Approach

Crystal CLEAR

Continuous Language Education through **Augmented Reality**

Program Design Flow

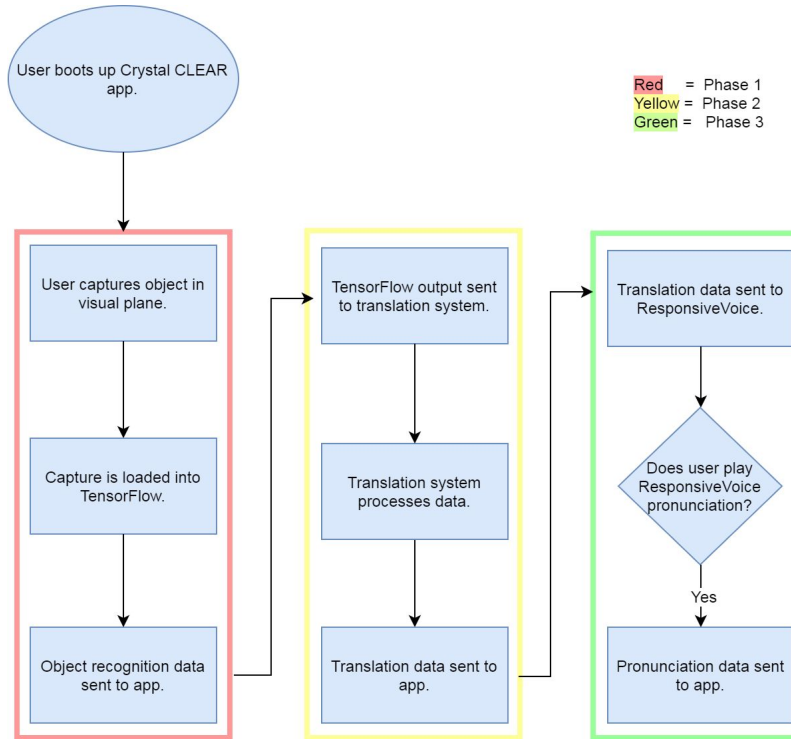


Fig. 17

Work Breakdown Structure

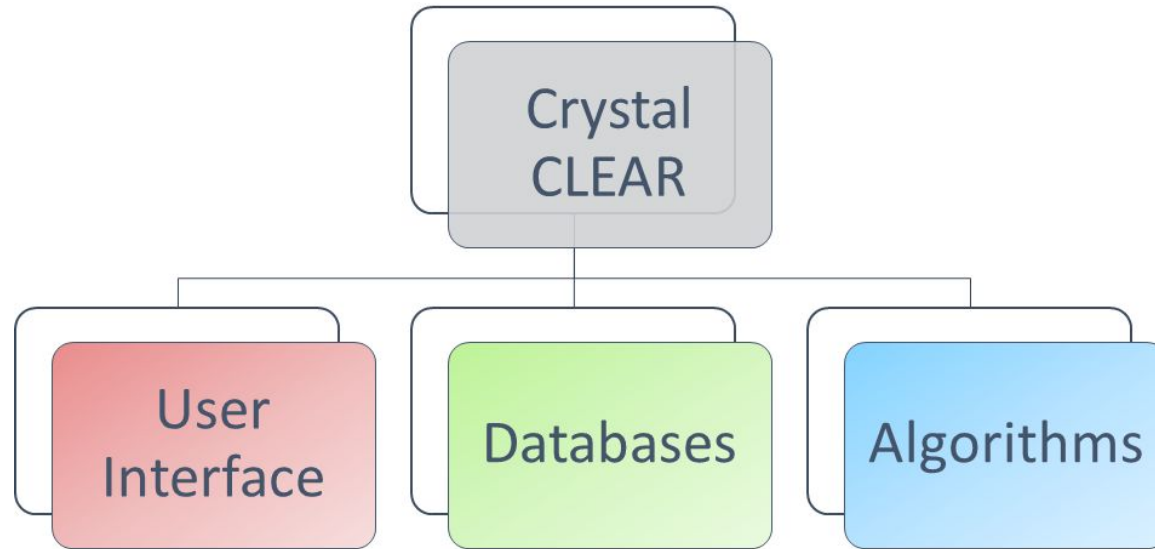


Fig. 18

Work Breakdown Structure: User Interface

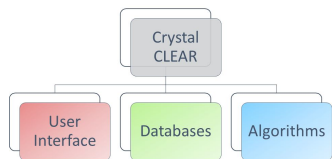


Fig. 18

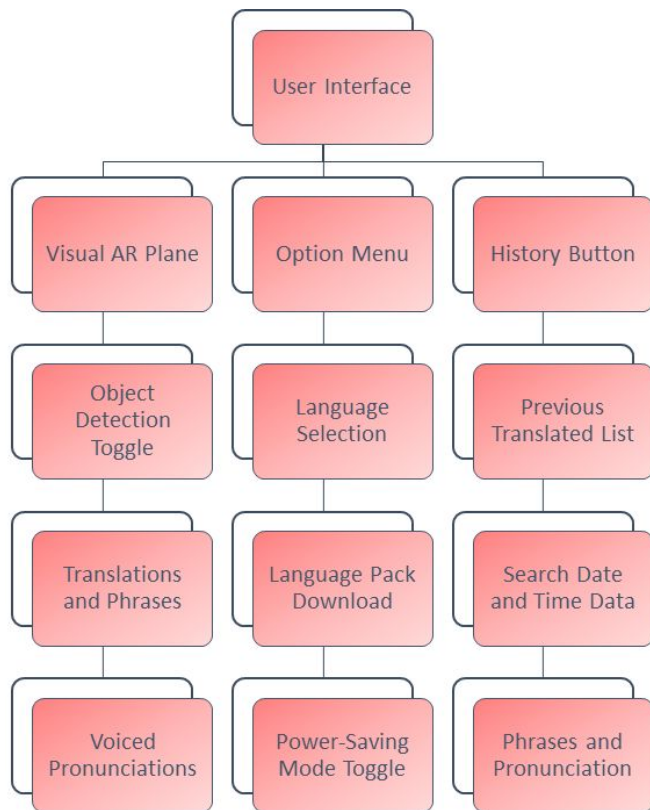


Fig. 19

Work Breakdown Structure: Database

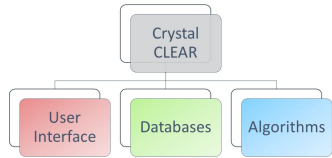


Fig. 18

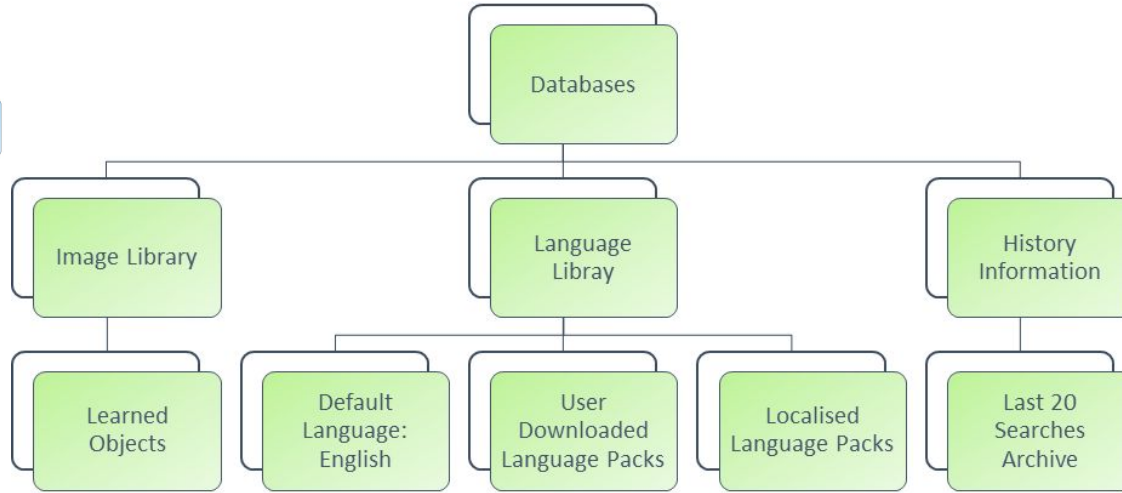


Fig. 20

Work Breakdown Structure: Algorithms

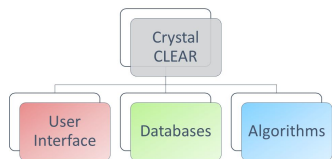


Fig. 18

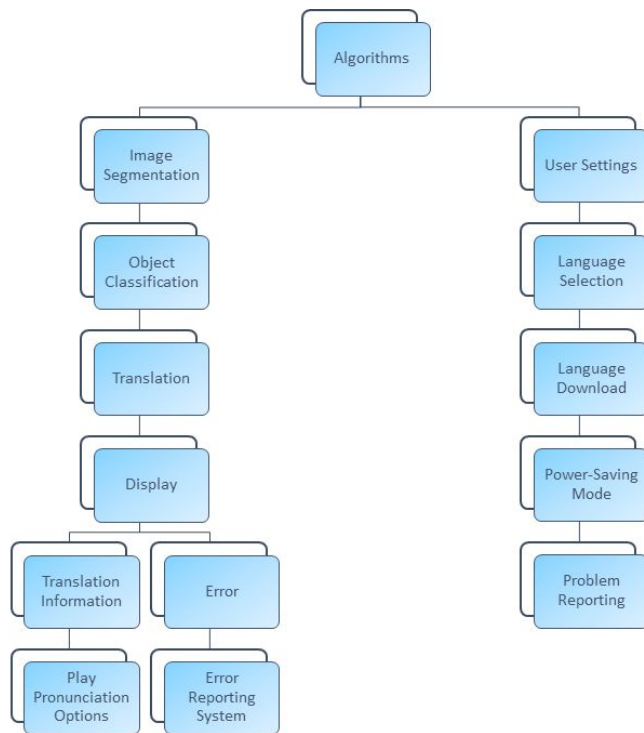


Fig. 21

Database ERD

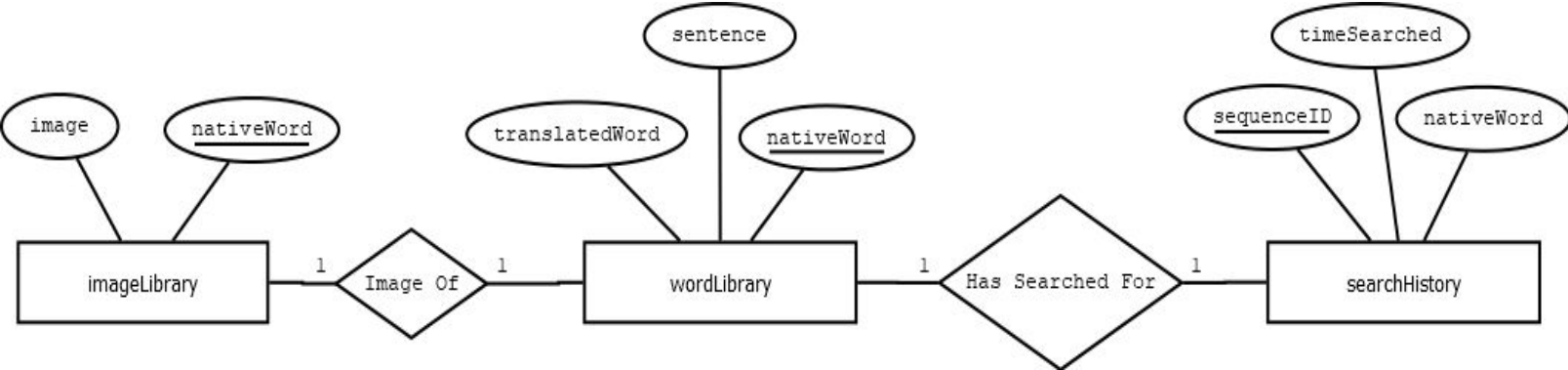


Fig. 22

Algorithms

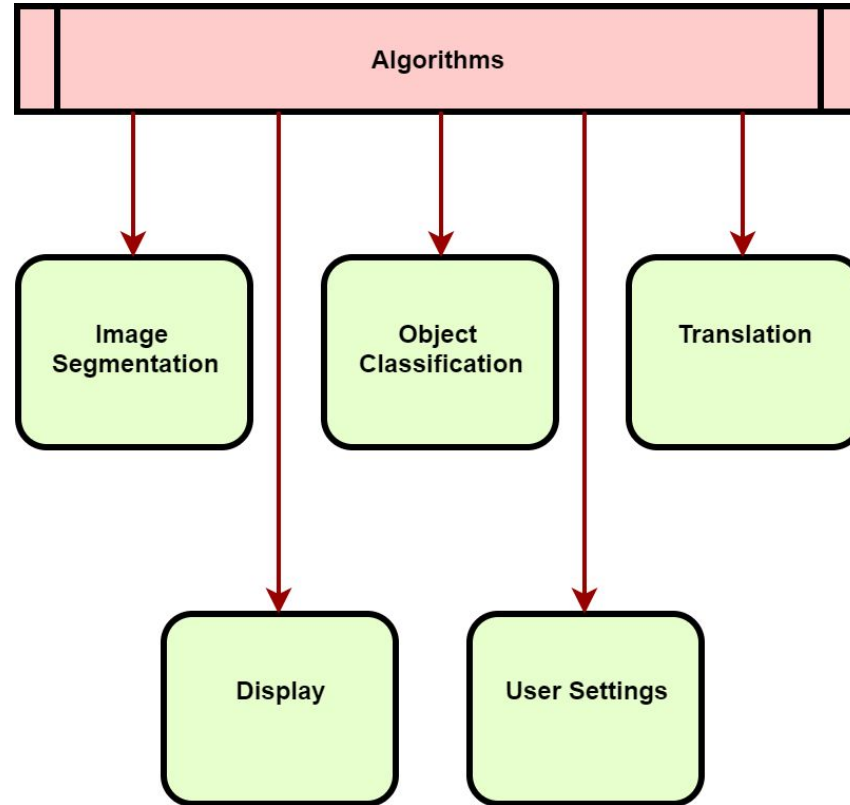


Fig. 23

Algorithm: Image Segmentation

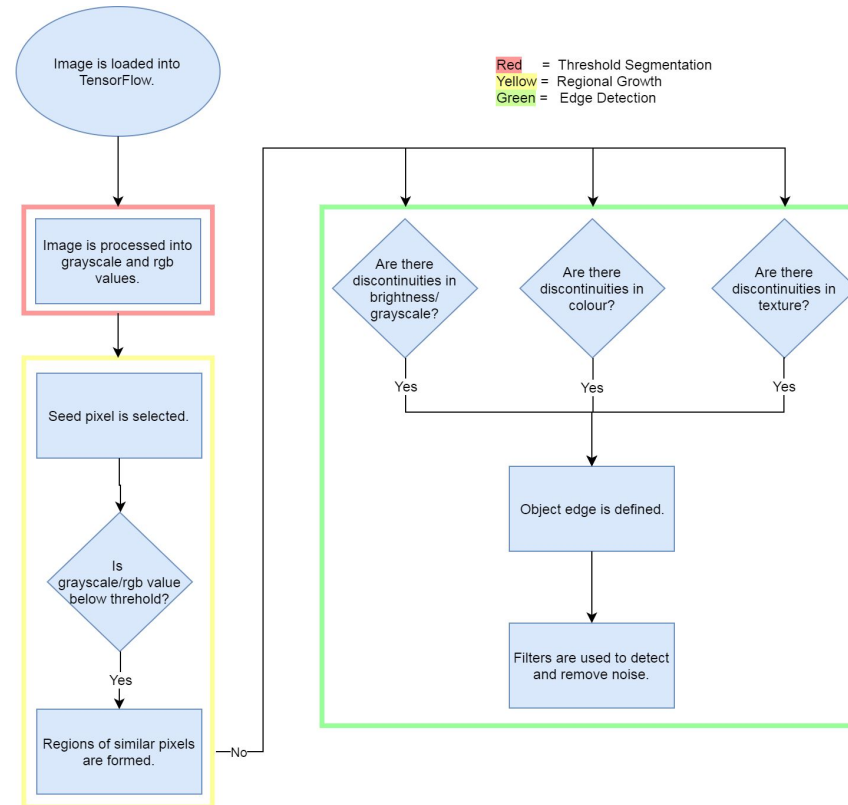


Fig. 24

Algorithm: Object Classification

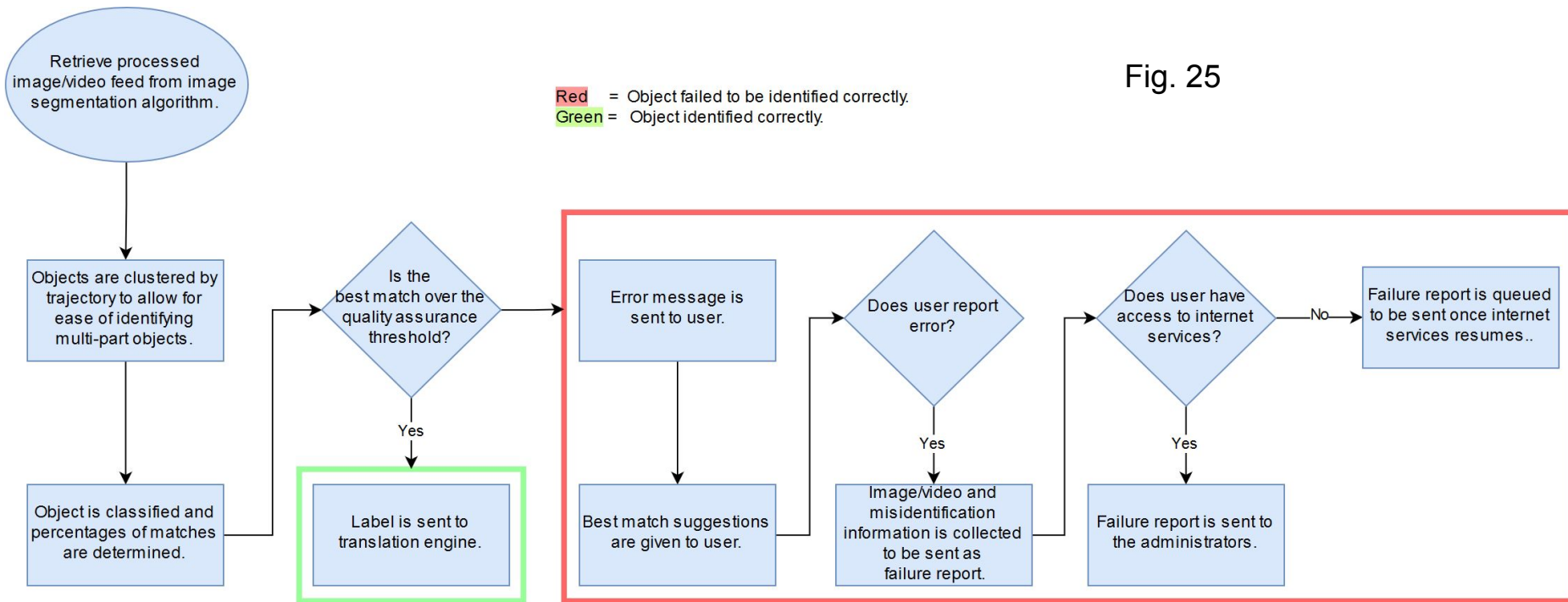


Fig. 25

Algorithm: Translation

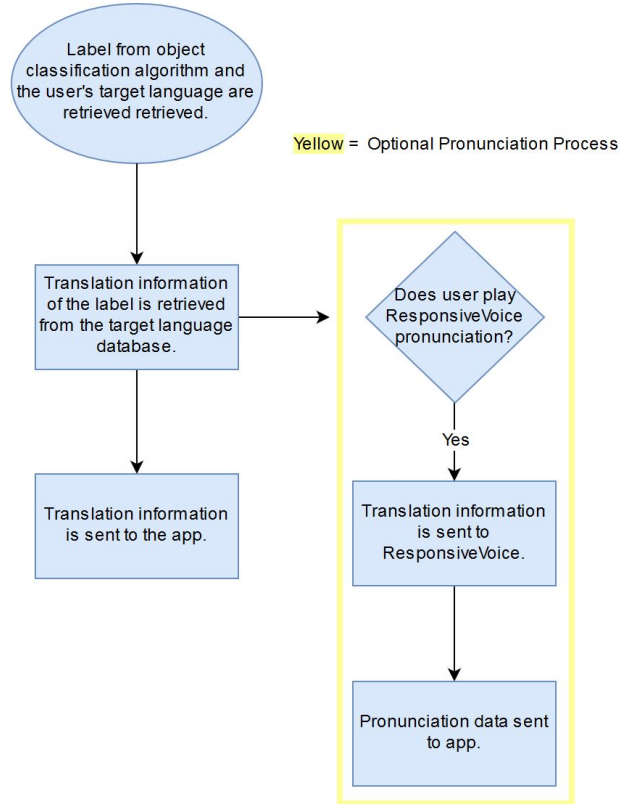


Fig. 26

Algorithm: Display

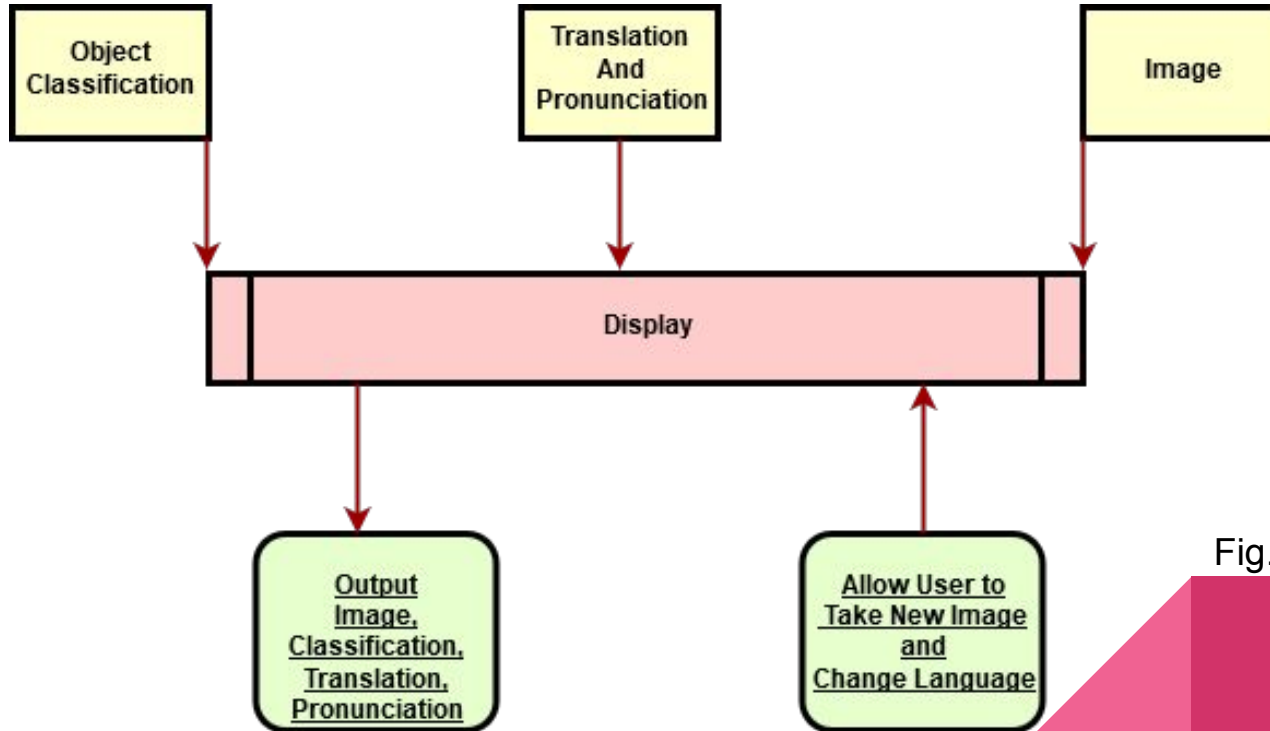


Fig. 27

Algorithm: User Settings

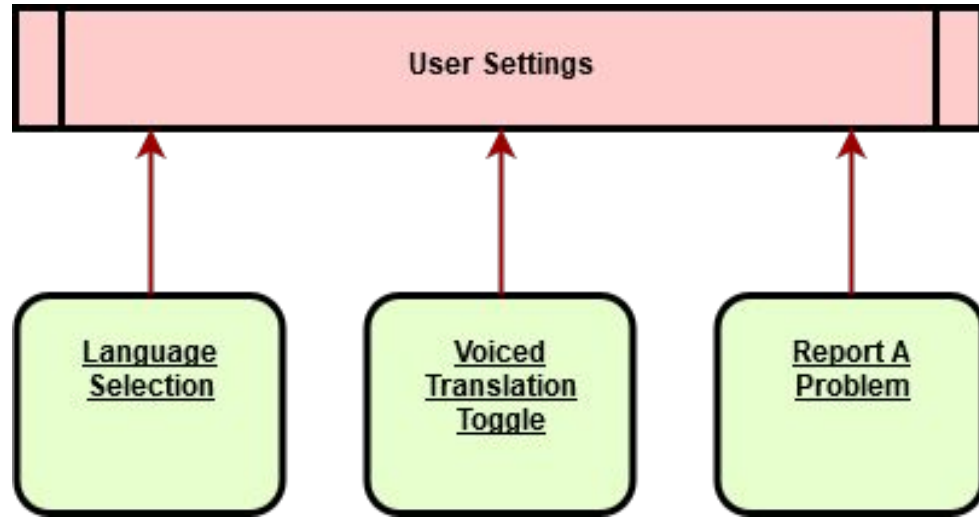


Fig. 28

GUI Mockup

Crystal CLEAR

Continuous Language Education through **Augmented Reality**

GUI Mockup 1

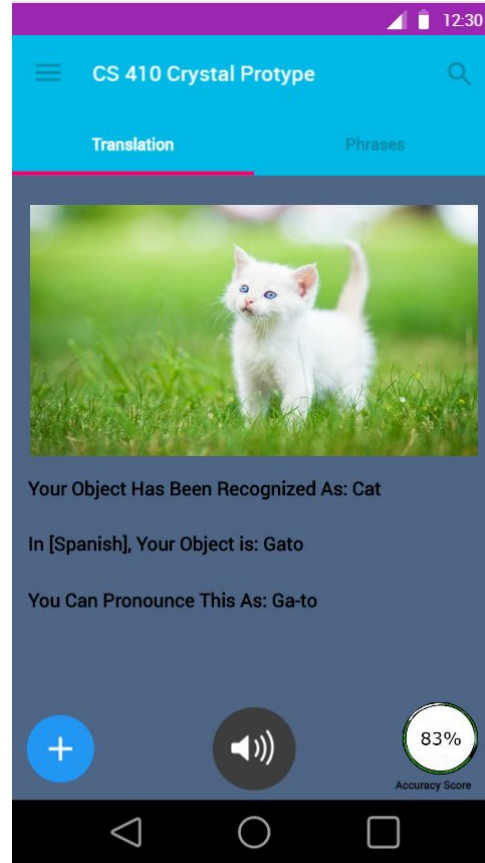


Fig. 29

GUI Mockup 2



Fig. 30

Risk Analysis

Crystal CLEAR

Continuous Language Education through **Augmented Reality**

Risk Matrix

C: Consumer Risk

T: Technical Risk

Impact

Red: Severe Risk

Yellow: Medium Risk

Green: Low Risk

		Probability				
		Very Low	Low	Medium	High	Very High
Impact	Very High		T4, T6			
	High		T3	T5		
	Medium			T1, C3	C2	
	Low	C1	T2			
	Very Low					

Fig. 31

Technical Risks - T1

Risk: The program does not recognize an unlearned object.

Mitigation: The library of objects will increase over time. Option to ask user what is the unidentified object in report a problem.

Impact: Medium

Probability: Medium

		Probability				
		Very Low	Low	Medium	High	Very High
Impact	Very High		T4,T6			
	High		T3	T5		
	Medium			T1,C3	C2	
	Low	C1	T2			
	Very Low					

Fig. 31

Technical Risks - T2

Risk: The program does not recognize a learned object.

Mitigation: The program is adjusted to better recognize object in question in the future.

Impact: Low

Probability: Low

		Probability				
		Very Low	Low	Medium	High	Very High
Impact	Very High		T4,T6			
	High		T3	T5		
	Medium			T1,C3	C2	
	Low	C1	T2			
	Very Low					

Fig. 31

Technical Risks - T3

Risk: The program misidentifies object.

Mitigation: The object will be identified in native language and target language.

Impact: High

Probability: Low

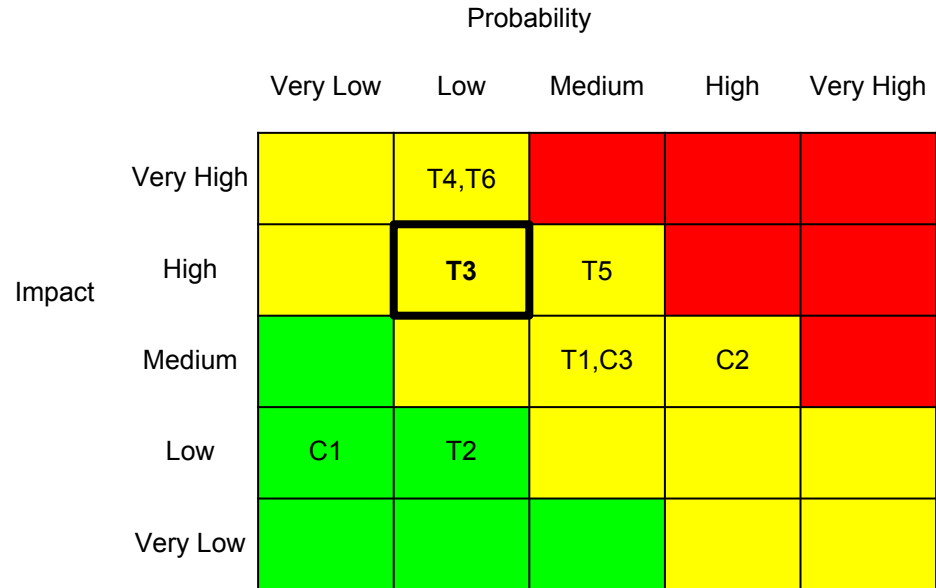


Fig. 31

Technical Risks - T4

Risk: The program mistranslated objects and/or phrases.

Mitigation: Phrases are linked with object translations which will reside pre-translated in a database.

Impact: Very High

Probability: Low

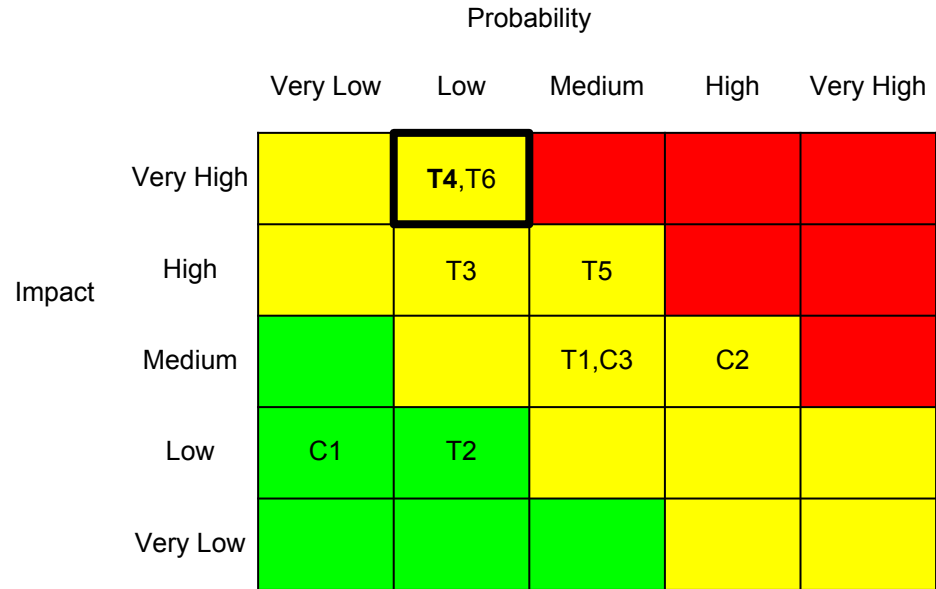


Fig. 31

Technical Risks - T5

Risk: Lighting and environmental factors reduces the quality of the picture making object detection difficult.

Mitigation: Program will have access to camera flash and zoom. Option to lower the accuracy threshold presented.

Impact: High

Probability: Medium

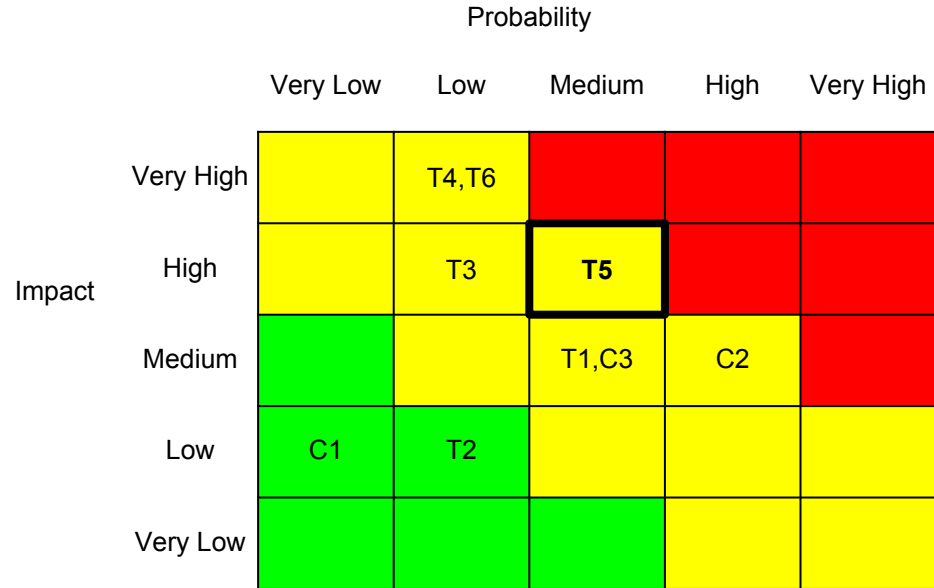


Fig. 31

Technical Risks - T6

Risk: Changes to underlying API renders app nonfunctional.

Mitigation: Development team will be prudent with keeping the app up-to-date.

Impact: Very High

Probability: Low

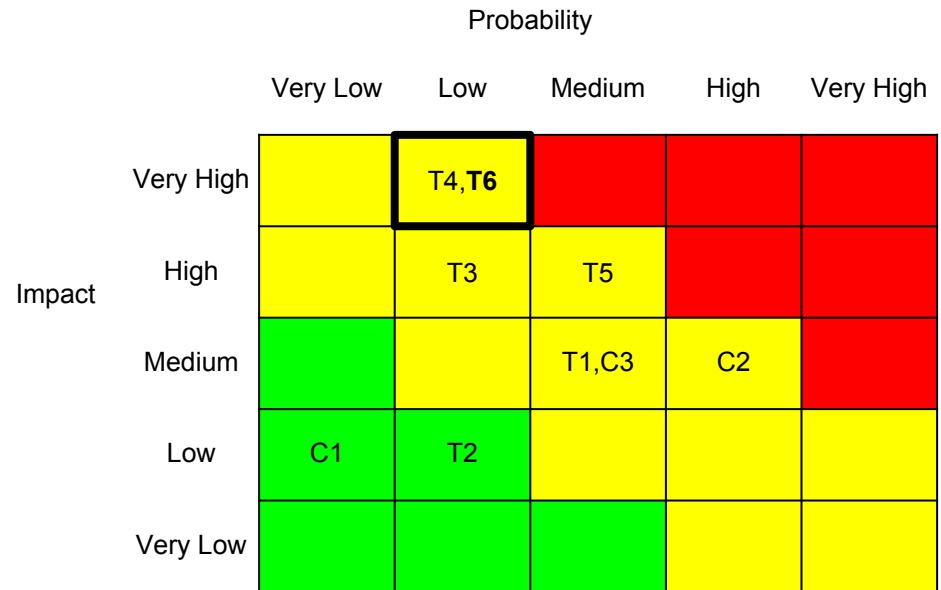


Fig. 31

Consumer Risks - C1

Risk: The user does not have hardware that can run the program.

Mitigation: The program will be optimized for the lowest possible hardware specifications.

Impact: Low

Probability: Very Low

		Probability				
		Very Low	Low	Medium	High	Very High
Impact	Very High		T4,T6			
	High		T3	T5		
	Medium			T1,C3	C2	
	Low	C1	T2			
	Very Low					

Fig. 31

Consumer Risks - C2

Risk: The program cannot connect to the internet for the customer to report technical issues.

Mitigation: Customer reports will be queued to be sent when internet connection to the device is restored.

Impact: Medium

Probability: High

		Probability				
		Very Low	Low	Medium	High	Very High
Impact	Very High		T4,T6			
	High		T3	T5		
	Medium			T1,C3	C2	
	Low	C1	T2			
	Very Low					

Fig. 31

Consumer Risks - C3

Risk: Consumer is unaware of surroundings.

Mitigation: Program will issue a warning about being vigilant of surroundings while using the app.

Impact: Medium

Probability: Medium

		Probability				
		Very Low	Low	Medium	High	Very High
Impact	Very High		T4, T6			
	High		T3	T5		
	Medium			T1, C3	C2	
	Low	C1	T2			
	Very Low					

Fig. 31

Crystal CLEAR: Summary

Continuous Language Education through Augmented Reality

What:

Makes Language More
Readily Accessible

Provides Meaningful Real
World Examples

Helps Mitigate Learning
Obstacles And Travelling
Concerns

How:

Utilises Augmented
Reality Through Smart
Devices

Identifies Objects
Through Machine
Learning

Provides Translations For
Specified Objects

Who:

Educators

Travel Agencies

International Business

Language Aficionados
and Beginners

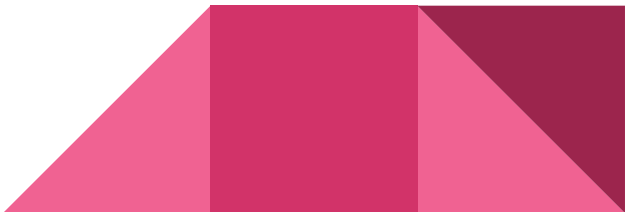
Appendix A: User Stories - User Roles

- Administrators
 - Anyone who is maintaining the application
- Users
 - Anyone who is using the application
- Database Managers
 - Anyone who is altering the database from which the application pulls.



Appendix A: Administrator

- As an Administrator I want to...
 - ...be able to update the program as new languages become available.
 - ...have access to user accounts and user account data.
- As an Administrator I would like to...
 - ...receive user feedback on incorrect item matches.
 - ... have user feedback queued when a user does not have an internet connection.



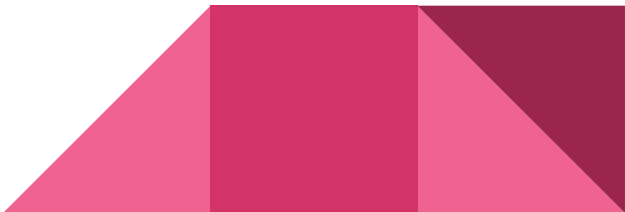
Appendix A: User

- As a User I want to...
 - ...hear how a word is pronounced.
 - ...select an object in view for translation.
 - ...be able to log in to this application and view my previously searched items.
 - ...use this application offline.
 - ...download language packs for a variety of different languages.
 - ...see the word in my own language as well as the other language displayed on the screen.
 - ...see some information on the object.
 - ...hear the word as used in a sentence.



Appendix A: Database Manager

- As a Database Manager I need to...
 - ...add new objects and their associated data into the database.
 - ...be able to associate specific words and phrases to images.
 - ...be able to edit item matches in the case of incorrect matches.



References

Bain, Nick. "Language Barriers' Stop Five Million UK Adults from Travelling Abroad." *Hostelworld Group*. November 2010.

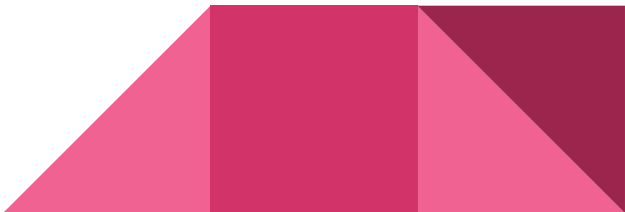
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"TensorFlow" *GitHub*. 23 January 2017.

"The Benefits of Being Bilingual" *Too Small to Fail Foundation*. February 2010.



Picture References

Fig. 1: Current Process Flow

Fig. 2:
<https://techcrunch.com/2014/02/06/amazon-puts-image-recognition-into-its-main-ios-app-prepare-to-be-even-more-showroomed-retailers/>

Fig. 3: Solution Process Flow

Fig. 4: Initial GUI Mock-Up

Fig. 5: Major Functional Component Diagram

Fig. 6: <https://www.skylinelabs.in/blog/images/tensorflow.jpg>

Picture References

Fig. 7: <https://responsivevoice.com/wp-content/uploads/2015/04/responsivevoice.com-logo400x.png>

Fig. 8:
https://lh3.googleusercontent.com/N_Nk4NMg4L3_1o8bj1eZR53rigiJXXkt34APyPBqb_gU3WmpCCyG5ArT69qkC80wNtuSHyUImM6R5fVpm_jWjSORekbJJkA=s688

Fig. 9: <https://luna1.co/232620.png>

Fig. 10: <https://leaptest.com/wp-content/uploads/2017/01/jenkins.png>

Fig. 11: <https://git-scm.com/images/logos/downloads/Git-Logo-2Color.png>

Picture References

Fig. 12: http://cleitonbueno.com/wp-content/uploads/2015/03/PyDOC_cleitonbueno.com_.png

Fig. 13: <https://i.pinimg.com/474x/3c/d5/67/3cd5679f54dc60811383649f9f6ea37d--github-logo-computer-logo.jpg>

Fig. 14: <https://s.aolcdn.com/hss/storage/midas/d08e426575725273f7e6976b898542bd/204459763/appstores-640.jpg>

Fig. 15: Competition Matrix Chart

Fig. 16:
http://www.icavictoria.org/wp-content/uploads/2017/03/logo_lockup_google_translate_icon_horizontal_en-gb-002.png

Picture References

Fig. 17: Program Design Flow

Fig. 18: Work Breakdown Structure

Fig. 19: Work Breakdown Structure: User Interface

Fig. 20: Work Breakdown Structure: Database

Fig. 21: Work Breakdown Structure: Algorithms

Picture References

Fig. 22: Database ERD

Fig. 23: Algorithms Diagram

Fig. 24: Image Segmentation Algorithms Diagram

Fig. 25: Object Classification Algorithms Diagram

Fig. 26: Translations Algorithms Diagram

Picture References

Fig. 27: Display Algorithm Diagram

Fig. 28: User Settings Algorithm Diagram

Fig. 29: GUI Mockup 1

Fig. 30: GUI Mockup 2

Fig. 31: Risk Matrix