UNIVERSITY OF BOHOL
College of Engineering, Technology, Architecture, and Fine Arts
DR. CECILIO PUTONG ST., TAGBILARAN CITY

Second Semester

FACIAL DROWSINESS RECOGNITION: MACHINE VISION

In Partial Fulfillment of the Requirements for CPEP 324 course

Submitted to:

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TABLE OF CONTENTS

FINALS

INTRODUCTION

Computer Vision is a rapidly evolving subfield in Artificial Intelligence (AI) that focuses on machines to interpret and understand visual information from the world, similar to human vision. By leveraging advanced algorithms, it brought us the new learning that computer vision is more than just an application, it produced a more purposeful material, computer vision systems analyze images and even videos to extract insightful patterns. This technology has become increasingly relevant as the volume visual data generated daily continues to grow exponentially, necessitating automated methods to process and interpret such data efficiently. The ability of machines to "see" and comprehend visual inputs has profound implications across numerous sectors, including healthcare, autonomous driving, security, and manufacturing.

The fundamental purpose of computer vision applications is to replicate human visual perception to enhance making and automate tasks that require visual cognition. For example, in the road sector, computer vision supports and aids in detecting drivers who are sleepy while driving, thus making it more effective for automation in detection. This application aims to improve accuracy, reduce human errors, and increase operational efficiency. The objective is to develop systems that can detect, classify, and respond to visual cues in real time, thereby enabling proactive and intelligent responses to dynamic environments. This technological advancement not only augments human capabilities but also opens new possibilities for innovation and safety in everyday life.

My working application is entitled Facial Drowsiness Recognition exemplifies the practical and critical use of computer vision in enhancing public safety in roads. By analyzing facial features such as eye closure, blinking rate, and yawning, this system detects signs of driver fatigue, a leading cause of road accidents worldwide. The objective is to create a reliable, real-time monitoring tool that alerts drivers before drowsiness impairs their ability to operate a vehicle safely. This application highlights how computer vision can be harnessed to address real-world challenges by providing timely interventions that protect lives. Ultimately, it demonstrates the transformative potential of computer vision technology in creating smarter, safer environments.

FACIAL DROWSINESS RECOGNITION

PROBLEM REQUIREMENTS

The following requirements are for this project to obtain a successful application and design of the project:

- **Real-Time Detection:**
  The system must be capable of processing live video feeds and detecting drowsiness in real time to ensure timely alerts and interventions.
- **Accurate Facial Feature Detection:**
  The system must reliably detect and track key facial landmarks (such as eyes and mouth) under various lighting conditions and with different facial orientations.
- **Robustness to Occlusions:**
  The system must maintain detection accuracy even when the driver is wearing glasses, hats, or face masks, or when parts of the face are temporarily obscured.
- **Low False Alarm Rate:**
  The system must minimize false positives and negatives to avoid unnecessary distractions or missed warnings, maintaining a high level of trust and usability.
- **Non-Intrusive Monitoring:**
  The system should operate using standard in-vehicle cameras without requiring the driver to wear special equipment or modify their behavior.
- **User Alert Mechanism:**
  The system must provide clear and immediate alerts (such as visual or auditory signals) when drowsiness is detected, ensuring the driver's attention is regained promptly.

SCOPE AND LIMITATIONS

The Facial Drowsiness Recognition system uses computer vision to monitor eye movements for signs of driver fatigue, providing real-time alerts without intrusive devices. It works under various lighting conditions and minor obstructions like glasses, but may be less accurate with poor lighting, extreme head

movements, or heavy facial coverings. The system can also misread normal expressions as drowsiness, and its accuracy may vary across different users. Despite these limitations, it offers a practical solution to improve driver safety.

ANALYSIS

The Facial Drowsiness Recognition system receives real-time video input from a camera focused on the driver's face, analyzing key facial landmarks such as the eyes and mouth to detect signs of fatigue like prolonged eye closure and yawning. Using advanced computer vision algorithms, the system continuously processes this visual data to assess the driver's alertness without requiring manual interaction or wearable devices. When drowsiness is detected, the system generates immediate alerts, such as visual warnings—to prompt the driver to take necessary action and prevent accidents. This non-intrusive, real-time monitoring ensures continuous safety by providing timely notifications based on objective facial behavior analysis.

DESIGN AND IMPLEMENTATION

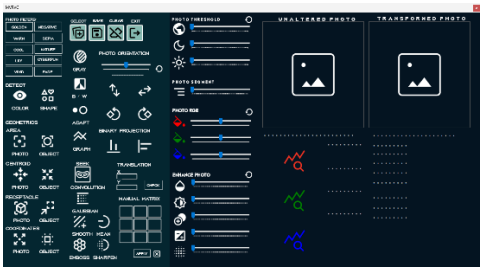

Figure 1.1: Main UI form

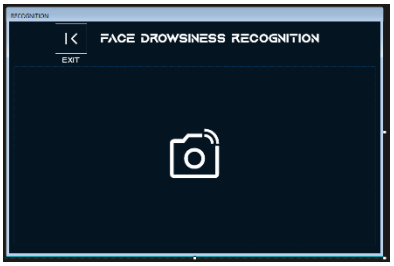

Figure 1.2: Facial Recognition UI

TESTING AND DEBUGGING

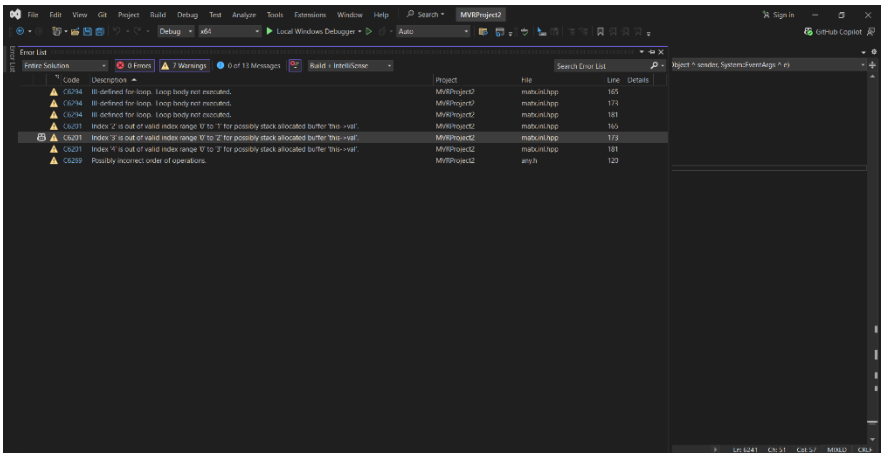

Figure 1.3: C++ code error list

FUTURE DEVELOPMENT

Future developments in Facial Drowsiness Recognition should focus on improving accuracy using advanced deep learning models and integrating multimodal data like head movements for better detection. Enhancing robustness in varied lighting and occlusion conditions and adapting to diverse driver demographics are essential. Integration with smart vehicle systems could enable automatic safety responses, while personalized, continuous learning would tailor alerts to individual drivers, making the system more reliable and user-friendly.

STUDENT INFORMATION

CURRICULUM VITAE

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https://bit.ly/4kq6Efq

"If it is to be, it is up to me."

PROFILE

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EDUCATIONAL BACKGROUND:

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PROJECTS:

Final Project	:	FACIAL DROWSINESS RECOGNITION
Project Link	:	**https://bit.ly/4jkWN9U**