ROAD SAFETY AND TRAFFIC CONTROL SIGNS

By

Henry soopu(2022089049)

Ezinala Nyirongo (2022020821)

Eniya Tembo(2022079221)

Supervisor:

Dr. Lighton Phiri

A report submitted to the Department of Library and Information Science, The University of Zambia, in partial fulfilment of the requirements of the degree of Bachelor of Information and Communication Technologies with Education

THE UNIVERSITY OF ZAMBIA

LUSAKA

2026

Abstract

Road safety remains an important concern in Zambia, where the condition and visibility of road signs and road markings play a significant role in guiding road users. However, assessing these traffic controls through manual inspection can be time-consuming, particularly when analysing large amounts of road footage. This project aimed to develop a web-based system for analysing road signs and road markings from recorded road video footage using computer vision techniques. The specific objectives were to extract key frames from road videos, detect and classify visually identifiable road signs and markings, and develop a web interface for presenting the analysis results.

The system was developed using the Rapid Application Development (RAD) model, which supported iterative prototyping, testing, and refinement. Python and OpenCV were used for video processing and key-frame extraction, while the YOLOv8s object detection model was integrated to support traffic sign detection. Flask was used to develop the web application, with HTML, CSS, and JavaScript providing the user interface and SQLite supporting data storage. The system enabled users with appropriate access rights to upload and manage road videos, process footage, and view available analysis results through the web interface.

Testing using Nationalist Road video footage demonstrated that the system could extract 44 frames at five-second intervals. However, no qualifying stop-sign detections were recorded during that test. This result demonstrated the operation of the frame-extraction process but also highlighted limitations in the detection process and the need for further testing with additional videos and traffic sign classes. The project established a foundation for computer-assisted road infrastructure assessment by providing a structured approach to processing road footage and presenting analysis results. Nevertheless, the system was a prototype and did not replace physical road inspections or establish the actual condition of all traffic controls across Zambia. Further development and validation were required to improve detection accuracy, expand the range of detectable road signs and markings, and support analysis of larger video datasets.

Keywords: Road safety, computer vision, road signs, road markings, video analysis, key-frame extraction, YOLOv8s, Rapid Application Development.

Acknowledgements

First and foremost, we would like to thank Almighty God for granting us the strength, wisdom and perseverance to complete this project.

We would like to express our sincere gratitude to our project supervisor, Dr. Lighton Phiri, for his guidance, advice and constructive feedback throughout the development of this project. His support and recommendations contributed significantly to the successful completion of our work.

We also extend our appreciation to the University of Zambia, particularly the School of Education and the Department of Library and Information Science, for providing the academic environment and knowledge that supported the development of this project.

Furthermore, we are grateful to our families and friends for their encouragement, patience and support throughout our academic journey. Finally, we would like to thank everyone who contributed directly or indirectly to the successful completion of this project.

Thank you all for your support and encouragement.

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CHAPTER 1

1.1 Background of the Study

Road traffic control devices played an important role in guiding, warning and informing road users and in promoting safe movement on public roads. These devices included traffic signs, road markings and traffic signals, which provided information about road conditions, restrictions, directions, hazards and required driver behaviour. When these control devices were poorly maintained, unclear or absent, road users could experience difficulties in interpreting road conditions and responding appropriately. Previous research demonstrated the importance of the condition and visibility of traffic control devices to road safety. Ferko et al. (for example, found a positive correlation between the number of traffic signs with unsatisfactory quality and the frequency of road traffic accidents under reduced-visibility conditions. [1], [2]

Road markings also constituted an important component of the road traffic control system. They were used to define lanes, indicate pedestrian crossings, communicate road instructions and guide vehicles along the road. [3] reviewed studies concerning the effect of road markings on driver behaviour and road safety and found that road markings influenced aspects such as vehicle lateral position, speed and compliance. The review further indicated that the maintenance and visibility of road markings were important factors in road safety. [4]

The road safety situation in Zambia demonstrated the importance of improving the identification and monitoring of road traffic control devices. The United Nations Development Programme (UNDP) Road Safety Investment Case reported that road traffic accidents cost the Zambian economy approximately ZMW 16.7 billion annually, representing about 4.7% of the country's Gross Domestic Product (GDP). The same investment case reported that more than 2,100 Zambians died from road traffic accidents in 2021[5]. These figures demonstrated the wider social and economic significance of road safety and the need for improved approaches to identifying road safety infrastructure deficiencies.

In Zambia, road users were guided by national road traffic legislation and the Zambian Highway Code. The Highway Code provided guidance on road traffic signs, markings, signals and appropriate behaviour for different road users. The Road Transport and Safety Agency (RTSA) provided the Zambian Highway Code and other road safety materials to support road safety education and compliance[6].

Despite the importance of these devices, assessing their condition and presence across a large road network could be difficult when the assessment depended entirely on manual inspection. Manual inspection of long road sections required substantial time and human effort and could also make it difficult to maintain consistent records of observed road conditions. The availability of recorded road footage provided an opportunity to use image processing and computer vision techniques to support this assessment.

The project therefore developed a web-based system for analysing recorded road footage to identify and document traffic control devices. The system accepted uploaded road videos,

extracted selected frames from continuous driving footage and analysed the extracted images for traffic signs and road markings. Computer vision models and image-processing techniques were incorporated into the system to support the automatic identification and classification of relevant road-control features. The resulting information was stored and presented through a web interface to support easier visualisation and review of road safety infrastructure.

The project focused on analysing recorded road footage rather than controlling traffic signals or automatically operating road intersections. The system was intended to support the assessment of existing road infrastructure by providing an organised method for processing road footage and presenting detected road-control devices.

The project uses Python, Flask, OpenCV, HTML, CSS and JavaScript to develop the web application. An existing YOLOv8s object detection model is integrated through OpenCV to demonstrate traffic sign detection from extracted video frames. The system also includes user authentication and role-based access, allowing administrators and analysts to perform authorised activities while public users can access selected road safety information and results.

1.2 Statement of the Problem

Road traffic signs and road markings are an important component of road safety infrastructure, but their presence, visibility and condition are not always easy to assess consistently across large road networks. Manual assessment requires inspectors to physically examine road sections or review large quantities of recorded footage. This process is time-consuming and can make it difficult to maintain a centralised record of identified traffic-control devices. [1]

In Zambia, the significance of road safety infrastructure is reinforced by the reported economic and social cost of road traffic accidents. The UNDP investment case estimated that road traffic accidents imposed an annual economic burden of ZMW 16.7 billion, equivalent to 4.7% of GDP[5] . The problem addressed by this project is therefore the lack of a simple computer-based approach for analysing recorded road footage and systematically identifying selected traffic signs and road markings.

1.3 Aim of the Study

The aim of the project was to develop a web-based road safety analysis system that uses video processing, computer vision and image analysis techniques to identify and document traffic signs and road markings from recorded road footage in Zambia.

1.4 Objectives of the Study

The objectives of the study are to:

1. To implement video processing techniques for key frame extraction to isolate reference images from continuous driving footage.

2. To apply computer vision and image analysis models to automatically detect and classify the presence and clarity of road markings and traffic signs.
3. To design and develop a simple, end-user web application to visualise the findings and highlight relative infrastructural gaps associated with road control devices across sampled Zambian roads.

1.5 Research Questions

The study seeks to answer the following questions:

1. How can video processing techniques be used to extract key frames from continuous road video footage?
2. How can computer vision and image analysis models be used to detect and classify the presence and clarity of road markings and traffic signs?
3. How can a simple web-based interface be designed and developed to visualise and present the results of the traffic-control analysis?

1.6 Significance of the Study

The study is significant because it demonstrated how information and communication technologies can be applied to a practical road-safety problem in Zambia. A video-based analysis system can reduce some of the manual work involved in reviewing long road corridors by allowing recorded footage to be processed systematically.

The system can also be useful to road authorities and other organisations involved in road maintenance and safety. Instead of relying only on individual observations, authorised users can use analysed footage to identify locations where signs or markings required closer inspection.

The project also provides an example of how computer vision, artificial intelligence, video processing and web technologies can be combined to address a practical problem. It can therefore provide a useful foundation for students and researchers interested in computer vision, road safety and intelligent transportation systems.

1.7 Scope of the Study

The study focused on the analysis of recorded or archived road video footage from Zambian roadways. Major roads such as the Great East Road were used as examples of road environments in Zambia. The system was designed to work with suitable recorded road footage rather than being limited to one specific road.

The system focused on road signs and road markings that could be identified visually from the available footage. The project covered video frame extraction, computer-vision-based

detection and classification, presentation of detection results and a web interface for viewing the findings.

1.8 Limitations of the Study

The main limitation was the availability and quality of suitable road footage. Detection performance could be affected by low-resolution video, poor lighting, rain, dust, camera movement, occlusion and objects appearing too far from the camera.

Another limitation was that existing computer-vision models might not recognise every type of Zambian road sign or road-marking pattern accurately if the relevant classes were not sufficiently represented during model training.

Road marking analysis also requires further development and validation using specialised models and larger datasets. In addition, the accuracy of computer vision detection can be affected by video quality, lighting, camera angle, distance from the traffic control and other environmental conditions.

1.9 Organisation of the Report

This report is organised into five chapters. Chapter One introduces the study by presenting the background, problem statement, aim, objectives, research questions, significance, scope and limitations. Chapter Two presents related work on road safety, road signs, road markings, video analysis and computer vision. Chapter Three explains the methodology and system development process. Chapter Four presents the results and discussion of the developed system and testing activities. Chapter Five provides the summary, conclusion, recommendations and areas for future work.

CHAPTER 2

2. Related Work

2.1 Introduction

Traffic control devices are widely used to communicate information to road users. Traffic signs provide warnings, restrictions, prohibitions and instructions, while road markings provide visual guidance concerning lanes, road boundaries, pedestrian crossings and other road conditions.

[2]investigated the relationship between traffic-sign quality and road traffic accidents. Their study analysed traffic accidents and traffic-sign quality on 130 state roads in Croatia between 2013 and 2015. The study reported a positive correlation between accidents under reduced-visibility conditions and traffic signs that did not meet required retroreflectivity levels. This finding demonstrated that the physical and visual quality of traffic signs could be an important factor in road safety.

[7] conducted a systematic review of 71 studies concerning road markings and their effect on driver behaviour and road safety. Their review examined issues including marking width, configuration, visibility, retroreflectivity and maintenance. The findings indicated that road markings influenced driver behaviour and could contribute to road safety when they were appropriately designed and maintained. These studies provided a basis for including both traffic signs and road markings in the proposed analysis system.

2.2 Traffic Sign Detection

Traffic sign detection and recognition had been investigated using several computer vision approaches. [8] reviewed traffic sign detection and classification methods and categorised approaches into colour-based, shape-based and learning-based techniques, including deep learning. They explained that detection focused on locating regions containing traffic signs before classification was performed.

Earlier approaches often depended on colour segmentation and shape analysis. [8] work demonstrated that these approaches could identify traffic signs based on visual characteristics, but the increasing use of machine learning and deep learning provided alternative approaches for detecting signs under more complex conditions.

[9] developed a multi-scale traffic-sign detection method based on an improved YOLOv4 model. Their approach incorporated preprocessing and improved feature-pyramid mechanisms to improve the detection of traffic signs at different scales and under complex environmental conditions. Their experiments used the Tsinghua-Tencent 100K dataset together with a collected dataset and reported an mAP of 81.78%.

[10] investigated Indian traffic-sign detection and recognition using a deep-learning approach based on a refined Mask R-CNN architecture. Their dataset contained 6,480 images and 7,056 traffic-sign instances grouped into 87 categories. Their proposed model achieved a reported precision of 97.08%, demonstrating the potential of deep-learning approaches for automated traffic-sign recognition.

The reviewed studies demonstrated that computer vision and deep-learning methods could be applied to traffic-sign detection. However, many of the existing models were developed using datasets from countries with road-sign systems and environmental conditions different from those found in Zambia. Therefore, the project integrated an existing YOLOv8 traffic-sign model as a practical case for analysing road footage while recognising that its performance on Zambian road footage required empirical validation.

2.3 Road Marking Detection

Road markings represented another important component of road traffic control. They included lane markings, pedestrian crossings and directional or symbolic markings. [11] showed that markings affected driver behaviour, particularly through their influence on vehicle positioning, speed and road guidance. Their review also highlighted the importance of marking visibility and maintenance.

In the developed system, road-marking analysis was incorporated alongside traffic-sign analysis. The implemented approach processed road frames and examined visible road-marking features. This allowed the system to consider both vertical traffic-control devices, such as signs, and horizontal road-control features, such as lane and pedestrian-crossing markings.

2.4 Object Detection Models

The Object detection identified both the class of an object and its location within an image. The YOLO approach was one of the well-known object-detection approaches. [12] described YOLO as a unified real-time object-detection system that predicted bounding boxes and class probabilities from an image in a single evaluation.

The speed of YOLO-style detection made the approach suitable for applications involving large numbers of images or video frames. However, the model still needed to be appropriate for the target classes.

A model trained mainly on general objects might not reliably detect specialised road signs or local road-marking categories without suitable training or fine-tuning.

2.5 Research Gap

The reviewed literature demonstrated significant progress in automated traffic-sign and road-marking detection. However, many studies focused on individual computer vision models, specific datasets or particular national road environments. The project addressed a different practical requirement by integrating video processing, computer vision and a web-based interface into one system for analysing recorded road footage.

The developed system therefore combined three stages: extraction of useful frames from continuous driving footage, automated analysis of traffic-control features, and web-based presentation of the

findings. This integration provided a practical basis for reviewing road-control infrastructure from recorded footage rather than treating object detection as an isolated computer vision task.

The project also provided a foundation for future expansion using larger local datasets and more specialised models.

CHAPTER 3

3. Methodology

3.1 Introduction

This chapter presented the methodology used to develop the system. It described the research design, data source, system development approach, technologies and implementation process used to achieve the three objectives of the study. The system analysed archived road video footage, extracted key frames, applied computer-vision models to identify traffic signs and road markings, and presented the analysis through a web application.

3.2 Research Design

The study used an applied research design with a developmental approach. The applied research design was appropriate because the project addressed a practical road-safety problem through the use of information and communication technologies.

The developmental approach was used because the main output of the study was a functional software system. The system was developed, tested and improved during the project.

3.3 Data source

The primary data consisted of recorded and archived road video footage. The footage represented road environments in Zambia and provided the visual information required for frame extraction and computer-vision analysis.

Roads such as the Great East Road were used as examples of major Zambian road environments. The system was not restricted to the Great East Road and was designed to accommodate suitable recorded road footage from other locations.

The video footage was processed as a sequence of images. Selected frames were extracted and used as input for the computer-vision analysis.

3.4 System development approach

The Rapid Application Development (RAD) model was used as the software development approach for the project.

RAD was selected because it supported rapid development of software through prototyping, user feedback, repeated refinement and early testing. This was appropriate for the project because the system contained several components that needed to be developed and integrated, including video processing, computer-vision analysis, database functionality and a web interface.

The use of RAD allowed the system requirements and interface to be refined as development progressed. Working versions of system components were produced and tested before the complete system was integrated.

3.5 Rapid application development model

3.5.1 Requirements Planning

During requirements planning, the main requirements of the road-safety analysis system were identified. These included video input, key-frame extraction, computer-vision detection, result presentation and web-based access.

The requirements were based on the project objectives and the intended users of the system.

3.5.2 User Design

During the user-design stage, the structure and appearance of the system were designed. The web interface, system workflow and interaction between the major components were considered.

Prototypes of the interface were developed and refined to make the system simple and understandable.

3.5.3 Construction

During construction, the system components were implemented. Python and OpenCV were used for video processing, computer-vision models were integrated for traffic-control analysis and Flask, HTML, CSS and JavaScript were used to implement the web application.The database and supporting system functions were also implemented during this stage.

3.5.4 Cutover

During the cutover stage, the completed components were integrated and tested as one system. Video processing, computer-vision analysis and web presentation were connected so that the complete workflow could be executed. The final system was then tested using suitable road-video input.

3.5.5 Computer-Vision Analysis

Existing computer-vision and image-analysis models were integrated into the system for the detection and classification of road signs and road markings.

The models were used to identify supported traffic-control objects and provide information about their detected classes and visual presence.

Examples of traffic signs included speed-limit signs, stop signs and warning signs, depending on the classes supported by the selected model. Road-marking analysis included visible features such as lane lines and pedestrian crossings.

The computer-vision component was connected to the Flask backend so that the results could be processed and displayed through the web interface.

3.6 System Features and Implementation

The developed system contained three major functional areas corresponding to the three objectives.

3.6.1 Video Frame Extraction

Video-processing techniques were implemented to extract key frames from continuous driving footage.

Python and OpenCV were used to read video files and sample frames at selected intervals. The extracted frames provided clear reference images for subsequent analysis.

Frame extraction reduced unnecessary processing because it prevented every individual video frame from being processed by the computer-vision model.

3.6.2 Web-Based Interface

A simple web-based interface was designed and developed to visualise and present the results of the traffic-control analysis.

The interface allowed authorised users to interact with the road-video analysis functions and review the generated results.

Flask was used as the backend framework, while HTML, CSS and JavaScript were used to create the web interface.

The interface presented processed information in a form that was easier to understand than raw computer-vision output.

3.6 System Testing

Testing was carried out throughout the development of the three features. The frame-extraction component will be tested to determine whether it produces useful and clear frames from the road footage. The computer vision models will be tested using selected road images to determine whether traffic signs and road markings are detected and classified correctly. The web interface will also be tested to ensure that the analysis results are displayed correctly and that the different components of the system communicate properly.The testing process helped identify problems in the system and

allow corrections to be made before the final system was presented. The final evaluation focused on whether the system successfully processes road footage, identifies relevant traffic-control features and presents the findings through the web interface.

CHAPTER 4

4. Results and Discussion

4.1 Introduction

This chapter presents the results obtained from the development and testing of the Road Safety in Zambia web-based system. The system was developed to support the analysis of road traffic controls, particularly road signs, road markings and recorded road video footage. The results presented in this chapter are based on the first working version of the system and the practical tests conducted using recorded road video footage.

The chapter discusses the implementation of the system, video frame extraction, traffic sign detection, road marking analysis, web interface, user access levels and system testing. The results are also discussed in relation to the objectives of the study, including the ability of the system to process road footage and provide a platform for road-safety analysis.

4.2 System Implementation

The Road Safety in Zambia system was successfully developed as a web-based application using Python and the Flask framework. The system provides a platform through which authorised users can manage and analyse recorded road video footage. Information about users, videos and extracted frames is stored using a database.

The system was developed with different levels of access to support different users. The main users are the Administrator and Analyst, while members of the public can access selected information through the public-facing website. The Administrator has additional privileges for managing users and system data, while the Analyst focuses mainly on accessing and analysing available road-safety information.

The system also includes authentication and password protection. Users with authorised accounts can log in before accessing protected functions. This provides basic security and prevents unauthorised users from accessing administrative functions.

Figure 4.1: User access structure of the Road Safety in Zambia system

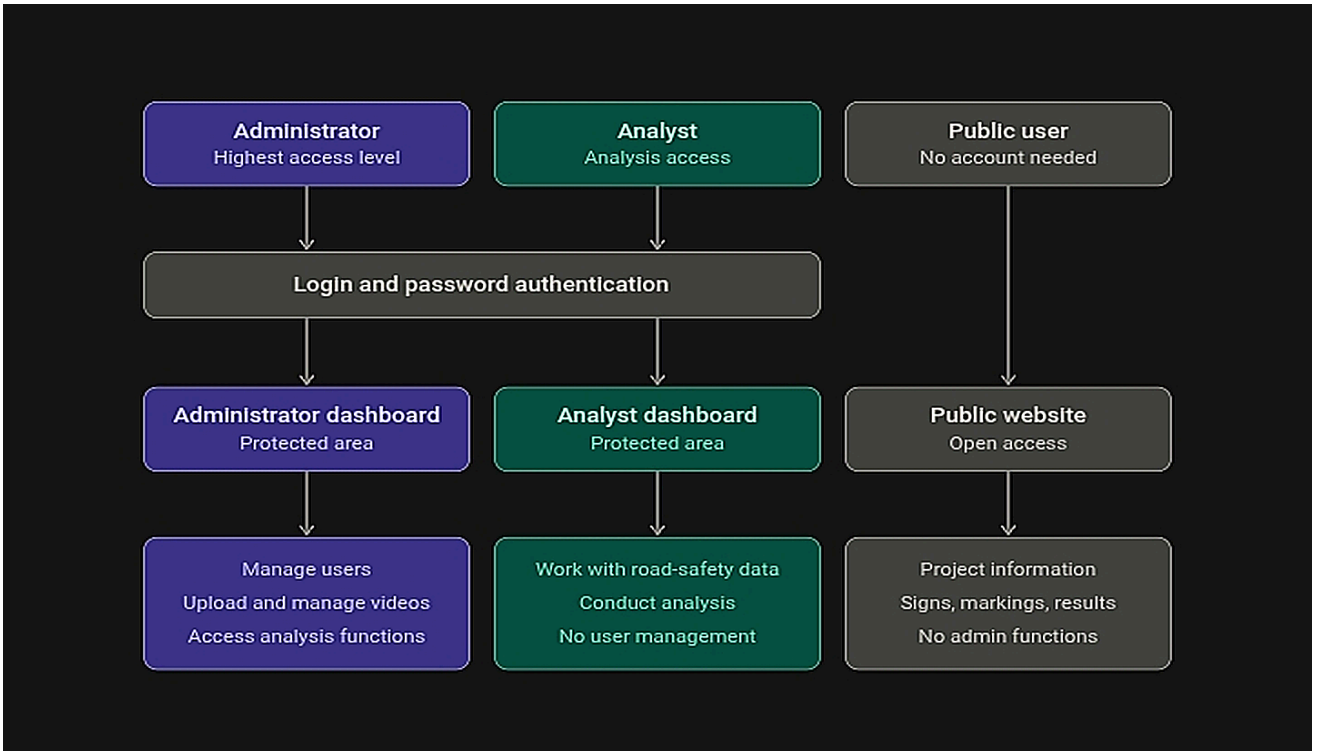


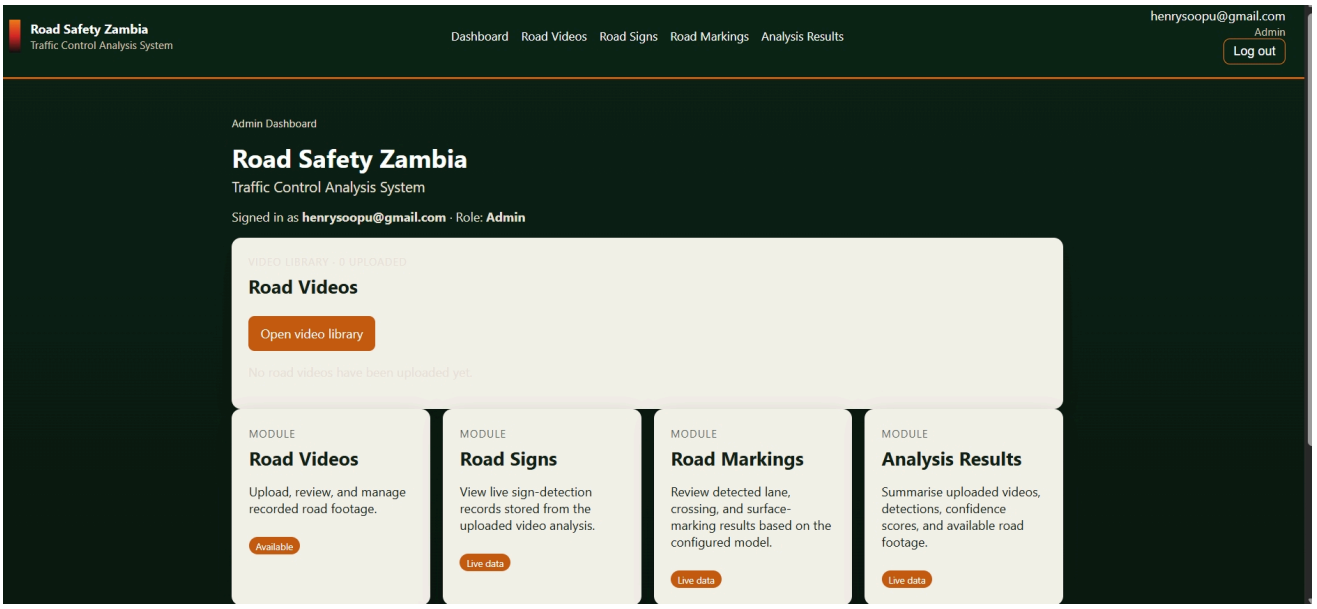
Figure 4.1 shows the different categories of users and their interaction with the system. The Administrator has the highest level of access and can manage users and road video data. The Analyst has access to analysis-related functions but does not have the same administrative privileges. Public users can access information made available through the public section of the website.

4.3 Administrator and Analyst Dashboards

The system provided separate dashboards for the Administrator and Analyst. This was implemented to ensure that users only access functions that are relevant to their responsibilities.

The Administrator dashboard provides access to management functions such as user management, video management and analysis functions.

Figure 4.2: Administrator dashboard



The Administrator dashboard provides a central location for managing the system. From this dashboard, the Administrator can manage authorised users, upload road videos, view uploaded footage and access available analysis functions.

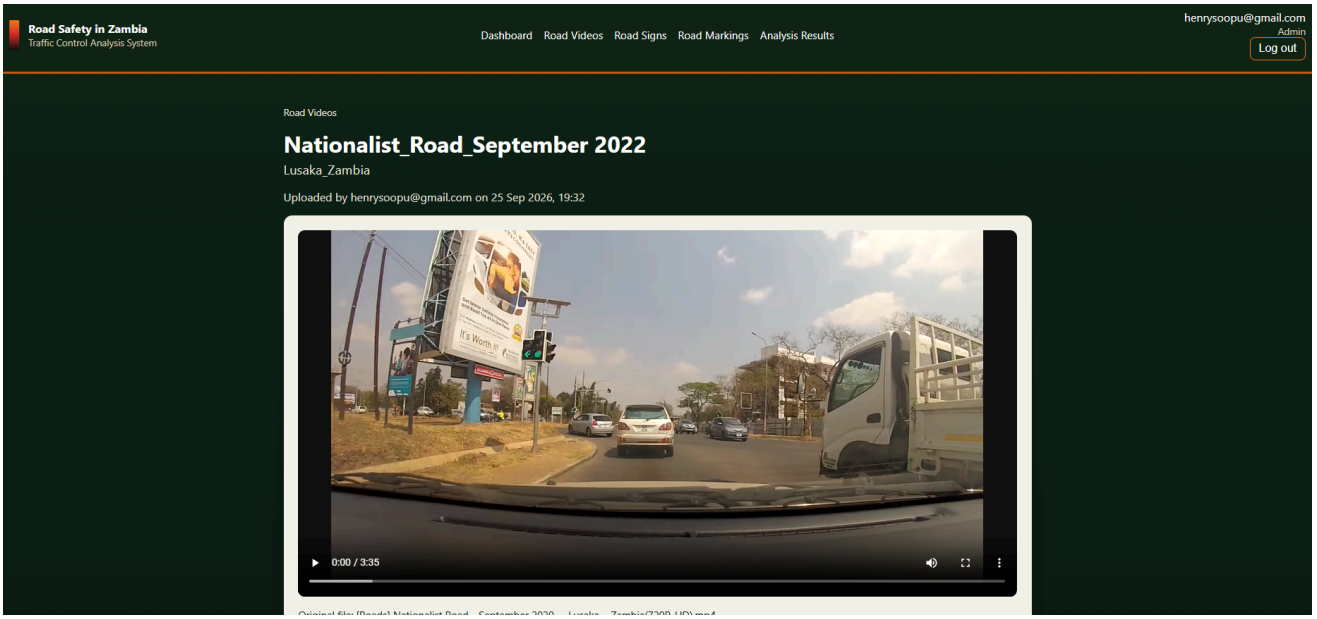
The Analyst dashboard provides access to functions required for working with road-safety data and conducting analysis.

4.4 Video Upload and Management Results

The video management component was implemented to allow authorised users to upload recorded road footage into the system. During testing, a recorded video of Nationalist Road in Lusaka was uploaded successfully.

The uploaded video was given the title **"Nationalist_Road_September 2022"** and was stored together with information such as its location, description, upload date and the user who uploaded it.

Figure 4.4: Uploaded Nationalist Road video



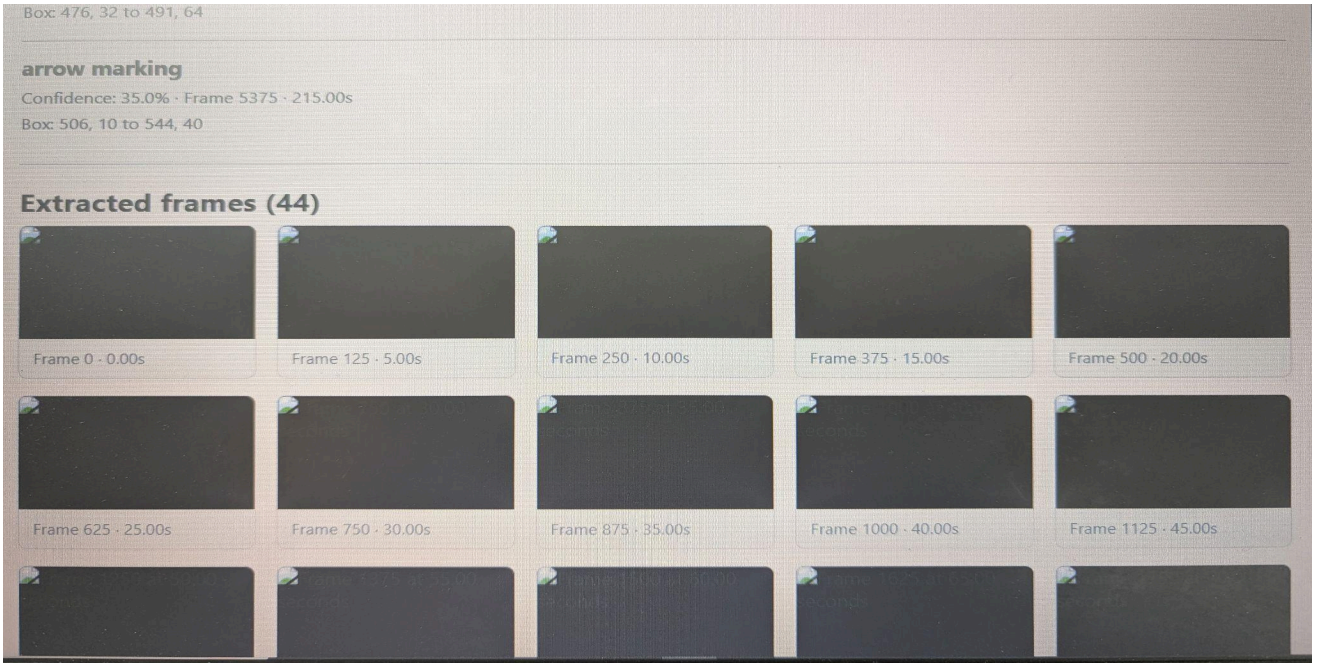
The system also provides an option to view and play the uploaded video. This demonstrates that the video management component can be used as the starting point for the analysis process.

4.5 Video Frame Extraction Results

Video frame extraction was successfully implemented and tested using the Nationalist Road video. The original video contained approximately 5,376 frames and was recorded at 25 frames per second with a resolution of 1280 × 720 pixels.

The system was configured to extract one frame at a five-second interval instead of processing every frame in the video. As a result, 44 frames were extracted from the video.

Figure 4.5: Video frame extraction results



The extracted frames were stored and associated with the original video. This demonstrates that the system can convert recorded road footage into smaller sets of images that can be used as inputs for computer-vision analysis.

The use of selected frames also reduces the amount of data that needs to be processed. This is useful when analysing long road videos because processing every frame can require significant computational resources.

4.6 Traffic Sign Detection Results

Traffic sign detection was implemented using an existing YOLOv8s object-detection model in ONNX format through OpenCV's Deep Neural Network module. The model was integrated into the system to analyse extracted frames for traffic signs supported by the model.

During testing, all 44 extracted frames from the Nationalist Road video were processed. The system recorded **zero qualifying stop-sign detections** from the analysed frames.

4.7 Road Marking Analysis Results

Road marking analysis was included as one of the major components of the Road Safety in Zambia system. The system provides a dedicated area for road-marking information and analysis.

Figure 4.7: Road marking analysis interface

Insert screenshot of the Road Markings page

In the first version of the system, the road-marking component was established within the web application; however, a specialised road-marking detection model was not fully implemented and validated. Therefore, numerical road-marking detection results are not presented.

This limitation provides an opportunity for future development. A specialised computer-vision model can be trained and integrated to identify road markings such as lane lines, edge lines and other traffic-control markings.

4.8 Public Website Results

A public-facing section was also implemented as part of the system. The public website allows users to access general project information and available road-safety information without creating an account.

Figure 4.8: Public-facing Road Safety in Zambia website



The public interface provides access to sections such as Road Signs, Road Markings, Analysis Results and About. This makes it possible for the developed system to provide information to members of the public while keeping administrative functions protected.

4.9 System Testing Results

The developed system was tested to determine whether the major components performed their intended functions. Testing covered user authentication, role-based access, video uploading, video playback, frame extraction and traffic-sign analysis.

The authentication system successfully restricted protected pages to authorised users. The Administrator account was able to access administrative functions, while different user roles were provided with different levels of access.

The video-upload function was successfully tested using the Nationalist Road footage. The video was uploaded and could be played through the system.

The frame-extraction function successfully extracted 44 frames from the selected video using a five-second interval. The extracted frames were stored and associated with the corresponding video.

The traffic-sign analysis process also executed successfully on the extracted frames. Although no qualifying stop-sign detections were produced, the detection pipeline was operational.

Table 4.10 Summary of system testing

Test	Expected results	Actual results	Status
User login	Authorised user logs in	Login successful	Passed
Role access	Users receive appropriate access	Role-based access implemented	Passed
Video upload	Video stored in system	Nationalist Road video uploaded	Passed
Video playback	Uploaded video can be viewed	Video played successfully	Passed
Frame extraction	Selected frames extracted	44 frames extracted	Passed
Traffic-sign analysis	Frames processed by model	44 frames processed	Passed
Stop-sign detection	Supported signs detected	0 qualifying detections	Complete
Road-marking detection	Road markings analysed	Specialised model not yet validated	Incomplete

The testing results show that the main foundation of the system is functional. However, additional testing using more road videos and a wider range of road signs and markings is required.

4.11 Discussion of Results

The results demonstrate that the developed system provides a working foundation for web-based road-safety analysis. The successful implementation of authentication, role-based access, video management and frame extraction shows that the system can bring several road-safety analysis activities together within one platform.

The frame extraction results demonstrate the usefulness of processing selected frames rather than the entire video. In the test conducted, approximately 5,376 original frames were reduced to 44 extracted frames using a five-second interval. This reduces the amount of data that needs to be processed and provides a practical input for computer-vision analysis.

The traffic-sign detection results demonstrate both the usefulness and limitations of integrating an existing object-detection model. The system was able to process the extracted frames using YOLOv8 s through OpenCV. However, zero qualifying stop-sign detections were obtained. This result highlights the importance of using a model that is appropriate for the local road environment. A model trained using Zambian road-sign data would be able to provide broader coverage of the signs found on Zambian roads.

The separation of Administrator and Analyst dashboards also demonstrates that the system supports different responsibilities. The Administrator can perform management activities, while the Analyst can concentrate on road-safety analysis. Public users are separated from protected system functions and can access information provided through the public interface.

Overall, the results indicate that the project has achieved the development of a functional first version of the proposed road-safety analysis platform. However, the system should currently be considered a prototype and decision-support tool rather than a complete replacement for professional road-safety inspections.

Further development is required to expand traffic-sign detection, implement and validate specialised road-marking detection, test the system using a larger collection of road videos and improve the production storage environment. These improvements would increase the usefulness of the system for large-scale road-safety analysis.

CHAPTER 5

5. Conclusion

The study successfully developed a web-based road safety analysis system for analysing road signs, road markings and recorded road video footage in Zambia. The system provides a structured platform where authorised users can upload road videos, extract frames and apply computer vision techniques to support the identification and assessment of traffic controls. The system also provides different levels of access for administrators, analysts and public users, making it possible to separate management and analysis functions from public information.

The implementation demonstrated that video frame extraction and traffic sign detection can be integrated into a web-based road safety system. In the test conducted using the Nationalist Road video, 44 frames were extracted at a five-second interval and processed using the YOLOv8s model through OpenCV. No qualifying stop-sign detections were recorded in the sampled frames. However, this result does not mean that the road contained no traffic signs because the detection model used in the study has limited traffic-sign classes and was not specifically trained for all Zambian road signs.

Overall, the developed system provides a useful foundation for large-scale analysis and reporting of road traffic controls. It demonstrates how web technologies and existing computer vision models can be combined to support road safety assessment. Further development is required to improve the detection of different Zambian traffic signs, complete the specialised road-marking analysis, increase the number of road videos tested and improve the system's production storage and analysis capabilities.

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