PROJECT NAME : EPForC (Easy Parking For Car)

Github Link: https://github.com/sumeyyetastan/CarPark.git

WHAT IS THE PROJECT PROBLEM?

Today,parking problem has become a big problem.Especially in big cities like İstanbul,it is very difficult to find a place even in the patking lots besides the streets.
Parking a car in parking lots is a problem.We wanted to solve this parking problem in our project.

WHAT IS THE SOLUTION?

This application will help you check if there is free space in the car parks and if you don't know the parking lot plan, application will help you park your car on a certain route at once.

We have designed a website for this. To solve this problem, we added the following steps to the website.

- First, you can save your license plate and parking plan for the parking area.
-The photos we have saved for the parking plan may have been taken at the moment with the help of the camera on the site, or they may have been previously saved.The system will check the photo you recorded or taken.
- According to the plan you saved, which fields are empty will be determined. After determining the empty area, you will be directed to that area with the help of simulation. Parking process will be completed with the help of simulation.

WHAT IS THE MACHINE LEARNING?

Machine Learning is used to categorize or predict specific data by type or size when new data arrives by analyzing specific data.The machine learning language receives the entered data of software programs and classifies them to help establish algorithms for estimating new data.

Machine learning can be used in the following areas.

- To be able to define the pictures taken,
- Spam filtering
- Determining the gaps on the network,
- Motion detection, facial recognition systems etc.

When using machine learning, we can use it in two different ways: supervised machine learning and uncontrolled machine learning.

The important thing for supervised machine learning is to detect the algorithms and analyze the data obtained from them.According to these analyzes, estimations can be made and proof of accuracy can be made.

In uncontrolled machine learning, the important point is to examine the data as a surface instead of examining it in depth, and we obtain results thanks to the deep learning system.Machine learning has a wide working capacity. With the already developing world, machine learning is used in almost every industry.

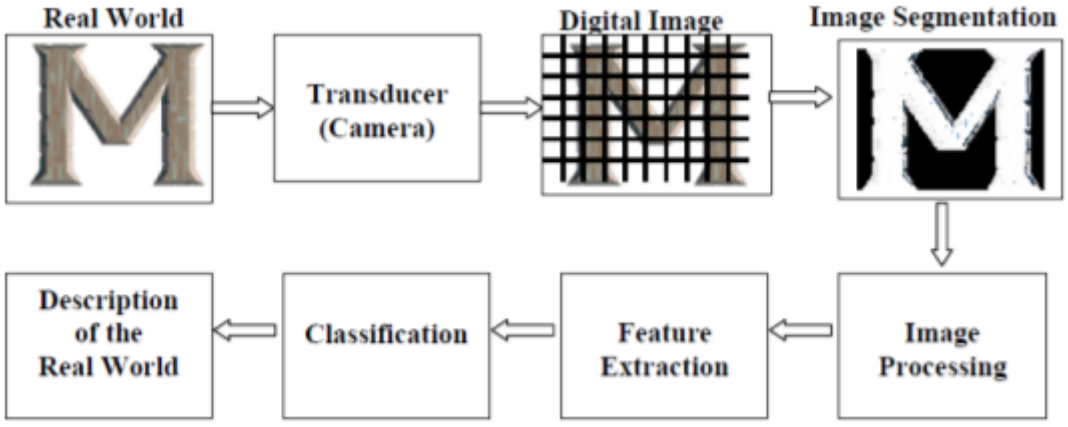
WHAT TYPE OF MACHINE LEARNING DO WE USE ?

In our project, we used OCR - optical character recognition, which is a use of machine language. We used optical character recognition to scan the parking plan for the camera on our site.

What is OCR?

It is an image processing technology that allows you to convert the physical document, such as phone cameras, computer cameras, photos and pictures on the internet, into a copyable text format.
This method allows electronic documents and pictures to be edited and saved in the system in the form of data.We use character recognition technology in many areas today.
As an example, optical scanning method was used to scan and detect car license plates by taking images through mobese cameras.OCR has been used in many areas such as automatically checking the checks sent to banks and performing the necessary account transactions in electronic media, transferring the books in the libraries to the computer environment.In our parking lot project, we use ocr to scan the parking lot floor using security cameras.

An example character recognition steps are as follows.



Transducer; it is usually a camera, scanner and is a stage for digitizing the image and making it workable in computer environment. Prosessing stage; It consists of pretreatments such as softening and filtering to normalize the image. Feature Extraction; It is the process of extracting the common features of the class that the data to be processed. Classification; is the decision-making process for class membership of a design in question. The main purpose of a character recognition system; For all these processes, using different methods is the best accuracy rate.

How to feature extraction ?

The first thing to do at the stage of defining the optical characters is the extraction of the attributes. Many methods are used when the feature extraction is performed. One of these methods is the automatic matching method. In this method, the black-and-white input pattern between 0-255 is less than 127 with a pixel value equal to 127. and the higher ones are labeled 0. Thanks to the numerical characters, a visible separation is experienced.

How is the Classification Done?

After the feature processing, the patterns are classified using certain algorithms. The algorithms used are as follows.

- Naïve Bayes
- k-NN (Euclidean Distance Function)
- LibSVM (Linear Core Function)

In Naive Bayes algorithm, normalized feature vectors for classification are used in the classifier space. This algorithm; It can be seen as the problem of calculating the greatest probabilities of the given examples.

The k-Nearest Neighborhood (k-NN) algorithm is among the most basic unattended learning methods that solve the clustering problem. The aim is to ensure that the clusters acquired at the end of the partitioning operation are maximum and the cluster resemblances are minimum.

LibSVM is one of the most widely used SVM libraries developed for Support Vector Machine (SVM). Unlike traditional SVM, which is a powerful machine learning technique in estimating two-class data, it enables the use of multi-class data.

What is OCR Operating Logic?

Image processing technology that allows you to convert physical documents such as paper documents, pdf files or photos taken with a digital camera into digital format.
The first step of OCR is to use a browser to process the physical form of a document. Dark areas are defined as characters to be recognized, and open areas are defined as backgrounds. Analysis is made for light and dark areas.

Why is it necessary?

It takes a lot of time and resources to read and process many documents. You can take advantage of using an OCR Scanner SDK to increase your efficiency and optimize your workflows.

Some OCR Systems:

Tesseract: Optical character recognition software developed for operating systems. It was previously produced as a closed source software and was released in 2005 as free software. It is available in many languages.

MODI: It is software developed by Microsoft. In order to use this application, MS Office applications must be on the computers. MODI is an application that performs many operations such as editing scanned documents, converting to Word format and searching text within the document.

Some of the OCR code we use in our code is as follows.

```
<script src="ocrad.js"></script>
<img id="image" src="resimler/<?php echo $resim;?>">
<script>
var image = document.getElementById('image'); // We send the picture we chose to ocrad js.
var string =OCRAD(image); // we equal to the read value into a variable named string.
console.log(image); // we print it to check if it gets the right picture
console.log(string); // After sending the picture ocrad js, we print the return value.
```

WHICH LANGUAGE DO WE USE IN THIS PROJECT?

In this project, we use phpmyadmin for registration and PHP .

While preparing our project, we followed these steps.

First, we investigated what functions we can use in the operation of camera systems.We decided which of these web based systems to use among them.The purpose of our project is to scan the parking lot with the help of cameras whenever a customer arrives to identify the empty areas.Since we could not use the security camera system, we conducted this experiment by accessing the camera in a web-based application.

Our first step in our project is to take pictures on the website.

In the second step, after taking the photo, we could transfer it to a file and after the completion of these steps, we were able to obtain the photo we wanted. On the website we use for the parking lot project, the user has to upload the photo he has taken or has taken by entering the license plate of the car.

Plate and picture are saved in the system.

In the continuation of our project, we had to read the picture uploaded to the system and determine the empty spaces.

In this section, when we read the picture with ocrad.js, the elements read were taken one by one.For example, the number 24 was taken separately as 2 and 4. Also, some characters were read in the picture, depending on the quality of the picture and reasons such as light intensity.

For example, "*, /, -, _, <" read some such characters.In our first attempts, we removed these characters from the value read with "split".

But then we realized that each picture was reading different characters in ocrad js.We have decided that split is not enough by itself, and we also wrote a code in the form of assigning an arra if we see the numbers between the values read in the if and for method and ocrad.But there were still errors in our code about getting and detecting elements.As we mentioned before, we were having trouble reading the elements one by one.

We take the items up to 9 in our array one by one. We assigned the elements we take to the first series.Then read the first number for the double-digit numbers, then read the second number, take them in string type, define an algorithm called `` Assign to the 1st element of another array " and write the code. Thus, we combined the number read as 2 and 4 to 24 and assigned it to the first element of the array.This way this we created the second array. Then we combined the first series and the second array.Thus, we created the array that holds the numbers of the empty parking spaces. And we saved one of these empty parking spaces in the random database for the customer. This is where we had the most difficulties in the project.

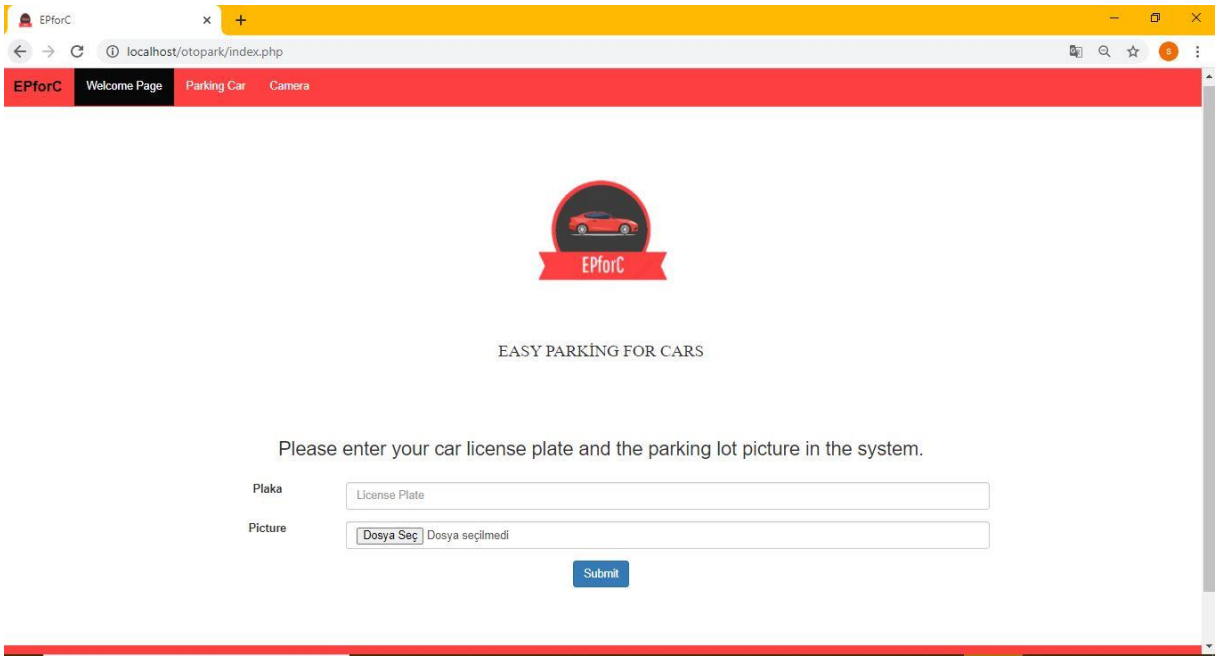
In the other step of the project, we showed the customer the empty spaces in our parking lot and showed that he should go to the place in database we assigned for him through a simulation.

We did the simulation using javascript canvas.In the first stage, we drew the plan of the parking lot with the help of canvas.We added a canvas car icon and made this car move. We used the locations to move the car up to the position specified for the customer. We have determined the parking spaces at 100 meters intervals on the canvas.For example, 8, instead of Park, we multiplied the number that came to the function by 100 to get the car and told it to go that far. It was not possible to do this for the parking spaces at the bottom of the simulation,

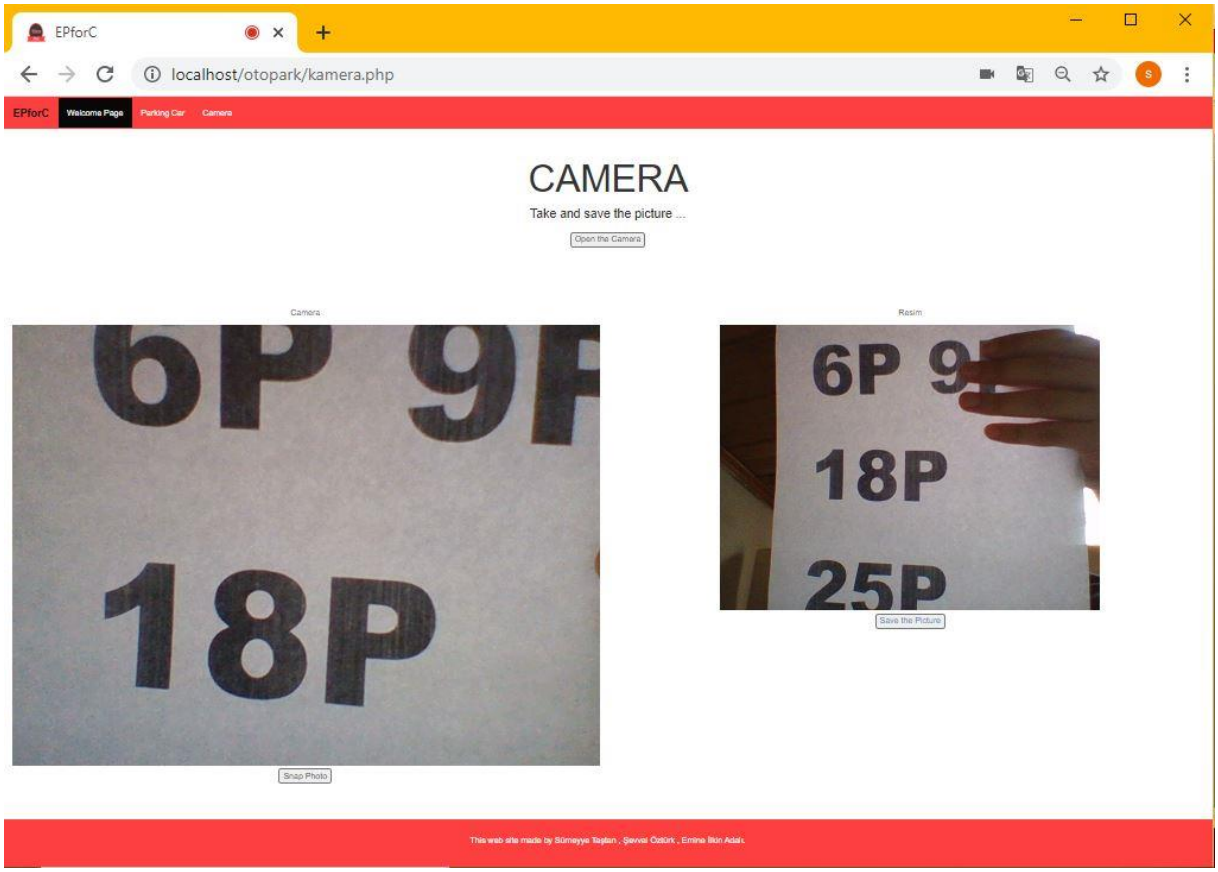
For example, 27 is the remaining 7 in 27/10 episodes. Let 7 * 100 cars will move. In order to move to the 2nd line, we applied the logic of 27/10 = 2.7 full part 2 to the 2nd step. The simulation phase was also very difficult for us.

PICTURES

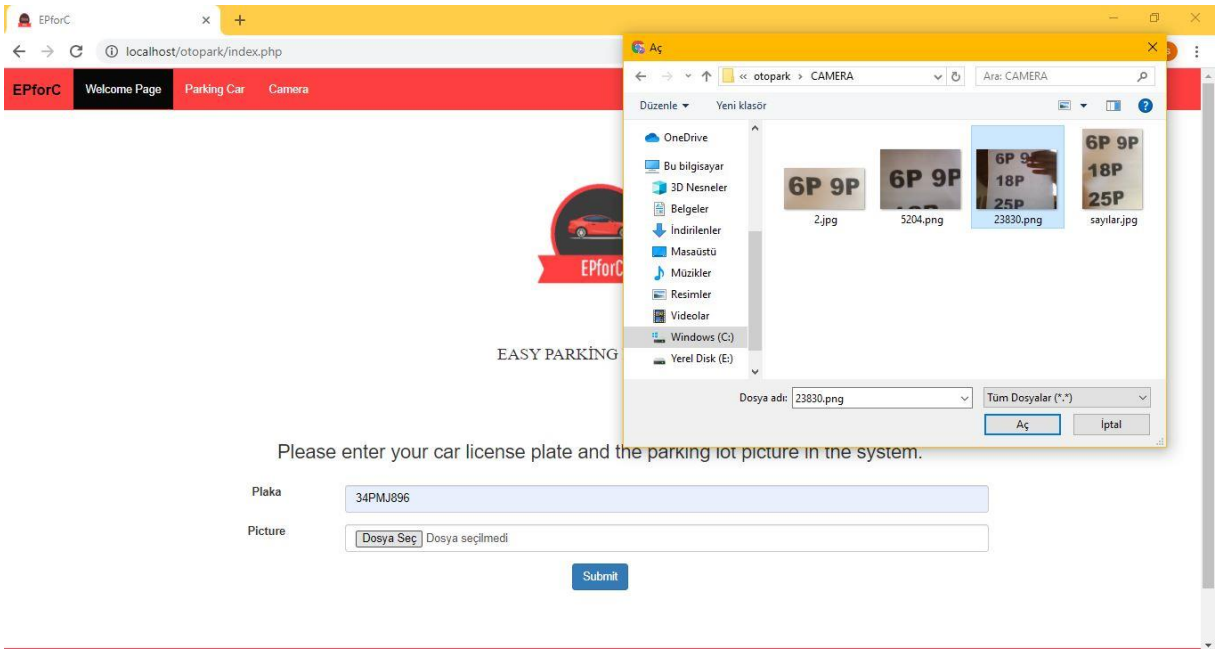
Our site is opened like this initially. When you press Close The Window, it takes us to the next screen.



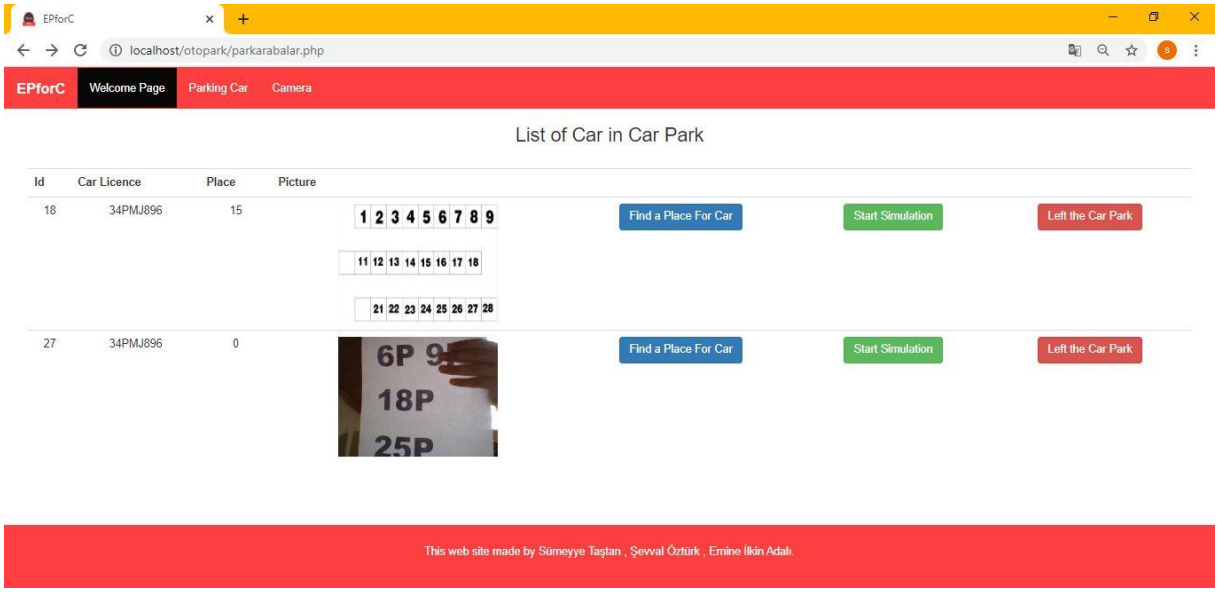
It leads us to this page after the start page.If there is a picture of the car park plan, we can load it directly, enter the license plate of our car and register it in the database.If there is no picture, we need to take a picture with the camera first.



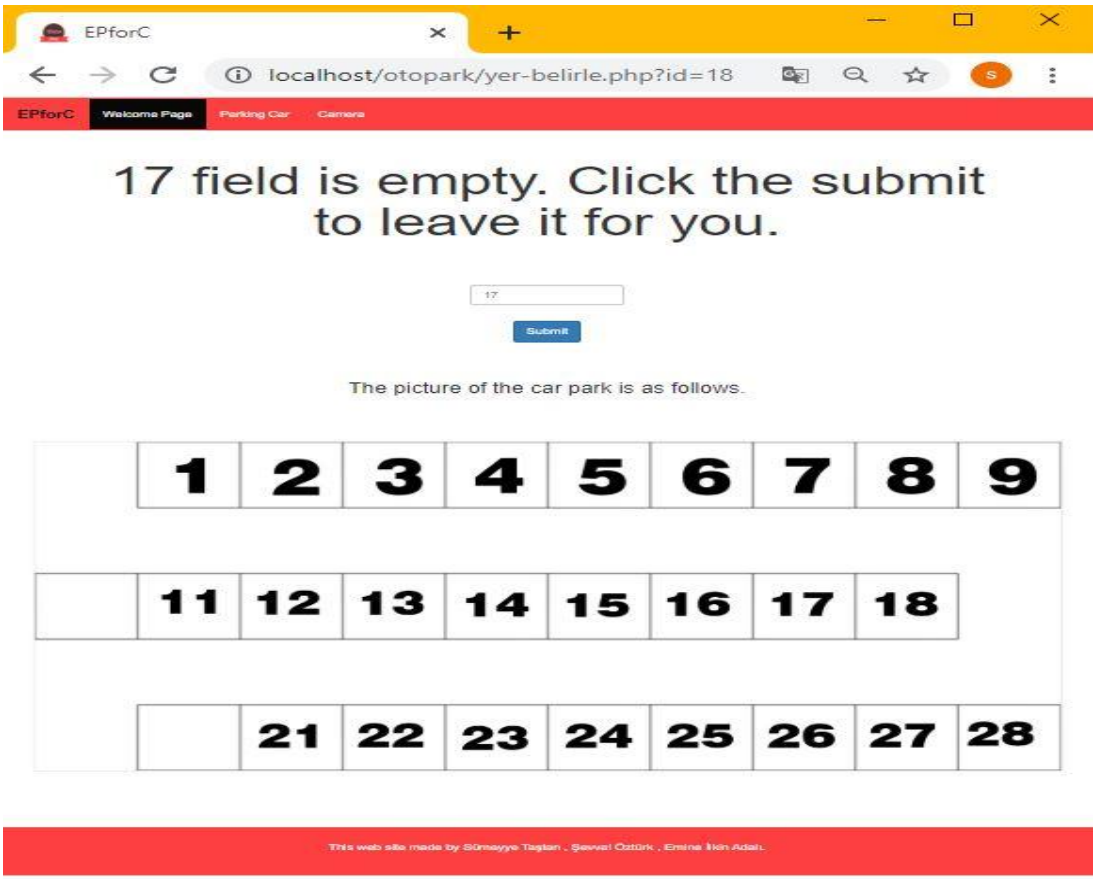
Pictures taken from the camera are saved in a file called camera on your phone or computer.



On this page, we can enter the license plate of our car and upload the picture we took from the camera file.

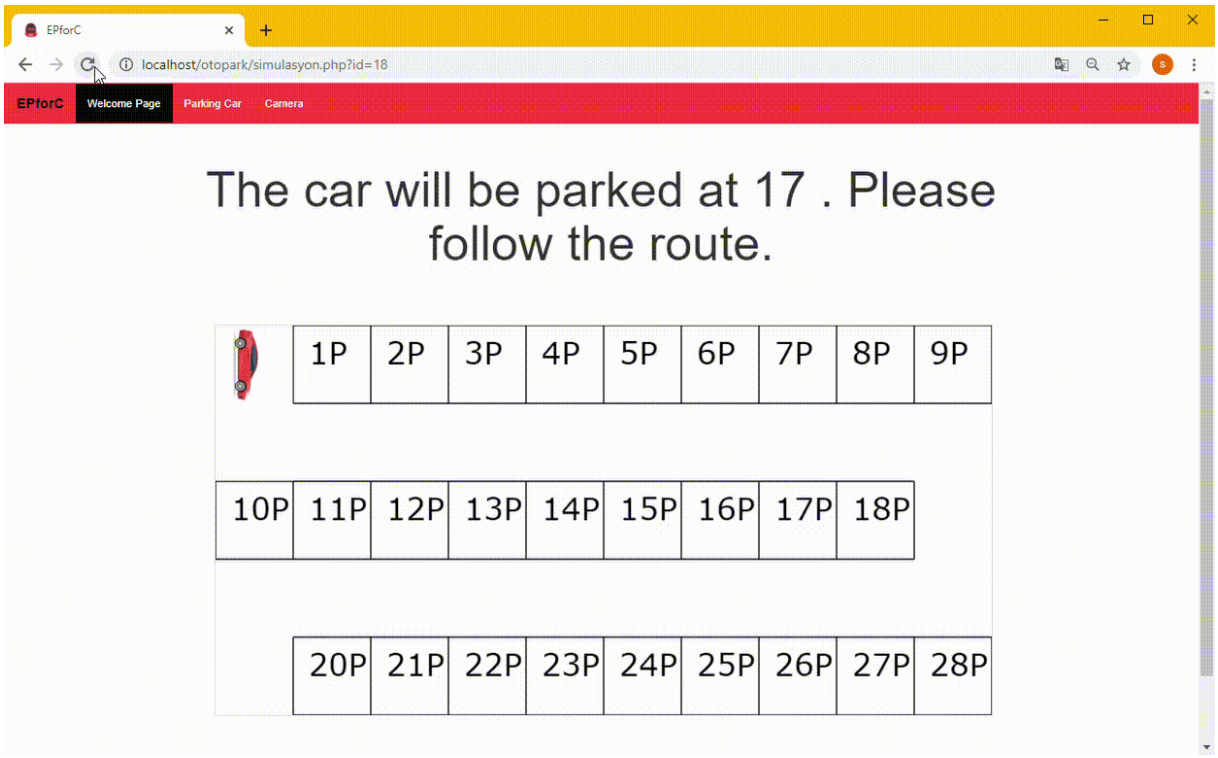


This page shows where the cars and car parks registered in the system are located.The location of our user, who is new to the system, is not certain in the car park.In this, by pressing the blue button, he can determine a vacant place in the car park.



When our user first enters the parking lot, we scan the picture of the parking lot and find a free space for our user. We randomly discard this area.

Our place in the parking lot we assign randomly is shown here as place. In the next step, we start the simulation by pressing the start simulation button.



Finally, when we start the simulation, our car travels through the gaps and goes to the point we set as the previous page and stops when it reaches that point.

Click on the link to access the video of the simulation.

Link : https://youtu.be/6edJindFsmo

We used phpMyadmin as the database. We kept our data here.