**Smart Parking System**

**(SPS)**

**Abstract**

With the increase in population density in the Kingdom of Saudi Arabia especially in Riyadh city which is considered the capital of Saudi and the largest Arab cities in term of area also the fastest expanding cities in the world.

With all these reasons, the crowding increases, especially in the morning and evening peak times.

One of the problems that facing the city is the improper parking which consider the most common causes of traffic congestion and disruption not only in Riyadh but in the whole Kingdom. Therefore, this behavior is considered a traffic violation in the Saudi Traffic Law, It is called an “Illegal parking violation”.

Our goal in this project is to serve The General Saudi Department of Traffic from a side and the civil from the other side by building a system that contains 2 main services:

1. chatbot that can answer all the questions, receive the inquiries and objections that are being asked by the civilian.
2. Detect all parking issues.

For more explanation, this project is based primarily on two deep learning applicants

1. Natural Language Processing NLP.

The concept is about analyzing the text that sent by the end-user (Input) then the model will find the best answer to replay within an active human-based conversation (Output).

1. Image processing.

Capturing the image frames from videos and do object detection to determine:

* Occupied parking.
* Available parking.
* Disabled parking.
* Parked in wrong space.
* One in two parking.

**Pre-processing:**

1-Capture frames from the video that taken by Drone

For each frame

Path to png

Gray scale

Edge detection

2- draw boundaries using mouse click around the car using cv2.setMoudeCallBack()

3-find the object boundaries coordinates

4- apply those coordinates on the parking space

5-seprate each object from the frame to treat as our dataset

6- set the image size to 72\*72

7- Do the image generator using the augmentation to balance the data

Create wight to detect all the cars photo that has been taken by the Drone because we used transfer learning and all the models detect the objects and capture it as a cell phone!

**Split Data to training and testing:**

1-We have 2 classes (empty [0], occuipaid[1])

2- Flatten

3-Loading the model

4-make and fit the model

Models:

Pre-trained models such as :

CNN:

* Xception
* Vgg16
* Resent50

OpenCV:

* MOG
* KNN

YOLOv5

**Jamila part**

Dataset contains 12416 images (different angels of cam)

Annotated by Roboflow application

Models: YOLOv5

We trained data by using yolov5x.pt(wight)

The output of model: acc-space and available space (object detection)

Number of spaces

**Yehya Part**

parking violation detection: {name might be changed!}

We utilize different methods to detect if a car is illegally parked. These method are based on background subtractor algorithms includes MOG and KNN which implemented with OpenCV. Since we don’t have dataset of double parking, we took a tracking object as an alternative approach. So in this case, if a car stops on illegal area above the limit time or as double parking, the model will detect this car and reported under parking violation section. These methods are based on contour detection on image/background and then draw the bounding boxes of the major contours in that area. Since we dealing with a video as a realtime detection, the first frame with no detected cars will be considered as a plain background.