CENG 407 - 408

Software Design Description (SDD)

Licence Plate Recognition System

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1. Introduction

1.1 Purpose

This software design document describes the License Plate Recognition System architecture and system design. This includes the architectural features of the system which operations each module will perform. The aim is to guide a design that can be easily implemented by any user reading this report. The primary audience for this document is License Plate Recognition System users and developers.

1.2 Overview

Each chapter contains the following topics in order.
Section 2 introducing the system context and design, and discussion the background to the project.
Section 3.1 is the Architectural Design, which determines the design to perform all functions included in the system. Each of these entities has a brief description concerning the services that it provides to the rest of the system.
Section 3.2 includes the providing decomposition of software components, including the hierarchy and control and data flows.
Section 4 discusses the User Interface Design, and how it can be created with maximum user efficiency and ease of use.
Section 5 is the which requirement specification will satisfy with the which component.

1.3 Definitions and Acronyms

Term	Definition
Activity Diagram	Activity diagrams are graphical representations of workflows with support for choice, iteration, and concurrency in stepwise activities and actions. Activity diagrams are used in the Unified Modeling Language to model both computational and organizational processes, as well as data flows that cross with the linked activities.
Architectural Design	The process of establishing the foundation for the creation of a computer system by defining a collection of hardware and software components, as well as their interfaces.
Camera	A device for recording visual images in the form of photographic, film or video signals.
Class Diagram	A class diagram is a form of static structural diagram that depicts a system's structure by displaying the system's classes, their properties, operations, and object relationships.
Character Recognition	Character recognition is a method for computers to recognize written or printed characters like numbers or letters and convert them into a format that the computer can understand.
Character Segmentation	Character segmentation is a process that attempts to break down a picture of a series of characters into individual symbol subimages. It's one of the decision-making stages of an optical character recognition system (OCR).
Decomposition Diagram	A decomposition diagram depicts the breakdown of a complicated entity, such as a process, organization, data topic area, or other sort of

	object, into lower level, more specific components. Division diagrams, for example, can depict organizational structure or the decomposition of functions into processes.
Interface	A shared boundary across which two or more different components of a computer system exchange information is referred to as an interface.
Licence Plate	A license plate is a sign that is placed on the front and back of a car and displays the vehicle's license number. A rectangular, generally metal plate with a series of numbers, letters, or both that is issued by a government to identify a legally registered vehicle one of the signs with numbers on it at the front and back of a car.
Licence Plate Recognition System	A license plate recognition system is a form of technology, primarily software, that allows computers to read the registration number (license number) of automobiles from digital images automatically.
Optical Character Recognition (OCR)	The electronic or mechanical translation of images of typed, handwritten, or printed text into machine-encoded text, whether from a scanned document, a photo of a document, a scene photo, or subtitle text superimposed on an image, is known as optical character recognition or optical character reader.
Software Design Description	A software design description is a visual depiction of a software design that will be used to keep track of design information, handle various design problems, and communicate that information to the design.
Support System	Someone who helps the License Plate

Manager	Recognition System when there is a problem with the system, camera or license plate reading.
Users	The person using the License Plate Recognition System.
User Interface Design	Predicts what users will need to do and ensures that the interface has features that are easy to access, understand, and utilize to assist them in doing those activities. UI combines interaction design, graphic design, and information architecture.

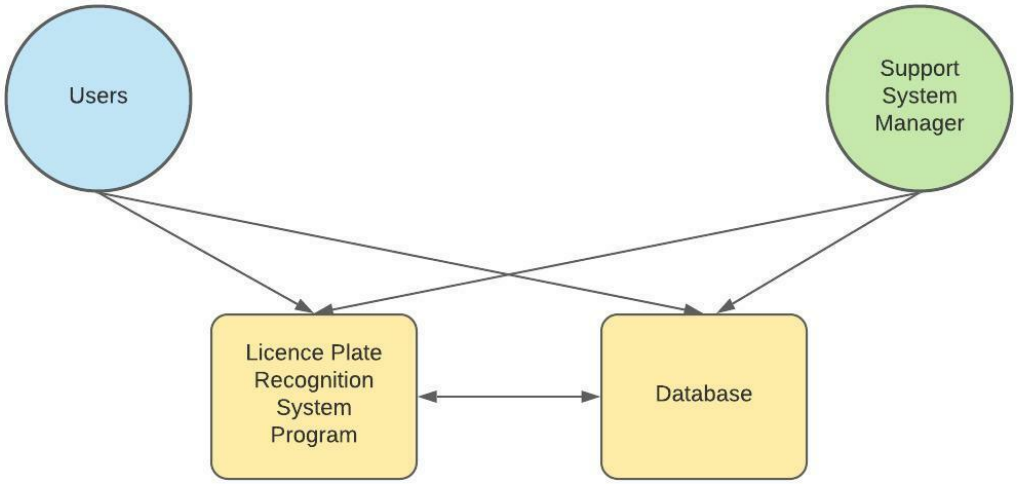
2. System Overview

The license plate recognition system is made by detecting the license plate region of the vehicles with the vehicle image and reading and separating the characters on the plate with image processing. By developing the license plate recognition system with deep learning and image processing, it will be tried to work towards detecting license plate recognition.

In the Plate Recognition System, the recognition process of the plates first takes place by finding all the contours in the picture. It happens that each stroke has its bounding rectangle. Then it has to compare and verify the side ratio and area of each bounding rectangle with an average plate. Image segmentation is then applied to the image within the verified contour to find the characters inside the plate. As the last step, the characters on the plate are recognized by using OCR (Optical Character Recognition). In the license plate recognition system, there is also a training phase by using the deep learning method for more recognition of the license plate in the images. Thus, different directions of vehicles and license plate positions can be better detected using multiple images or different sections of a video. In this way, it also provides convenience in terms of accuracy and speed in plate recognition.

3. System Design

3.1 Architectural Design

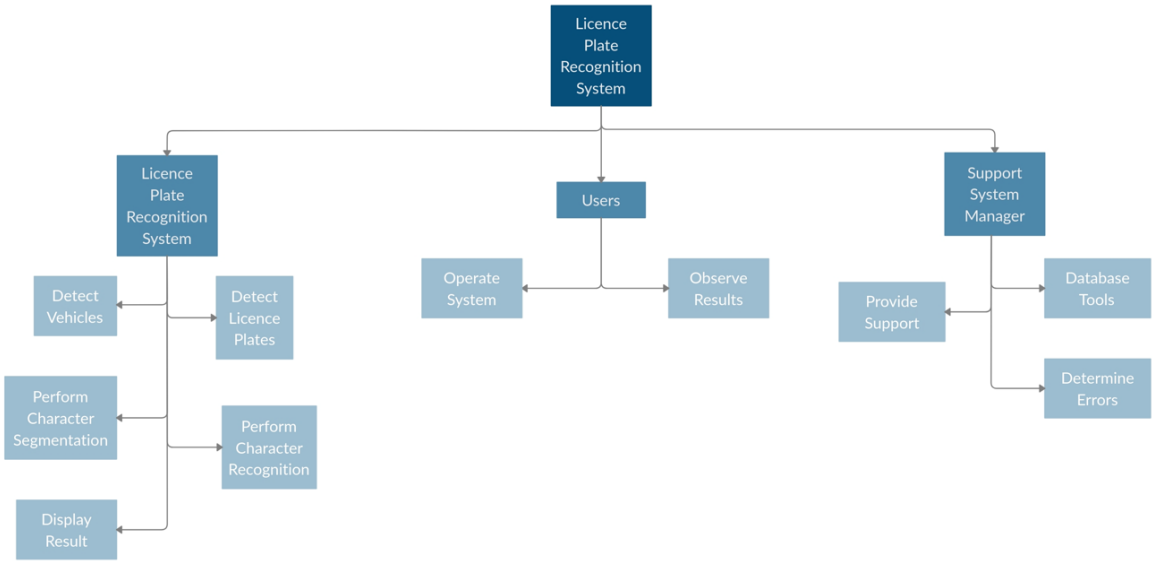


1. Licence Plate Recognition System Program: It is the part where the users run the License Plate Recognition System project and the whole project is located.

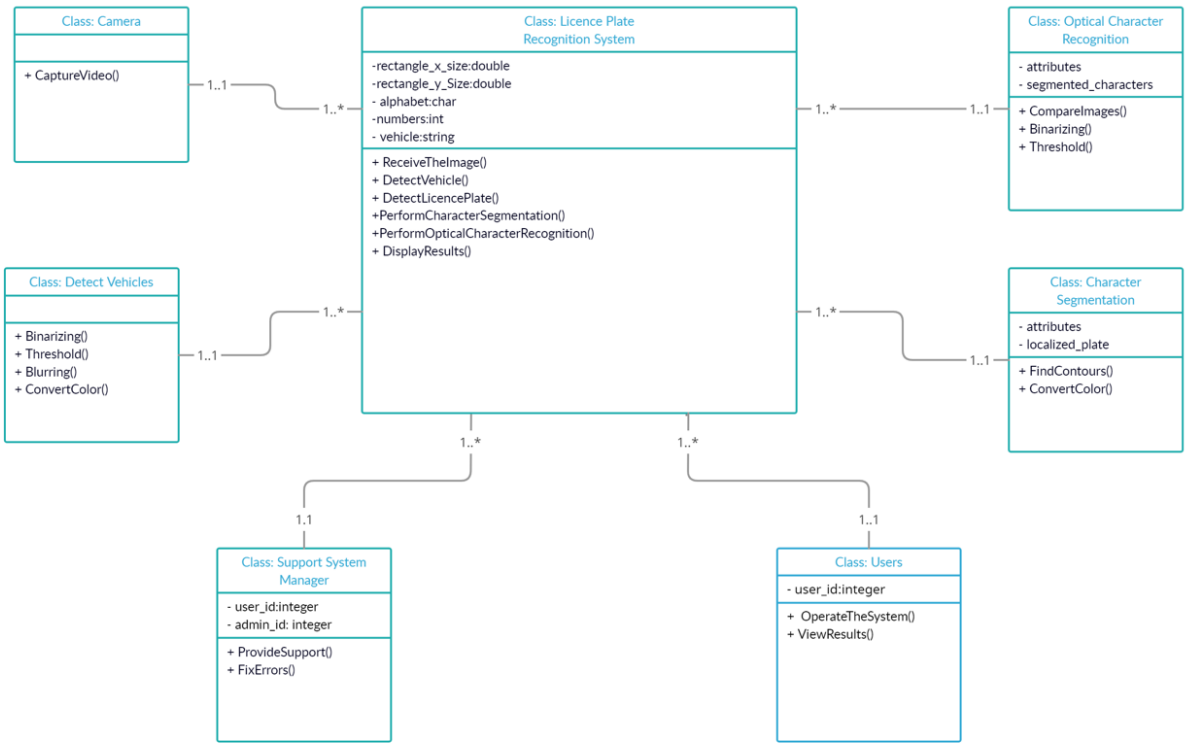
2. Database: It is the place where license plate information is stored in the License Plate Recognition System project.

3.2 Decomposition Description

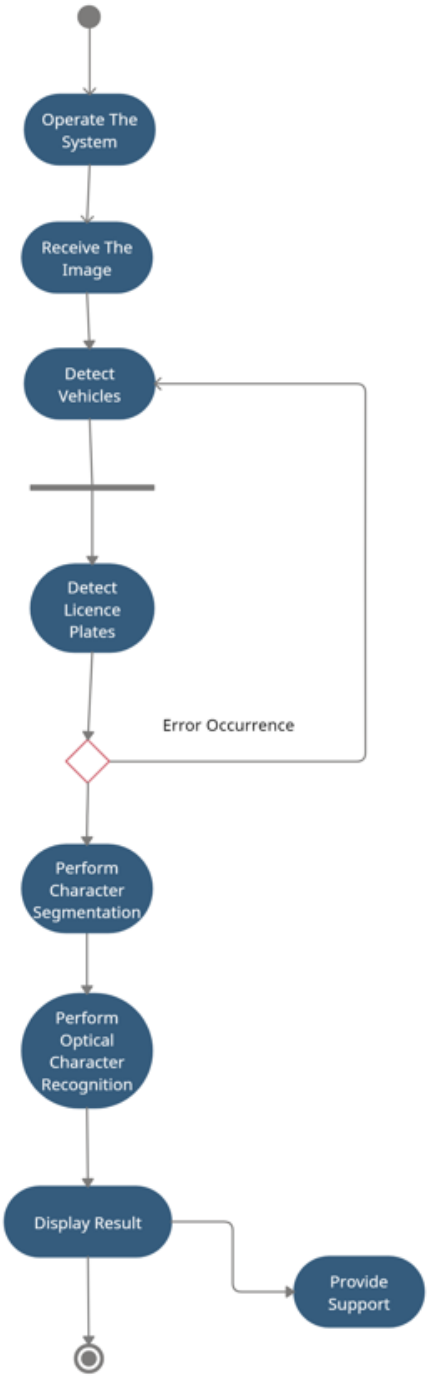
Decomposition Diagram:



Class Diagram:

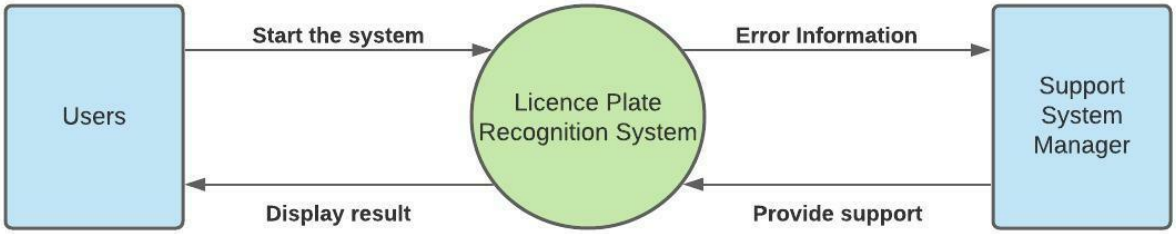


Activity Diagram:

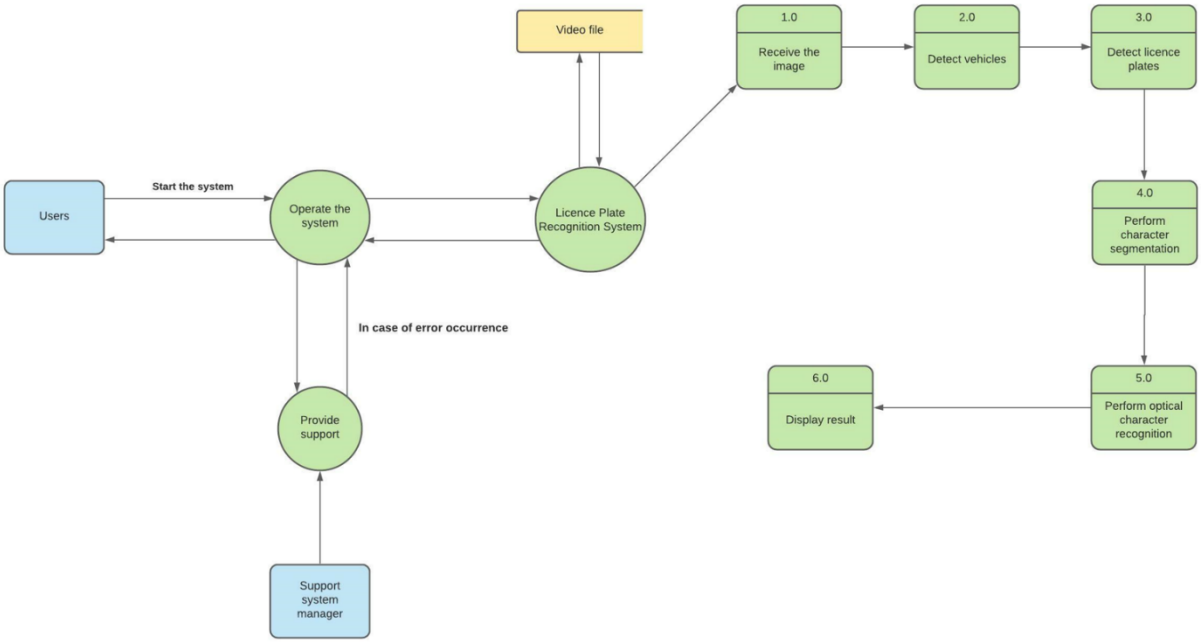


Data Flow Diagram (DFD):

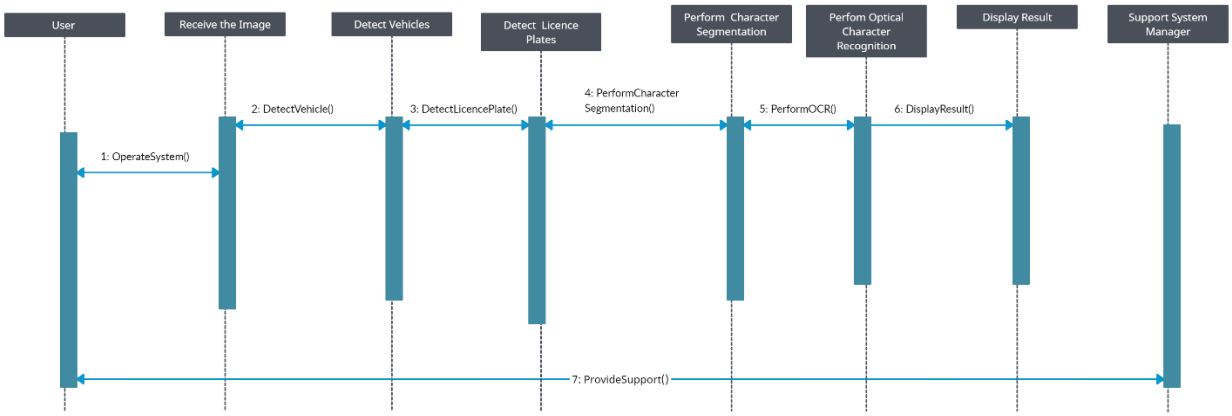
LEVEL 0:



LEVEL 1:

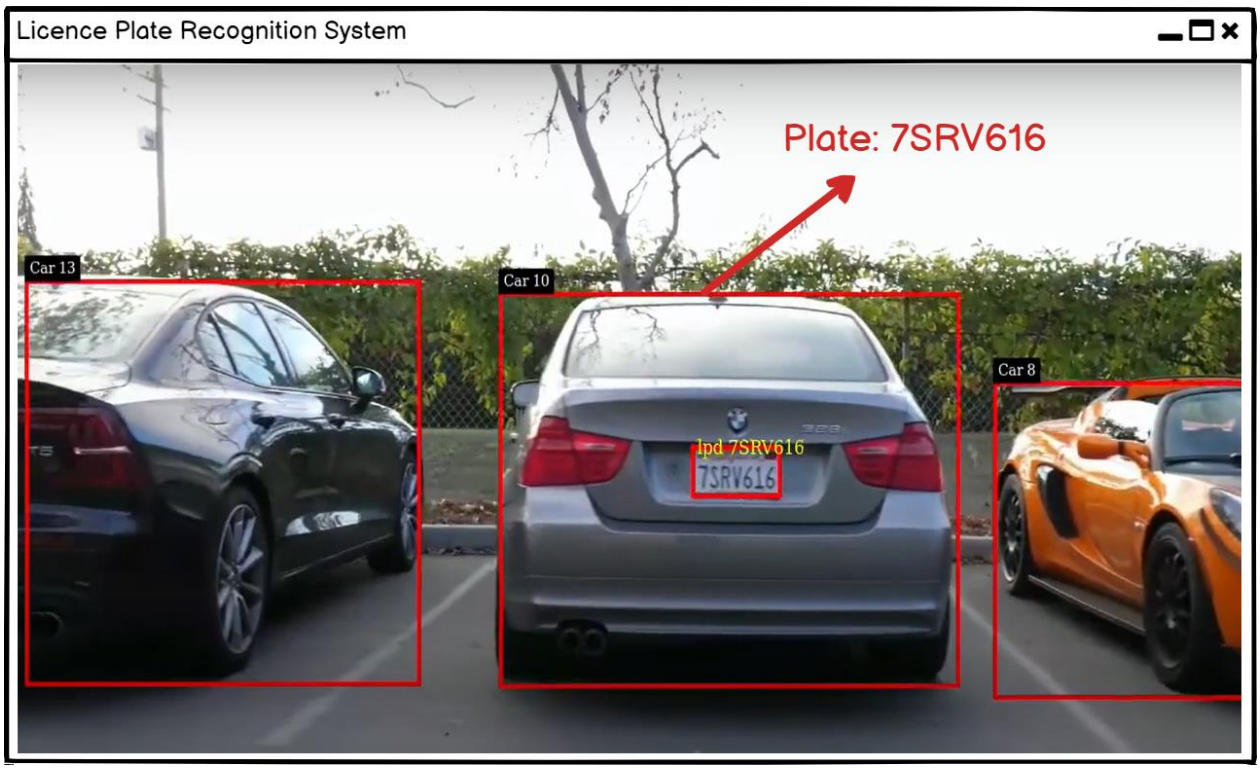


Sequence Diagram:



4. User Interface Design

- **Display Result**



After users run the License Plate Recognition System, the system performs license plate recognition. The license plate of the vehicles is recognized through the image taken from the video. After the users run the program, the result of the license plate recognition process is

written on the screen as in the interface. In this way, users can clearly see the result of the license plate recognition process.

5. References

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