

Whale Tail: Video Conference and Test Maker with Object Recognition and Similarity Detection

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Abstract:- E-Learning is a learning system that allows learners to take their courses online. It keeps on achieving the modern way of learning that is more convenient for everyone. This study will allow teachers, students, and their parents to achieve the same goal in the advanced learning system. It aims to provide an easy and monitored way of learning. The learning can be measured in an E-Learning setup and can properly set goals for the areas of opportunity for the students. For their better learning, researchers added some key features that can help students to focus more on online learning.

I. INTRODUCTION

Education is defined as the key to learning. However, in the last couple of years, as the pandemic comes, this has led to the other system of learning. One of the learning systems in the Philippines is online education or distance learning which allows students to learn in a very flexible time and place, it also has a bunch of benefits that students can get. However, there are also a lot of challenges that can face by the students. And some of those challenges are lack of concentration, the temptation for cheating and procrastinating, etc.

Thus, this study is focused on constructing a website for students and professors. This would help them provide a concentration on class, guide and teach the student to control their desired will of cheating and procrastinating. In addition, the study could give both students and professors the same amount of learning as face-to-face education.

II. REVIEW OF RELATED LITERATURE

This chapter documents the studies about E-learning and the technologies that are used by developers to create E-learning.

A. Overview

In the world of e-learning, many institutions, especially in education, are interested in providing ideal learning with the help of technology. The challenges and changes in learning and education are identified that give us more vision of what the appropriate approach is in providing the assessment to the students via an online setup.

Numerous understandings are given as to what type of knowledge and skills are needed to work into the setups of assessment that can be used most effectively to evaluate the understanding of the students.

Technology has served as an important instructional tool for education and other institutions. Learning online helps the students in decision-making and problem-solving, data processing skills, and communication capabilities. Using technology, students may acquire more knowledge that ties and widen their direction to various individuals and standpoints.

B. Study about a Web-based Online Examination System

An online examination system is one of the methods of taking exams that doesn't require any kind of a piece of paper or a pen. It is a fast-growing method to take exams online. Speed and accuracy are the reason behind the popularity of this method because speed and accuracy are the backbones of this system.

Many researchers have already researched online examination systems and we have developed an online examination system to keep an eye on this research as a reference these all are the following: Zhenming et al (2003): They developed an online examination system based on web browser/server framework. SIETTE Guzman and Cenejo (2005): Developed an online examination system called SIETE; (System of intelligent Evaluation using Tests for Tele education). Ayo et al (2007): Proposed a model of e-examination. Jim and sean (2006): They justified the assessment can be taken in different ways. Zhenming et al (2003): They developed an online examination system based on a web browser/server framework. Which supports some premium basic features, carries out the examination, and provides the auto-grading system for objective questions and operating questions like programming, editing MS Word, Powerpoint, MS windows, Excel, etc

C. Study about React

React is an open-source JavaScript library that provides a view layer for rendering data as HTML to create interactive UI components. Components have been used typically to render React views that contain additional components specified as custom HTML tags. React views efficiently update and re-render the components without reloading the page when your data changes. It gives you a trivial virtual DOM, powerful views without templates, unidirectional data flow, and explicit mutation. It is a very systematic way of updating the HTML document when the data changes and provides a clean separation of components in a modern, single-page application. The React Component is built entirely with JavaScript, so it's easy to pass rich data through your app. Creating components in React lets you split the UI into reusable and independent pieces, which makes your application component reusable, and testable,

and makes the separation of concerns easy. React is only focused on View in MVC, but it also has stateful components that remember everything within this. state. It handles mapping from input to state changes and it renders components. Let's look at React's component lifecycle and its different levels.

D. Study about Firebase

According to the study, the Firebase platform helps you develop high-quality apps and focus on your users. Firebase is a mobile and web application development platform backed by Google. It is a one-stop solution for all your needs to develop high-quality mobile and web applications. It includes various products, such as Realtime Database, Crash reporting, Cloud Firestore, Cloud Storage, Cloud functions, Authentication, Hosting, a Test Lab for Android, and Performance monitoring for iOS, can be used to develop and test real-time applications by focusing on the user's needs, rather than the technical complexities. It also includes products such as Cloud Messaging, Google Analytics, Dynamic Links, Remote Config, Invites, App Indexing, AdMob, and Ad Words that help you grow your user base and increase the engagement of your audience.

E. Study about Node JS

Node.js (Node) is a cross-platform runtime environment originally developed in 2009 by Ryan Dahl for developing server-side applications. It can be regarded as server-side JavaScript. It was created to address the issues platforms can have with the performance in network communication time dedicating excessive time processing web requests and responses. "Node.js is a platform built on Chrome's JavaScript runtime for easily building fast, scalable network applications. Node.js uses an event-driven, non-blocking I/O model that makes it lightweight and efficient, perfect for data-intensive real-time applications that run across distributed devices." Node has become popular as it makes creating high-performance, real-time web applications easy.

Node allows JavaScript to be used end to end, both on the server and on the client. JavaScript has originally run only in the web browser, but the considerable demand has brought it to the server side. JavaScript has developed very

much and has excelled to dominate server-side scripting. We need to analyze the security issues in Node applications because of their use of JavaScript, which has security liabilities. Node is event-based rather than thread-based. Node uses an event loop within a single thread instead of multiple threads and can scale to millions of concurrent connections. In Node, a single thread can accomplish a high concurrency. Every I/O operation in Node is carried out in an asynchronous fashion, meaning that the server can continue to process incoming requests while the I/O operation is taking place.

F. Study about TensorFlow.js

Tensor Flow.js is an open-source library (developed by Google) for creating and executing machine-learned algorithms in JavaScript. Tensor Flow models can be executed in web browsers or in the Node.js environment. This library provides a set of APIs that are compatible with those from Python, providing the ability to use the JavaScript model in the Python ecosystem and vice versa.

JavaScript can run in a variety of environments, once written machine learning code can be easily executed on different platforms.

G. Study about Nodemailer

Nodemailer, an open-source project started in 2010, is an npm module for Node.js applications to send emails. Today, nodemailer is a factor way to send an email in Node.js.

It is a single module with zero dependencies and supports HTML Content. Allows you to easily add attachments to messages. It also supports SMTP as the default transport method; other supported transport methods are SES, Sendmail, Stream, and OAuth2 authentication.

III. METHODOLOGY

This chapter determined the methodology that developers used in conducting the research. This chapter presents the research design, target users, and how the system works and is completed.

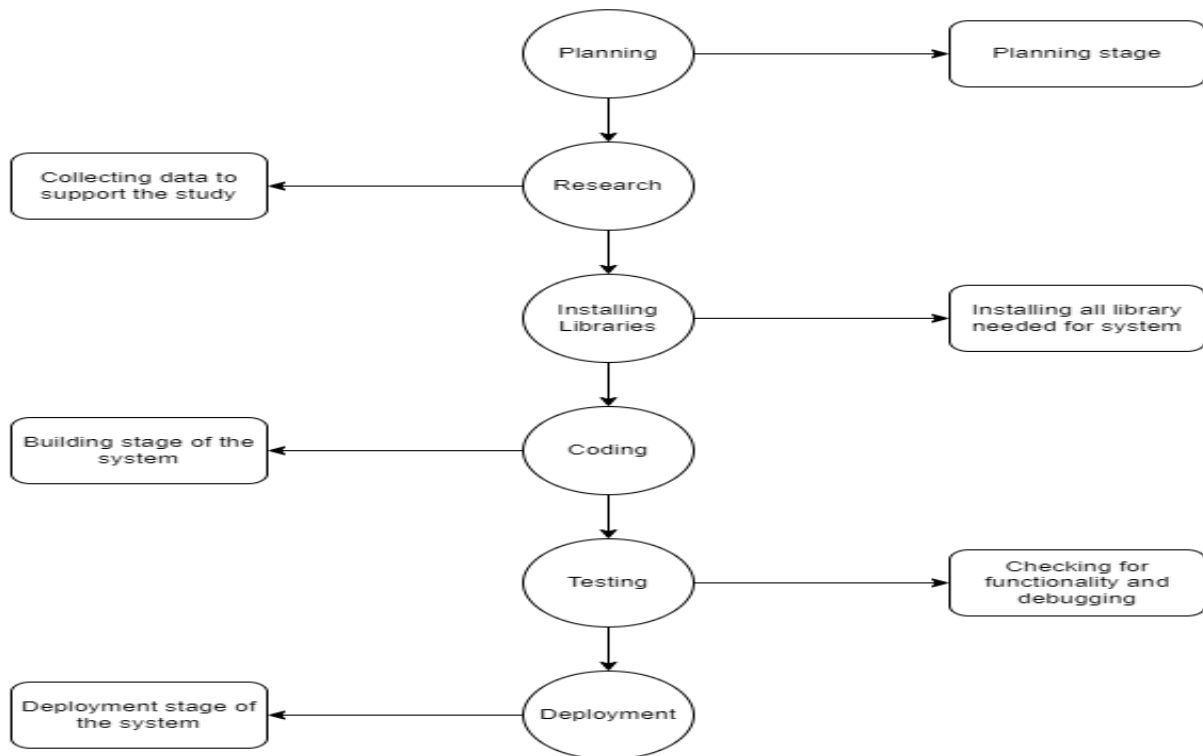


Fig. 1: System Implementation Stages

LMS or Learning Management System is software that is used to help students and teachers to manage their school activities. Its concept emerged directly from e-Learning.

A. *Pure Research.*

It is a type of research that's not only seeking a solution for a specific problem rather than improving and advancement of a specific topic.

B. *Software used in developing.*

Developers used React.js for frontend development while in the backend developers used Firebase and Node.js. Developers also used Tensorflow.js for object recognition, RAPID API for similarity detection, Agora.io for video conference, and VS Code for an integrated development environment.

C. *System's Flowchart.*

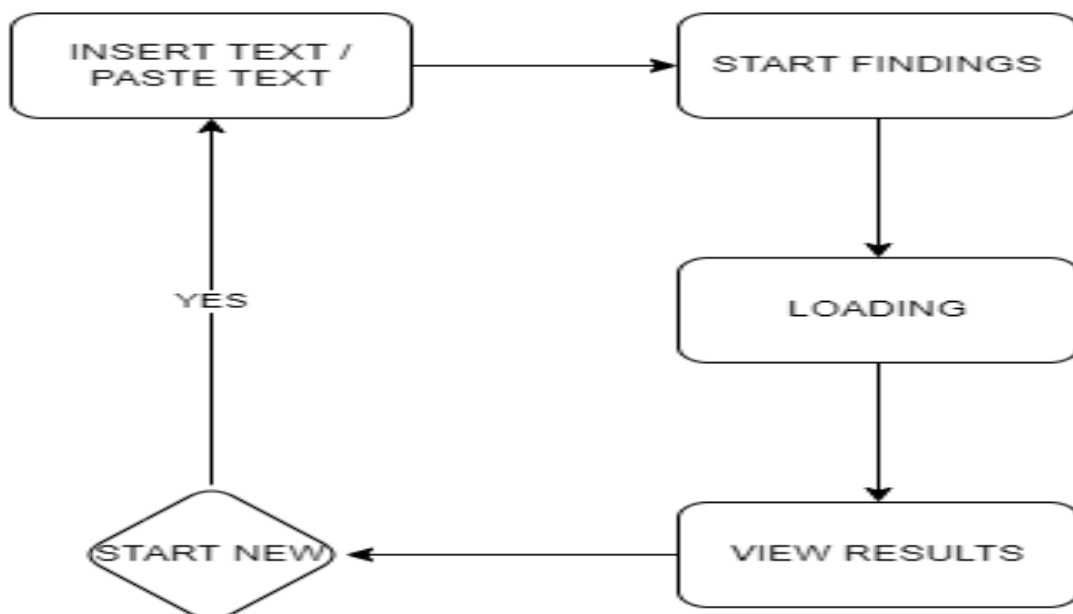


Fig. 2: System's Similarity Detection Flowchart

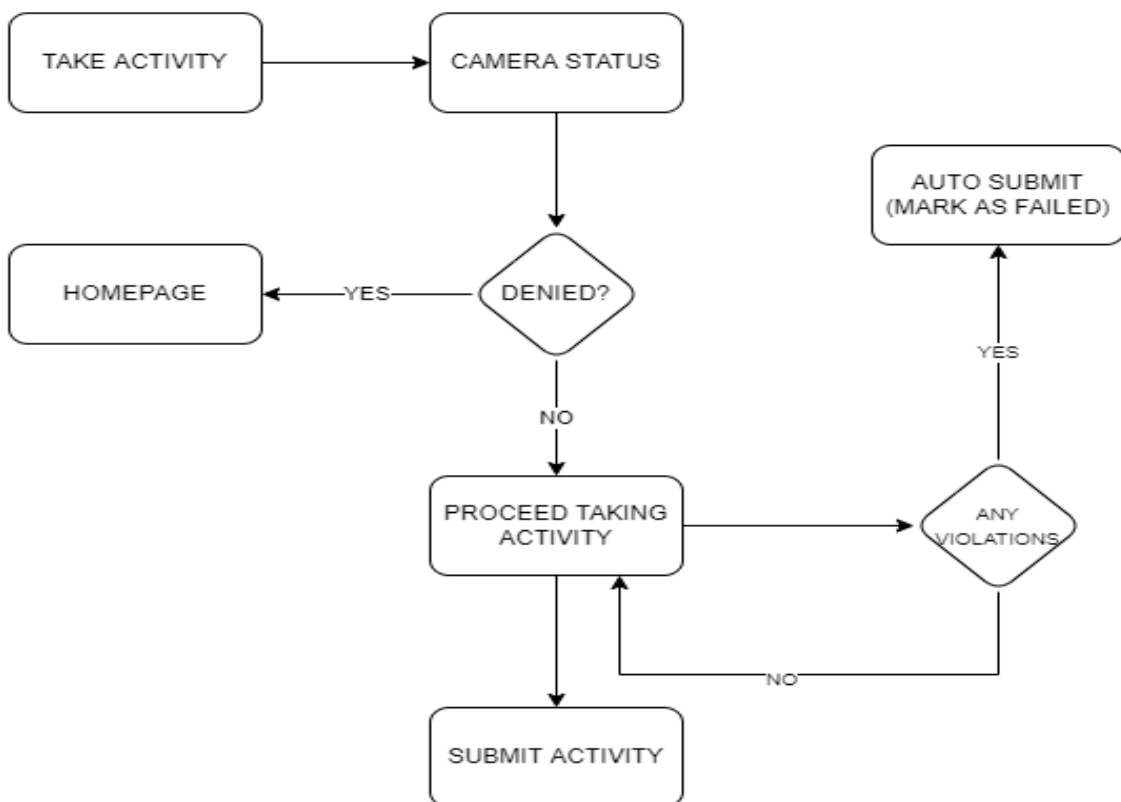


Fig. 3: System's Taking Activity Flowchart

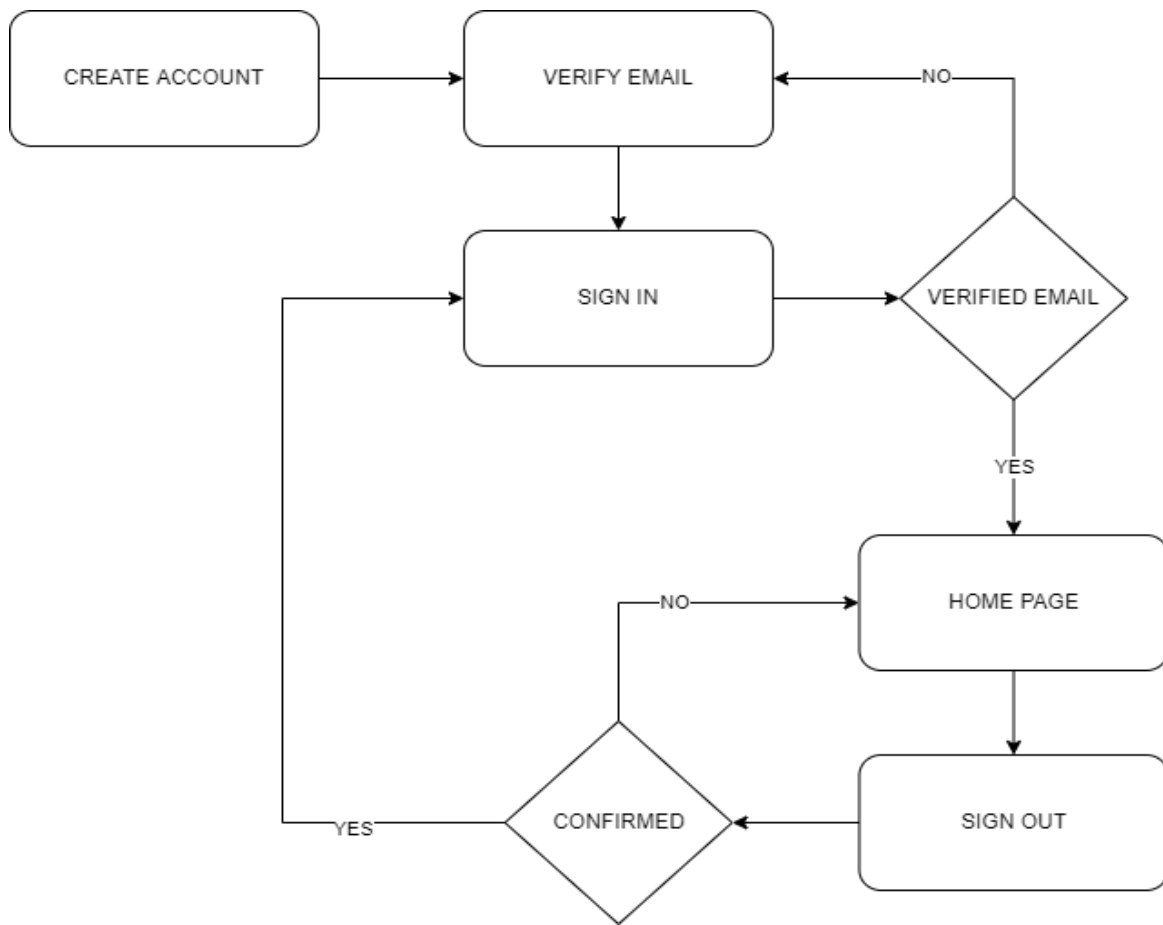


Fig. 4: System's Authentication Flowchart

The diagram above shows how the system works. Below are the steps on how users can use the system.

- Step 1: Create User Account A new user needs to be registered and verify his/her email so he can use his/her registered account.
- Step 2: Sign in. After registration and verification of email, the user can now sign in.
- Step 3: Features. Every signed-in user can use every feature that the system has.

• System’s list of key features.

- Create Group. Every user can create their own group for their class, they can upload meeting links, create exams/assessments, upload files and share their files from their own storage.
- Dive-in. Developers added an Instagram-like feature so every user can share their story with their followers.
- Prevent cheating. During taking exams/assessments, a camera is needed and needs to be on to prevent cheating. While taking exams/assessments exit fullscreen and using other tabs are not prohibited.
- Send feedback. In case there’s an error or the user has a suggestion to improve our system they can send us their thoughts.

- Inserting data to be checked for similarity

- Storage. Every user has their own storage for files and images.
- Similarity Detection. Users can check for a similar article based on the text they insert.
- Real-time Notifications. Every user will be notified of every new activity that has been made. Example: new followers, group invitations, etc.

IV. RESULTS AND DISCUSSION

This chapter shows some of the functionality, maintainability, speed, and accuracy of the system and its results.

A. The results of a phase of a study

a) Similarity Detection

Developers used the Rapid API key from Google to use for checking similar articles to text inserted by the user, the process almost takes 3 to 5 seconds before getting the response data.

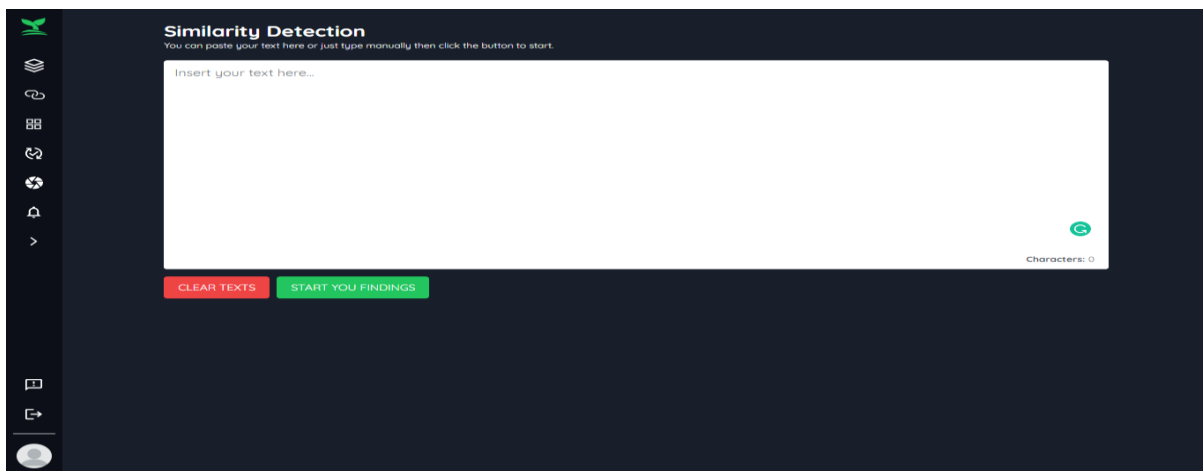


Fig. 5: Data Insertion

- Processing data

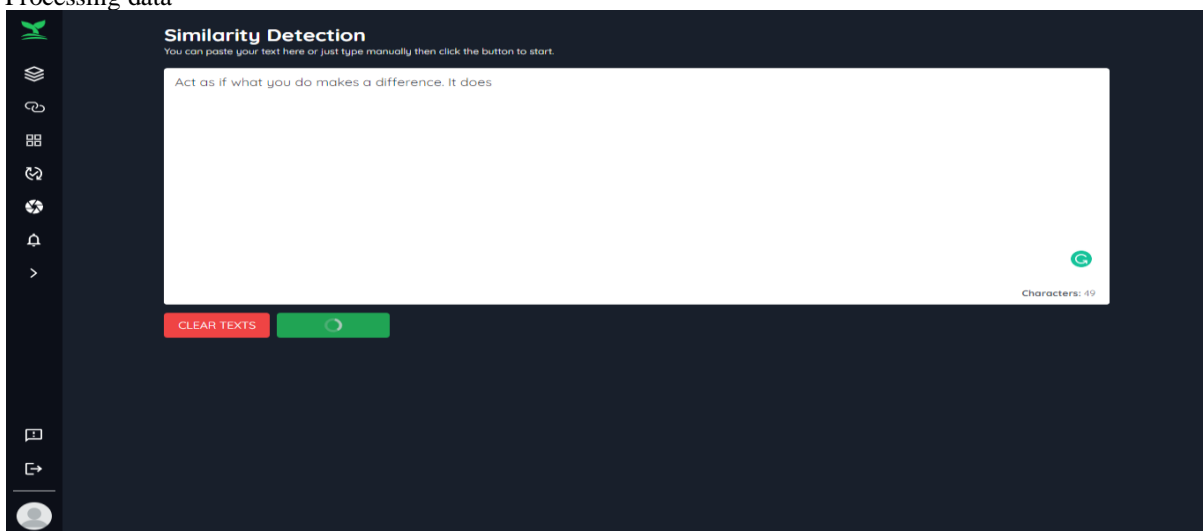


Fig. 6: Data Processing

• Similar articles results

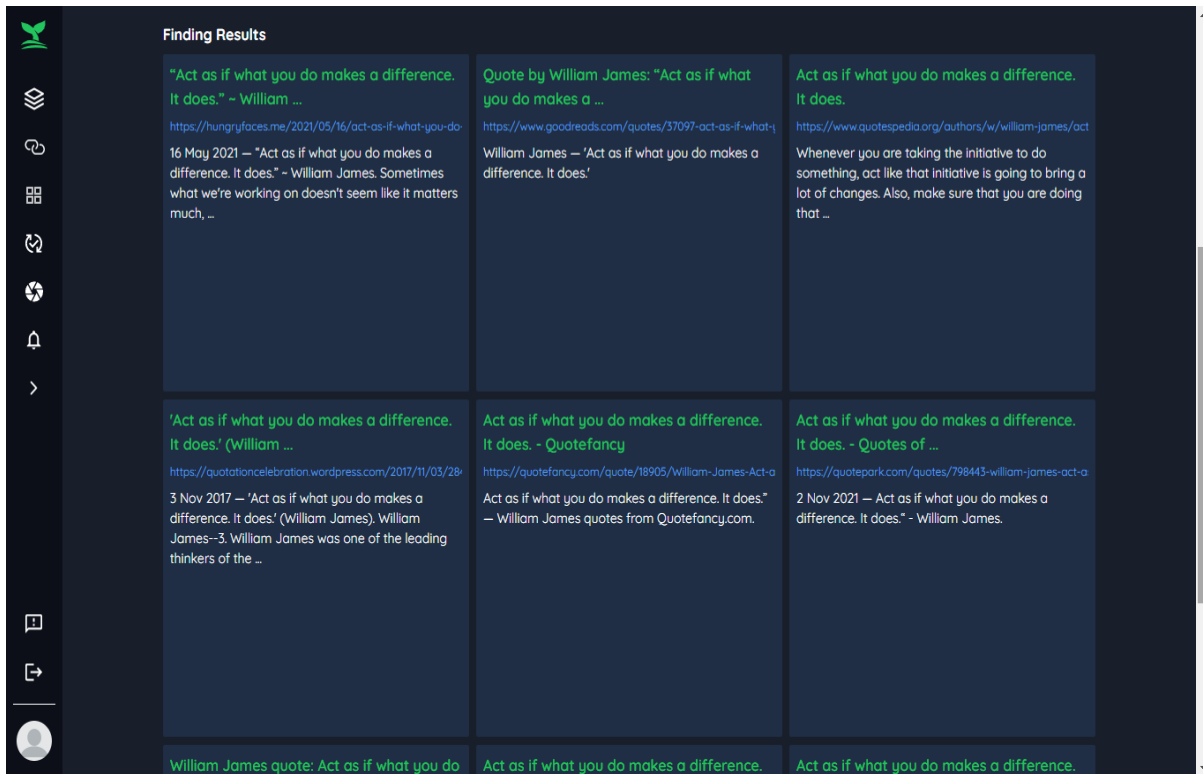


Fig. 7: Results of Findings

b) Object Recognition

Tensorflow.js was used by the developers to detect any kind of object that shows in the camera.

• Camera Processing for Detection

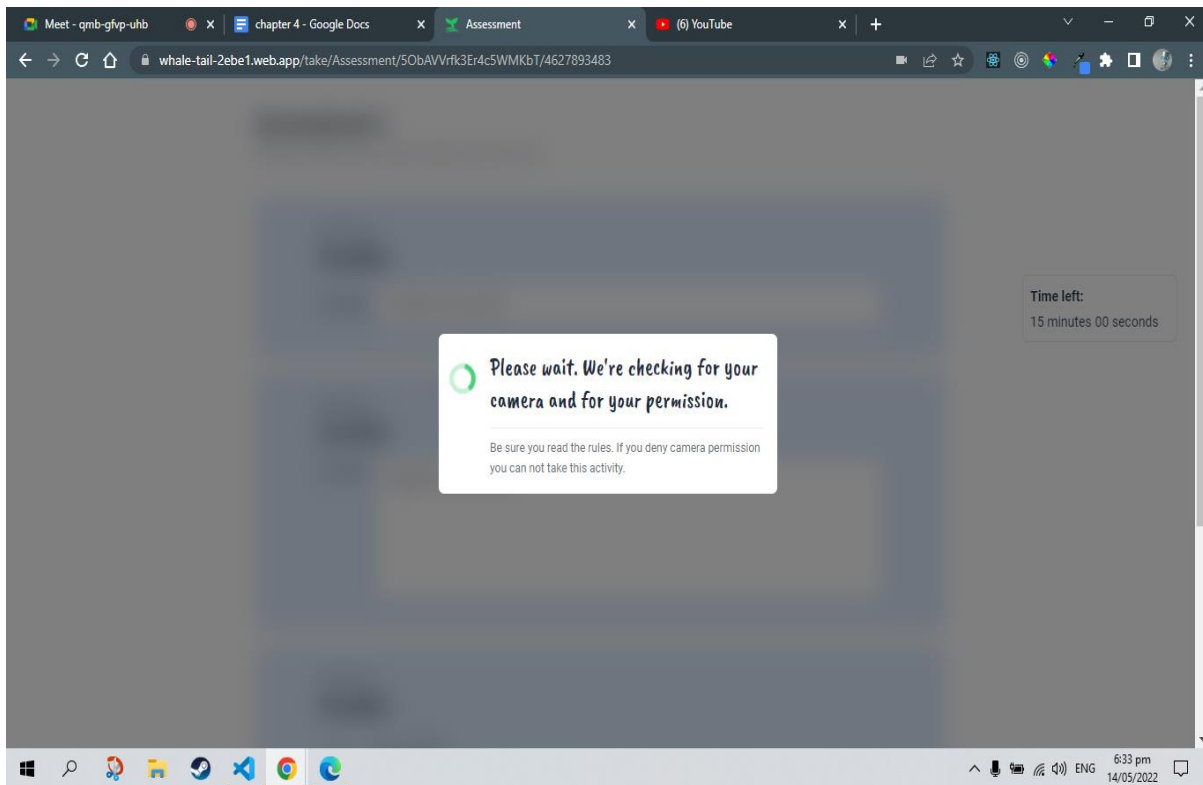


Fig. 8: Camera Processing

• Detection

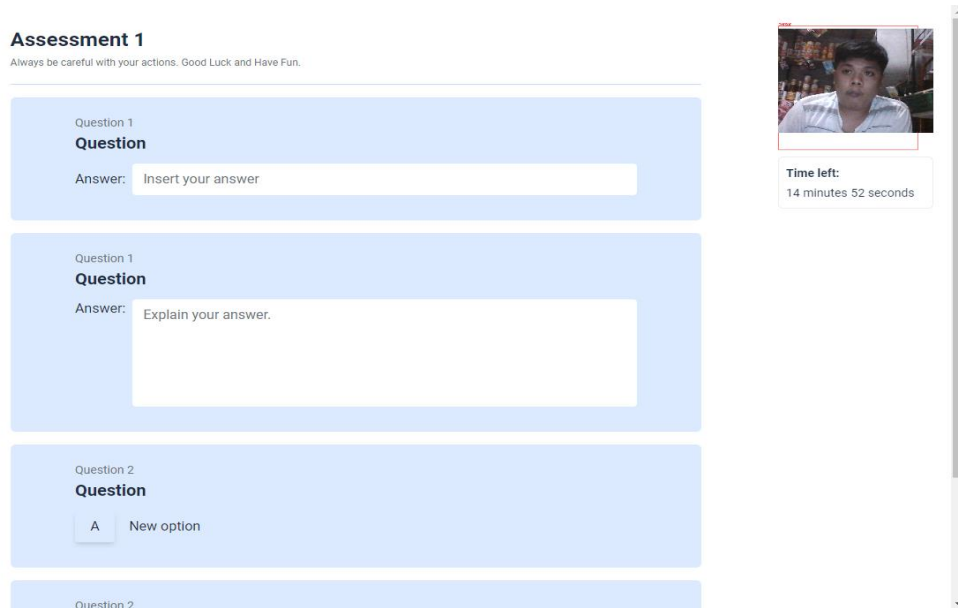


Fig. 9: Detection Result

B. Testing and Evaluation of the System

a) Maintainability

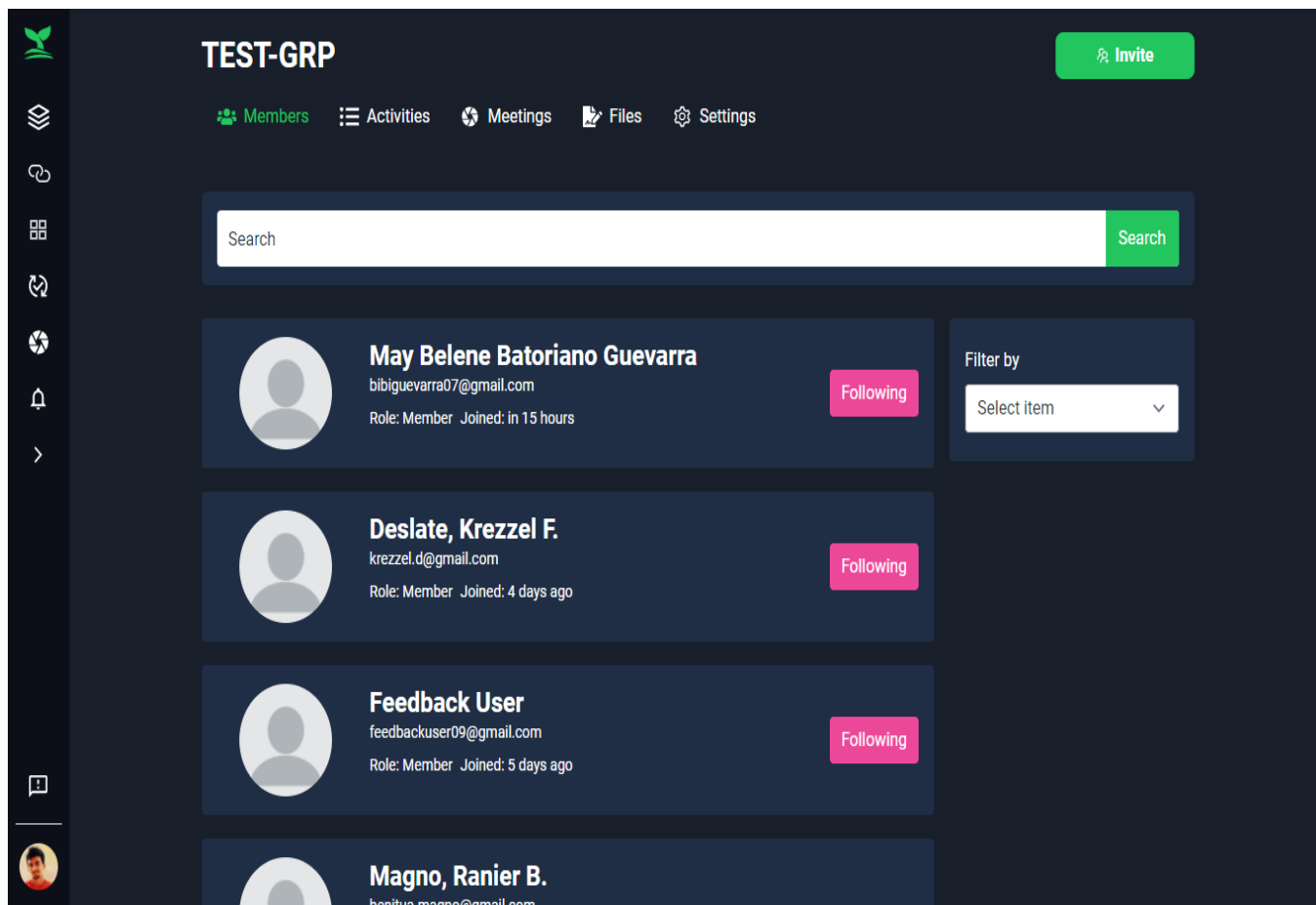


Fig. 10: System's Sample of Data Fetching

It maintains the real-time data fetching from the database when there's a user.

b) Functionality

```

export const UserFuncProvider = ({ children }) => {
  const [currentUser, setCurrentUser] = useState()
  const [loading, setLoading] = useState(true)
  const useFirestore = (collectionName) => {...}
  const useFirestore2 = (collectionName) => {...}
  const useSingle = (collectionName, docId) => {...}
  useEffect(() => {
    const unsubscribe = onAuthStateChanged(auth, (user) => {
      setCurrentUser(user)
      setLoading(false)
    })
    return unsubscribe
  }, [])
  const addDocs = async (collectionName, docData) => {...}
  const settingDocs = async (collectionName, docData, id) => {...}
  const value = {...}
  return (
    <FuncContext.Provider value={value}>
      {!loading && children}
    </FuncContext.Provider>
  )
}
    
```

Fig. 11: Global scope functions

Developers used global scope functions to prevent passing problems with component props and to prevent the website from slowing.

c) Reliability

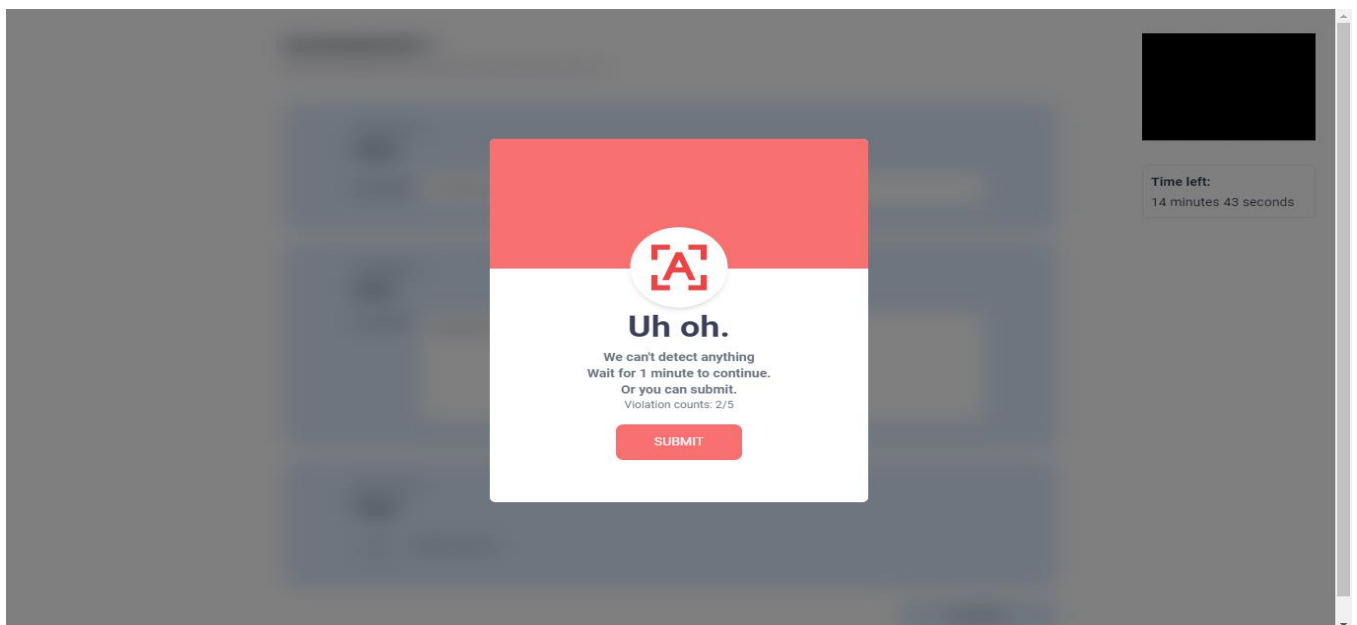


Fig. 12: System’s Sample of object detection during exams/assessments

It shows how reliable the system is in terms of protecting the exams/assessments from cheating.

d) Accuracy

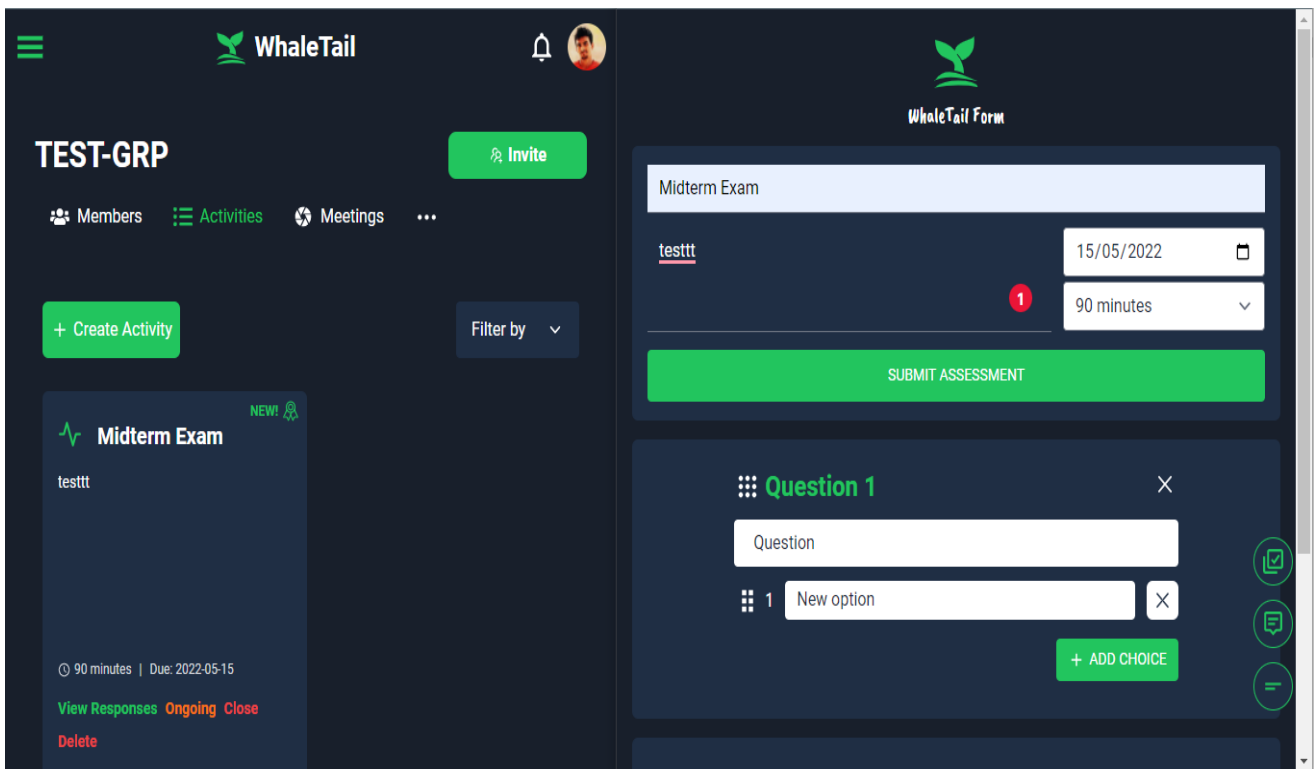


Fig. 13: System’s Sample of data accuracy test

It surely gives 100% data accuracy from creating data to showing it in the user’s UI, it will show up in the user’s UI as soon as it is submitted.

e) Speed

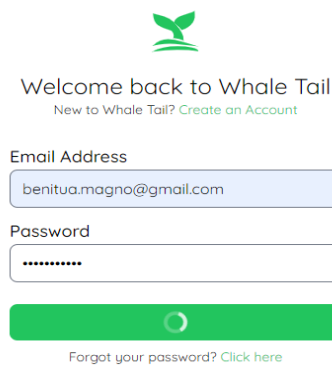


Fig. 14: System’s Sample of functionality speed

From the original speed, it only takes 1 second to complete the signing in, but the developers added extra seconds to make sure the data of the users are completely ready.

f) *Testing and Evaluation of the Algorithm*

a) *Functionality*

• *Similarity Detection’s Algorithm:*

It only used API from another website to check some articles similar to inserted text.

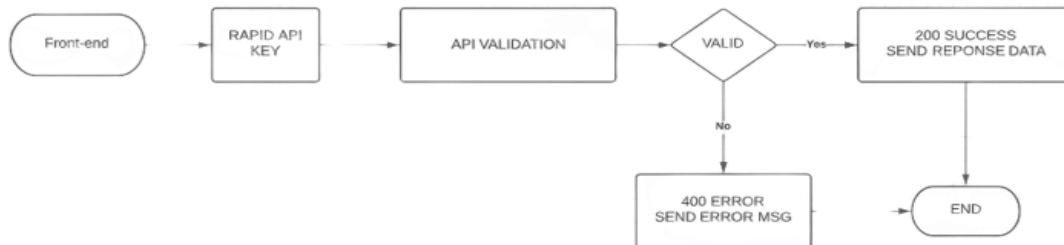


Fig. 15: Similarity Detection’s Algorithm

• *Tensor Flow’s Algorithm*

The tensor flow used deep learning models and machine learning algorithms The tensor flow used only three steps to carry out the object detection task.

They need to generate small segments.

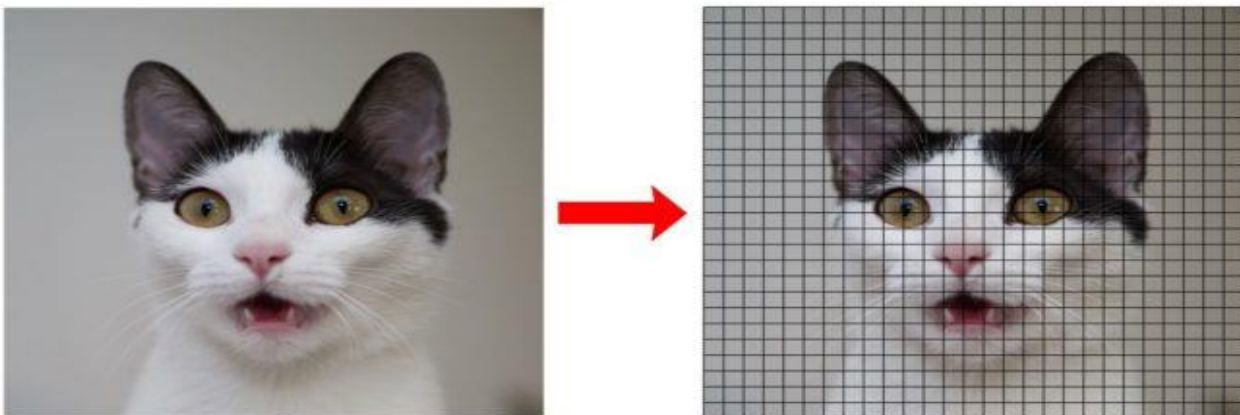


Fig. 16: Generate small segments

• *Extract features from segments to detect if there is a valid object*

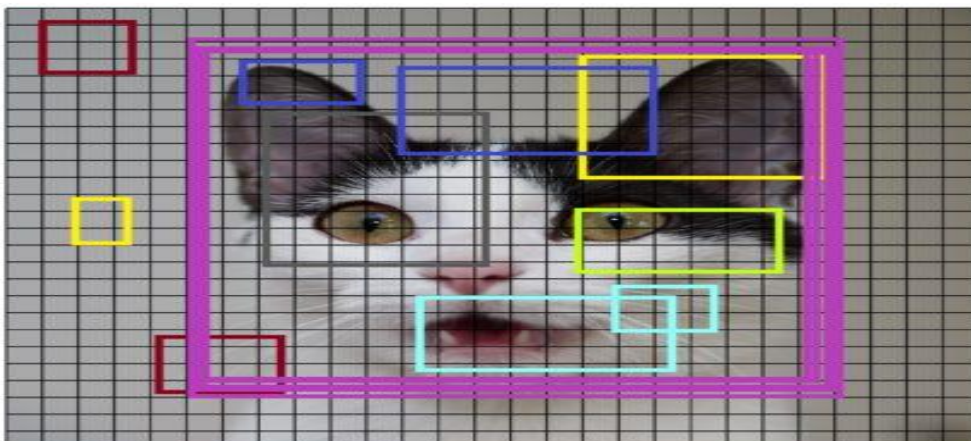


Fig. 16: Generate small segments

- Create a single rectangle for the detected object



Fig. 17: Object Detected

b) Accuracy

- Data response from RAPID API

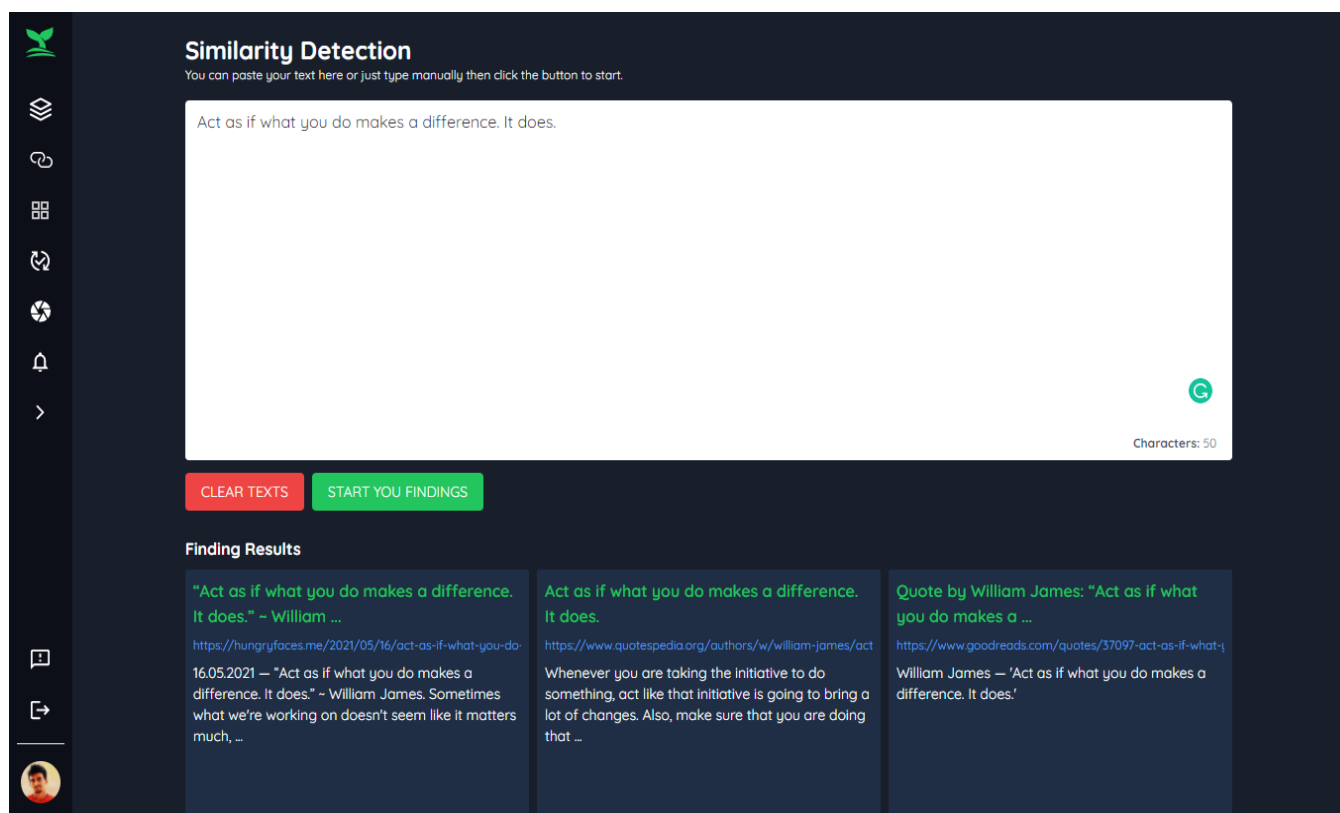


Fig. 18: Sample Accuracy test

The figure shows the articles similar to the text that the user inserted, it shows accurate data.

c) Speed

- Getting response data from API

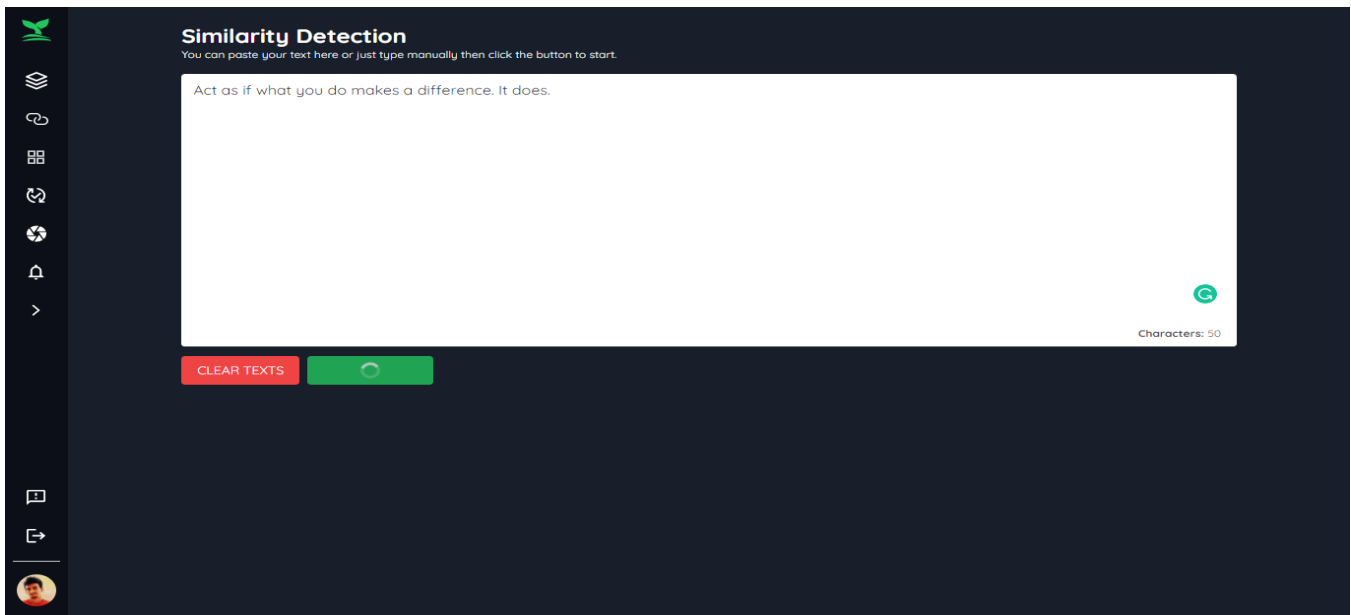


Fig. 19: Getting a response from RAPID API

It only takes up to 3 to 5 seconds to get response data from the API

- Tensor Flow's running time



Fig. 20: Running code to maintain object detection

The function runs for every 0.1 seconds to maintain the detection of every object shown in the examiner's camera.

V. CONCLUSION AND RECOMMENDATION

This chapter summarizes the findings, conclusions, and recommendations of a study that looked into the effectiveness of using Video Conference and Test Maker with Object and Person Recognition and Similarity Detection in an online class for teachers. The research was done entirely online. Teachers were chosen as the respondents.

A. CONCLUSIONS

The following conclusions were formed based on specified findings:

The study revealed that the platform that the teachers used in an online class may use some improvement. The application did not meet their expectations for teaching, causing the student to lose focus throughout class/exams. It is also not strict, which could encourage students to cheat.

The researcher concluded that teachers learned more about Video conferences and Test Maker with Object and Person Recognition and Similarity Detection. Students and teachers were given the opportunity to learn about and experience the system's great benefits. They also contribute to the researcher's improvement of the system by providing genuine evaluation.

B. RECOMMENDATIONS

The study revealed the effectiveness of Video Conference and Test Maker with Object and Person Recognition and Similarity Detection. As a result, the following suggestions were made,

- Teachers may support officials in establishing the Video Conference and Test Maker with Object and Person Recognition and Similarity Detection in place. Learners should use the framework to deepen their understanding.
- To maintain the same level of learning quality as the old curriculum, and administration must encourage the use of Video conferences and Test Maker with Object and Person Recognition and Similarity Detection.
- The research work should be done to see whether the outcomes can be achieved with a wider number of individuals.

ACKNOWLEDGEMENT

The proponents wish to extend our sincere gratitude to our school, the Asian Institute of Computer Studies for giving us an opportunity to take this subject.

The proponents would like to give our deepest appreciation to our panelists, Ms. Rodriguez, Ms. Michelle Placides, and especially our professor Ms. Hazel San Patalano, for guiding us throughout the research work. Their insightful feedback brought our research work to a higher level. It was an honor to study this research under their guidance.

To our teammates, I would like to acknowledge us for our hard work; especially, the proponents want to single out our project manager, thank you for the patience, moral support, and enthusiasm that you gave to make our research perfect. In addition, the proponents want to give thanks to our family and friends for their moral and financial support.

The proponents also want to express praise and thankfulness to God who gave us strength, knowledge as well as good health to complete our research work.

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