Design Review I -
AR Object Detection and Text Recognition for Language Learning

Team LangLens

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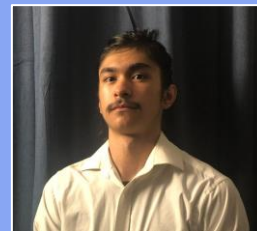Team Lead

Sami Tanquary
Architect and Lead Web
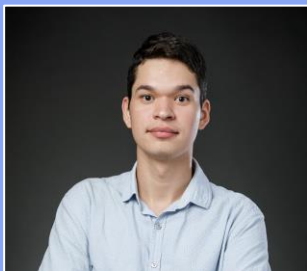Developer

Daniel Navarrete
Release Manager

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Recorder

Kyle Young
Customer Communicator

LangLens

Our Mentor and Client

Italo Santos
CS Faculty Mentor

Dr. Okim Kang
Client

Problem **Statement**

1

Lack of free tools targeted towards language learners utilize modern AR advances

2

Tools on market fail to incorporate BOTH object and text detection

Our Solution

Free

Free-to-use and accessible to anyone

Mobile

Web-app optimized for mobile devices

Modern

Employs both object AND text recognition capabilities

Word Learning

Covers key aspects of word learning: meaning, usage, and form

LangLens

Scan Object | Learn | Save | Scan Word

Computadora

Silla

SCAN AGAIN

Key Requirements

Free, web-app optimized for mobile devices

Simple, easy to understand, user interface

Capable of toggling between object detection and text recognition seamlessly

Capable of choosing a target translation language.

Scanning process can be restarted for unlimited, repeated use
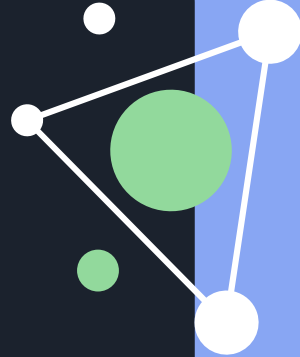
Detection modes scan environment in real time

Displays a link to an external learning page after each scan

Functional Requirements

Top-Level View:

- User Actions

- Displays Learning Page

- Database Management

Functional Requirements: User Actions

→ **User Actions**

◆ **Toggle between Object and Text Detection Modes**

● **Detect Object Mode:**

○ powered by Python based object detection engine – **YOLOv5**

○ scans user's environment in real time

○ visual bounding box

◆ translated label paired to bounding box matches selected target language

silla
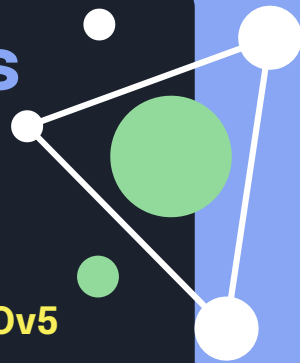
Functional Requirements: User Actions

→ **User Actions**

- **Detect Word Mode:**
  - powered by OpenCV EAST Text Detector and Tesseract OCR engine (Python)
  - Scans a single word from a image of user's current environment.
  - visual bounding box
    - ◆ translated label paired to bounding box matches selected target language

Silla

Chair

Functional Requirements: User Actions

→ **User Actions**
- ◆ **Translation Options**
  - ● **Target Language Selector**
    - ○ base language is defaulted to English
    - ○ user has option between Spanish, French, or Korean for translation

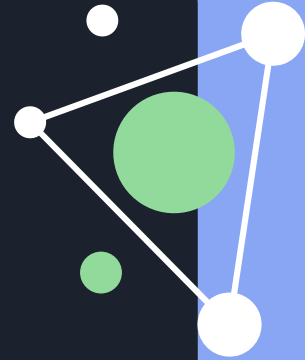# Non-Functional Requirements

→ Speed and accuracy of detection engines

→ Highly responsive and communicative front and back ends
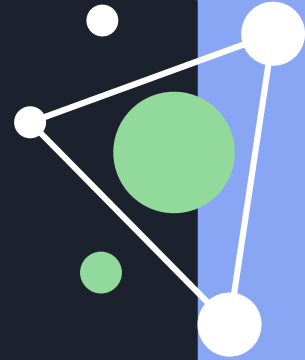
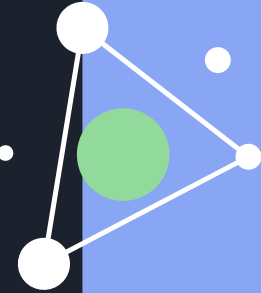→ Easily understandable UI

Environmental Requirements

Constraints imposed by client and chosen software:

➜ Web-based mobile application

➜ Free-to-use software

➜ Mobile device with camera

➜ Tesseract "Traineddata" Files

Risks and Resolutions

Risk	Severity (1-5)	Resolution
Languages Not Supported	3.5	- add more language libraries - user's can request languages
Inaccurate Translation	3	add dictionary to contain certain words that cause known issues
Inaccurate Detection	2.5	add images of objects/words that are not in database creating new classes to scan

Project Plan

TASK TITLE	START DATE	DUE DATE	September	October	November	December	January	February	March	April	May
FALL SEMESTER						TODAY					
Team Standards / Inventory	9/19/22	10/3/22	11 days								
Team Website	9/26/22	12/5/22		51 days							
Mini Intro	9/26/22	10/10/22	11 days								
Technological Feasibility	10/10/22	11/7/22		21 days							
Requirements Specfication	10/31/2022	11/23/22			18 days						
Tech Demo	11/21/22	12/5/22			11 days						
Mini Video	11/21/22	12/5/22			11 days						
Design Review	11/07/22	12/02/22			25 days						
WINTER BREAK	12/17/22	01/17/23									
PROJECTED SPRING SEMESTER	Tentative Dates										
Basic User Interface	1/17/23	1/31/23					21 days				
Implement Object Detection Mode	1/17/23	2/28/23					42 days				
Implement Text Detection Mode	1/17/23	2/28/23					42 days				
Target Language Selector	1/17/23	3/15/23					57 days				
Implement Learning Page	1/17/23	3/29/23					71 days				
Polished UI	1/17/23	4/19/23					92 days				
Product Delivery	1/17/23	5/1/23					104 days				

**Dates for Spring Semester may change slightly according to deadlines unknown at this time.
*Testing will occur after each requirement implementation

Conclusion

Free Translator

uses the camera to scan objects and text

Mobile Web-App

serves as a reinforcement learning tool

Research Process

to get a description of all required information

Individual Demonstrations

to have a working prototype.