



Faculty of Electrical and Electronic Engineering Technology



**DEVELOPMENT OF A WILDLIFE SIGHTING REPORT AND
ALERT SYSTEM USING COMPUTER VISION**

MUHAMMAD SYAFIQ BIN MOHD NADZRI

Bachelor of Computer Engineering Technology (Computer Systems) with Honours

2021

**DEVELOPMENT OF A WILDLIFE SIGHTING REPORT AND ALERT SYSTEM
USING COMPUTER VISION**

MUHAMMAD SYAFIQ BIN MOHD NADZRI

**A project report submitted
in partial fulfillment of the requirements for the degree of
Bachelor of Computer Engineering Technology (Computer Systems) with Honours**



Faculty of Electrical and Electronic Engineering Technology

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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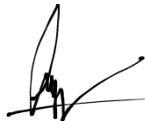
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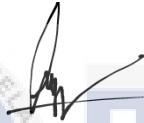
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I declare that this project report entitled “Development of a wildlife Sighting Report and Alert System Using Computer Vision “ is the result of my own research except as cited in the references. The project report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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I hereby declare that I have checked this project report and in my opinion, this project report is adequate in terms of scope and quality for the award of the degree of Bachelor of Computer Engineering Technology (Computer Systems) with Honours.

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DEDICATION

*To my beloved mother, AZLIN BINTI PILUS, and father, MOHD NADZRI BIN ABDUL
LATIFF,*

My family,

*(Nurin Adrina Binti Mohd Nadzri, Muhammad Haiqal Bin Mohd Nadzri, Muhammad
Haziq Bin Mohd Nadzri and Muhammad Aqil Bin Mohd Nadzri*



ABSTRACT

The incident of wildlife entry on the public places is increasing nowadays. This is because animals require migration from place to place between specific causes. Therefore, this project allows us to overcome this problem. This project is called the Development of a wildlife sighting report and alert system using computer vision. This project will monitor wildlife activities if they are found around the scene. This project uses a system called Tensorflow which serves to store pictures of the physical characteristics of the wild animals and compare them with the current pictures captured. When recognition is detectable, the system will warn people near the scene by sending messages to their smartphone and another warning system will execute at the scene which is an alarm light with sound warning will be turned on. In this report, the list all of the software and hardware requirements have been clarified. This project able to recognize three types of wildlife which is wildboar, tiger and elephant with the accuracy of more than 50% on each condition. Raspberry pi 4 modules also have been explored in terms of using python, opencv and GPIO pin.

ABSTRAK

Insiden kemasukan hidupan liar di tempat awam semakin meningkat pada masa kini. Ini kerana haiwan memerlukan penghijrahan dari satu tempat ke satu tempat antara punca tertentu. Oleh itu, projek ini membolehkan kami mengatasi masalah ini. Projek ini dipanggil Pembangunan laporan melihat hidupan liar dan sistem amaran menggunakan penglihatan komputer. Projek ini akan memantau aktiviti hidupan liar jika ia ditemui di sekitar tempat kejadian. Projek ini menggunakan sistem yang dipanggil Tensorflow yang berfungsi untuk menyimpan gambar ciri fizikal haiwan liar dan membandingkannya dengan gambar semasa yang ditangkap. Apabila pengesanan dapat dikesan, sistem akan memberi amaran kepada orang yang berdekatan dengan tempat kejadian dengan menghantar mesej ke telefon pintar mereka dan sistem amaran lain akan dilaksanakan di tempat kejadian iaitu lampu penggera dengan amaran bunyi akan dihidupkan. Dalam laporan ini, senarai semua keperluan perisian dan perkakasan telah dijelaskan. Projek ini mampu mengenali tiga jenis hidupan liar iaitu babi hutan, harimau dan gajah dengan ketepatan lebih 50% pada setiap keadaan. Modul Raspberry pi 4 juga telah diterokai dari segi penggunaan python, opencv dan pin GPIO.

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LIST OF SYMBOLS

Σ - Summation



LIST OF ABBREVIATIONS

V	- Voltage
MHz	- Mega Hertz
MPPT	- Maximum power point tracker
DET	- Detection Error Trade-off
FPPW	- False Rate Positives per Window
UAV	- Unmanned Aerial Vehicle
GPS	- Global Positioning System
GUI	- Graphical User Interface
GCS	- Glasgow Coma Scale
RCNN	- Region Based Convolutional Neural Networks
ROI	- Regions of Interest
RPN	- Risk Priority Number
NMS	- Non-maximum Suppression
AP	- Average Precision
WTB	- Where's The Bear
IoT	- Internet of Things
TDP	- Thermal Design Power
UPS	- Uninterrupted Power Source
OCR	- Optical Character Recognition
YOLO	- You Only Look Once
SSD	- Single Shot Detector
LED	- Light Emitted Diode
MOSFET	- Metal–Oxide–Semiconductor Field-Effect Transistor
GPIO	- General Purpose Input/Output
V2	- Version 2
WMSN	- Wireless Multimedia Sensor Networks
LR-WPAN	- Low-Rate Wireless Personal Area Network
CR	- Color Retention Rate
TPR	- True-Positive Rate
TNR	- True-Negative Rate
FoV	- View of the Camera
CSRT	- Channel and Spatial Reliability Tracker
GPU	- Graphical User Interface
SD	- Storage Data
FPS	- Frame Per Second
IDE	- Integrated Development Environment
OS	- Operating System
VNC	- Virtual Network Computing
XML	- SGML (standard generalized markup language)
mAP	- Mean Average Precision

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CHAPTER 1

INTRODUCTION

1.1 Project Background

Roads are built to allow humans to move to their desired location. It will be a huge help, especially for people who need to travel to complete their jobs, visit family, run errands, and so on. However, according to [1], for the past few years, which is between 2015 to 2017, road accidents in Malaysia have increased dramatically. Part of the crash was caused by a collision with wild animals. This accident will take the lives of not only the animals involved, but it could also take the lives of a person or a family.

Nonetheless, several solutions have emerged in order to address the following issues. Referred to researchers [2], they discovered that erecting a fence between two roads would minimise the number of wild animal collisions. This approach works well in terms of increasing wild animal populations due to lower road mortality. The same can be said about highway crossing infrastructure to mitigate wildlife-vehicles. Referred to study [3], It is the chosen approach for improving motorist and animal safety on global highway networks. Tiny and medium-sized wildlife may also use the crossing systems for safe passage. However, using this method is very costly. Certain project cost more than \$4 million, Highway overpass are more than \$50 million [4].

Wildlife crossing signs and reflector posts are also installed on a regular basis to ensure that drivers are aware of the sign and are more vigilant after receiving the information. Regrettably, some of the methods can be used and others cannot. According to [5], The signs are normally posted where hunters or other people are watching the area, or where there have been some vehicle incidents involving wildlife collisions that have

been reported to higher authorities. The issue that arose was the lack of clarity in the location of the warning sign. It is unclear why some potentially hazardous (or potentially beneficial) road parts are marked with a sign and others are not. There is also the issue of signs being mounted and then not being replaced for more than 40 years. It should be located in areas where there is a high risk of accidents, which means it should be in small numbers; the more warning signs there are, the fewer people pay attention to them. A lot of progress has been made in order to reduce the number of serious injuries affecting individuals or families that come into contact with wildlife.

To tackle problems regarding wild animal trespassing, an idea occurs which is to develop a System that can monitor the trespassing thus bring an automated warning system for wildlife trespassing.

1.2 Problem Statement

Wildlife would need to relocate for a while to have a place to breed, eat, and care for their offspring. It is normal when these wild animals migrate from one place to another through the forest because for them it is safer than through public roads. It is natural for these animals migrating. Therefore, this incident will involve the population living near the forest. The public is unable to make initial preparations to address this issue. This can lead to accidents for several reasons. Wild animals will be violent if they feel threatened. When they see an individual or a group of people, they will defend themselves and act violently. This will lead to serious injury. Some place such as Taman Botanical Melaka and around Politeknik Sabak Bernam have a problems when animals frequently invade the area. due to the incident, the residents or locals became afraid to do their daily activities.

In order to overcome the possibility on wild animal trespassing a real time notification/warning system of this need to be develop. Hence, a solution is made which is

to create a system that can keep an eye on such wild animals in real-time with an alarm system to acknowledge the people around Taman Botanikal Melaka. This prototype will be placed at Taman Botanikal, Melaka where wild animals may to be actively found in this area due to the position of the park is near the forest . The reason that this place is chosen is that the area lacks security related to invading animals and also there have been some complaint regarding the issues. As a result, this project is done to produce a surveillance system against wild animals along with a warning system that will help them to acknowledge the presence of wild animals around their residents.

1.3 Objectives

The main objective is to develop a surveillance system in Taman Botanikal Melaka that can detect and recognize an animals with an alarm system. The objectives carried out as follows:

- i) To develop a prototype of a notification warning system of wildlife trespassing using computer vision.
- ii) To validate the efficiency of the designed prototype designed for monitor the behavior of wild animals and warn people nearby in the scene.

1.4 Scope of Project

The scope of the project must be done to achieve the objective of the project. This project design a prototype wildlife detection and recognition system with an alarm system. The prototype is using a Raspberry Pi 4 as a minicomputer and a Infrared Camera (IF Camera) to provide visual feedback to the Raspberry Pi 4 module. Any animals that have been pre-trained its images in the system will be detected and recognized by their species. The device would send out alerts to everyone in the area as a warning that there are wild

animals ahead. The Raspberry Pi module also will send an email message towards people to warn about the incident. The prototype will detect and recognize the object in around 30cm to 40cm in between prototype and object. There is also a warning light and sound to make sure people around 'Taman Botanikal Melaka' aware of the situation. This park is chosen because the possibilities of invasion of wildlife such as wildboars is high due to the placement of the park is near the forest. With this prototype, people will feel safer and can be prepared to take action.

