PARKA

Amr Alshatnawi   Alejandra Lopez   Karlee Barr   Daniel Carabez

Computer Science Department
Saint Xavier University

Introduction

What is project PARKA ?

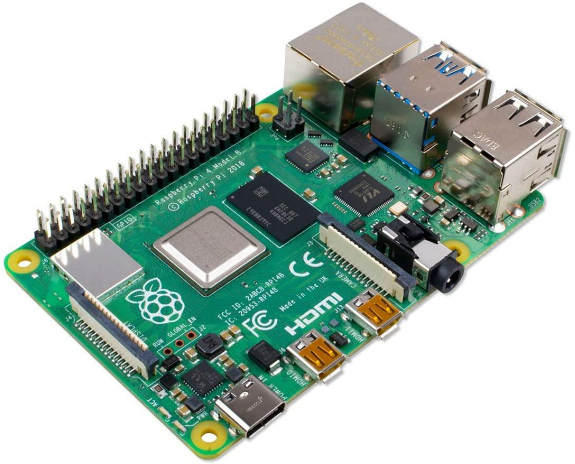
- We are developing a software product that detects the number of empty and occupied spots in a parking lot.
- We’re using a Raspberry Pi to run our code which is developed in Python.
- We built a physical model (landscape) to demonstrate how the product works.
- A prototype of a mobile application is being developed; this app will allow users to use the software product.

Why did we chose this Project?

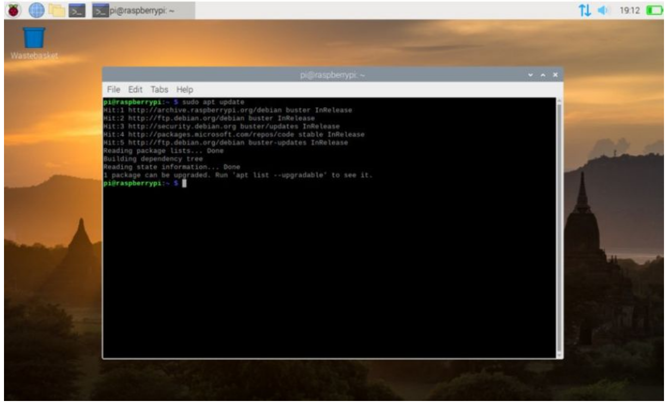
Our team wanted to work on a project that will ultimately help solve an issue students, staff, and faculty face on campus. Developing a product that helps us find parking easily on campus is an idea that we believe is very beneficial.

PARKA

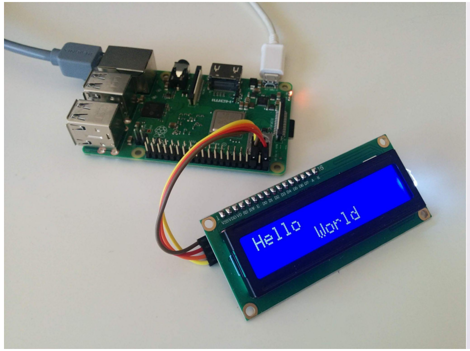
Raspberry Pi

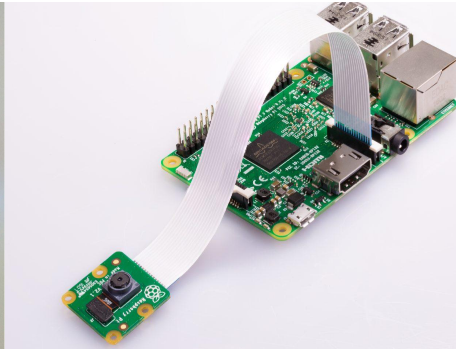


- Raspbian OS
- Used to Run the program
- VSCode
- WinSCP and Putty was used to gain remote access



```
pi@raspberrypi:~ $ sudo apt update
Hit:1 http://archive.raspberrypi.org/debian buster InRelease
Hit:2 http://ftp.debian.org/debian buster InRelease
Hit:3 http://security.debian.org buster/updates InRelease
Hit:4 http://packages.microsoft.com/repos/code stable InRelease
Hit:5 http://ftp.debian.org/debian buster-updates InRelease
Reading package lists... Done
Building dependency tree
Reading state information... Done
1 package can be upgraded. Run 'apt list --upgradable' to see it.
pi@raspberrypi:~ $ 
```



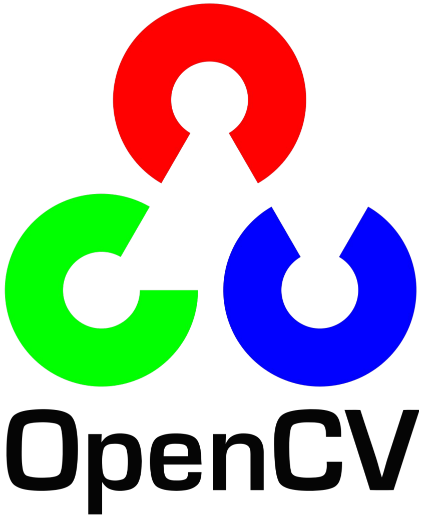


Open CV

- Open Source library

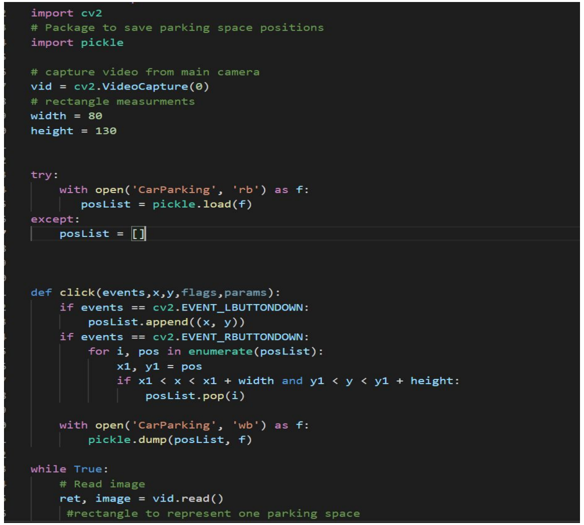
- Real time computer vision

- Virtual environment to manage libraries and Packages used for the project.

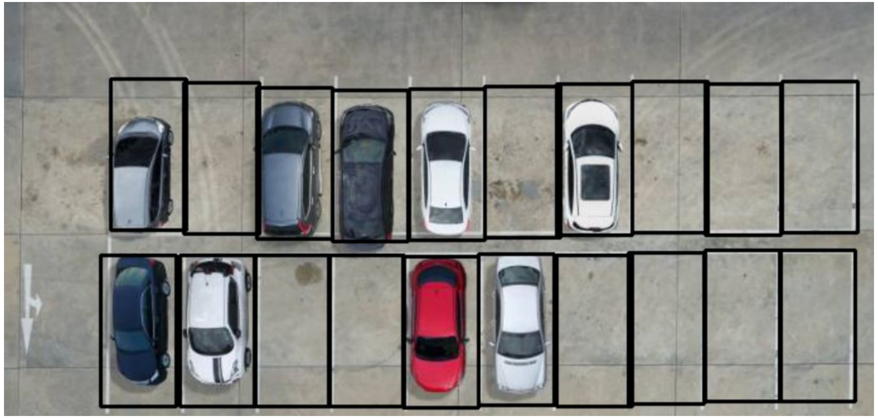


How does the program work?

- Parking spot are defined manually
- All spots are stored in a list
- The list is saved in a file.

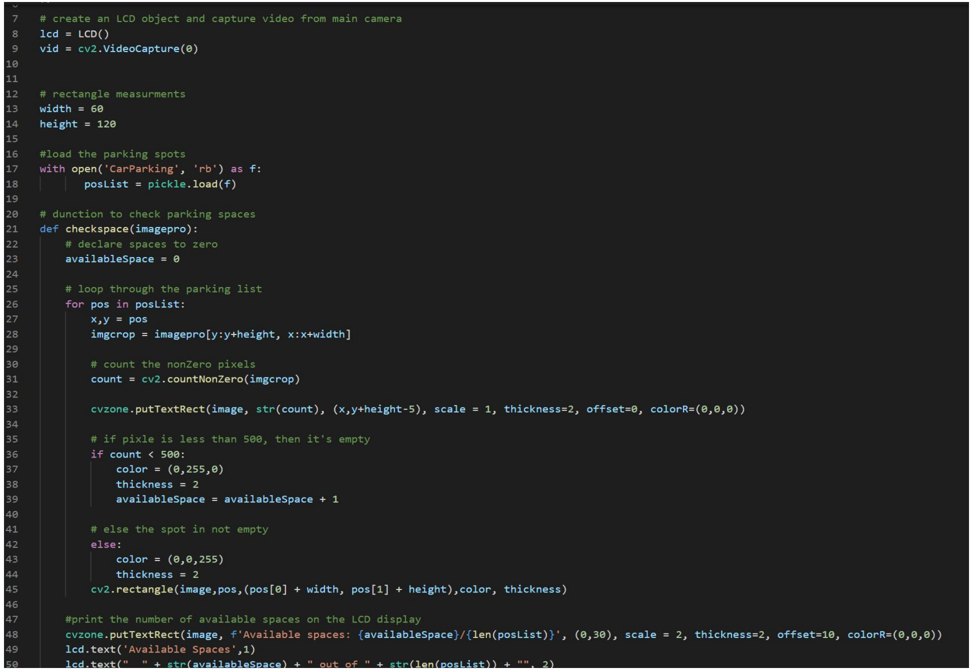


```python
import cv2
# Package to save parking space positions
import pickle

# capture video from main camera
vid = cv2.VideoCapture(0)
# rectangle measurments
width = 80
height = 130


try:
    with open('CarParking', 'rb') as f:
        posList = pickle.load(f)
except:
    posList = []



def click(events,x,y,flags,params):
    if events == cv2.EVENT_LBUTTONDOWN:
        posList.append((x, y))
    if events == cv2.EVENT_RBUTTONDOWN:
        for i, pos in enumerate(posList):
            x1, y1 = pos
            if x1 < x < x1 + width and y1 < y < y1 + height:
                posList.pop(i)

    with open('CarParking', 'wb') as f:
        pickle.dump(posList, f)

while True:
    # Read image
    ret, image = vid.read()
    #rectangle to represent one parking space
```



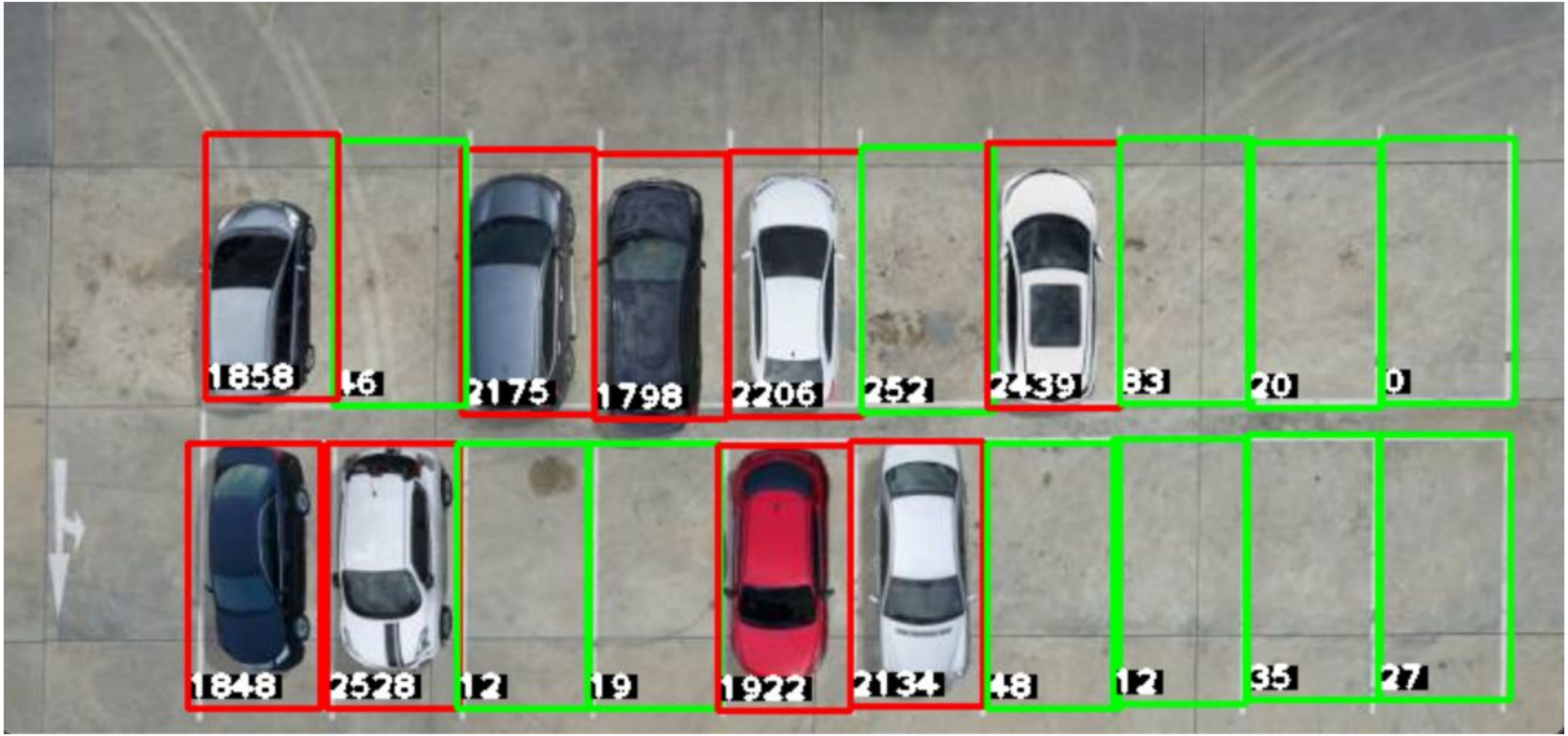
PARKA

How does the program work ?



```
# create an LCD object and capture video from main camera
lcd = LCD()
vid = cv2.VideoCapture(0)


# rectangle measurments
width = 60
height = 120

#load the parking spots
with open('CarParking', 'rb') as f:
        posList = pickle.load(f)

# dunction to check parking spaces
def checkspace(imagepro):
    # declare spaces to zero
    availableSpace = 0

    # loop through the parking list
    for pos in posList:
        x,y = pos
        imgcrop = imagepro[y:y+height, x:x+width]

        # count the nonZero pixels
        count = cv2.countNonZero(imgcrop)

        cvzone.putTextRect(image, str(count), (x,y+height-5), scale = 1, thickness=2, offset=0, colorR=(0,0,0))

        # if pixle is less than 500, then it's empty
        if count < 500:
            color = (0,255,0)
            thickness = 2
            availableSpace = availableSpace + 1

        # else the spot in not empty
        else:
            color = (0,0,255)
            thickness = 2
        cv2.rectangle(image,pos,(pos[0] + width, pos[1] + height),color, thickness)

    #print the number of available spaces on the LCD display
    cvzone.putTextRect(image, f'Available spaces: {availableSpace}/{len(posList)}', (0,30), scale = 2, thickness=2, offset=10, colorR=(0,0,0))
    lcd.text('Available Spaces',1)
    lcd.text("  " + str(availableSpace) + " out of " + str(len(posList)) + "", 2)
```

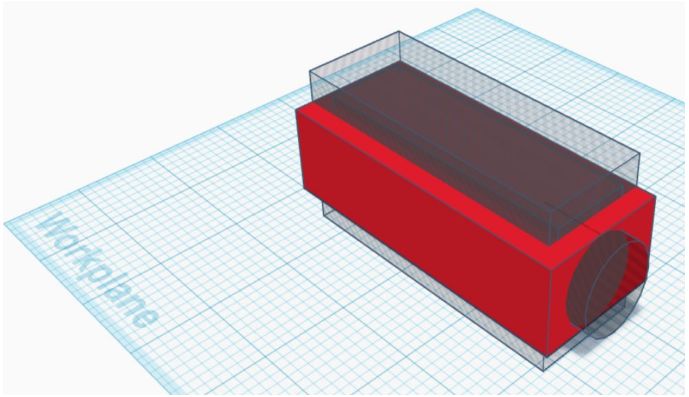
PARKA

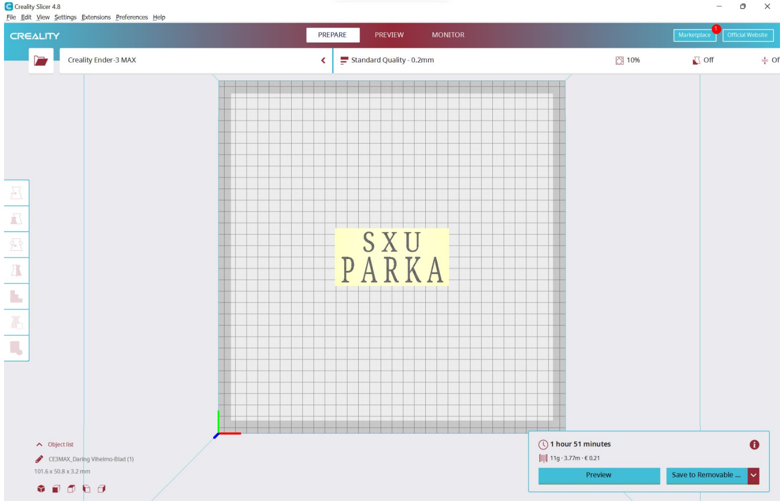

1858
46
2175
1798
2206
252
2439
83
20
0
1848
2528
12
19
1922
2134
48
12
35
27

PARKA

Tinkercad & Ender

- Tinkercad is a 3D modeling program
- Ender is a 3D printer





Creality Ender-3 MAX

Standard Quality - 0.2mm

10%

Off

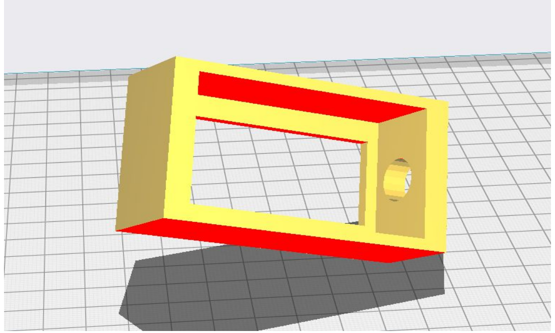
Of

CE3MAX_Daring Vihelmo-Blad (1)

101.6 x 50.8 x 3.2 mm

1 hour 51 minutes

11g · 3.77m · € 0.21



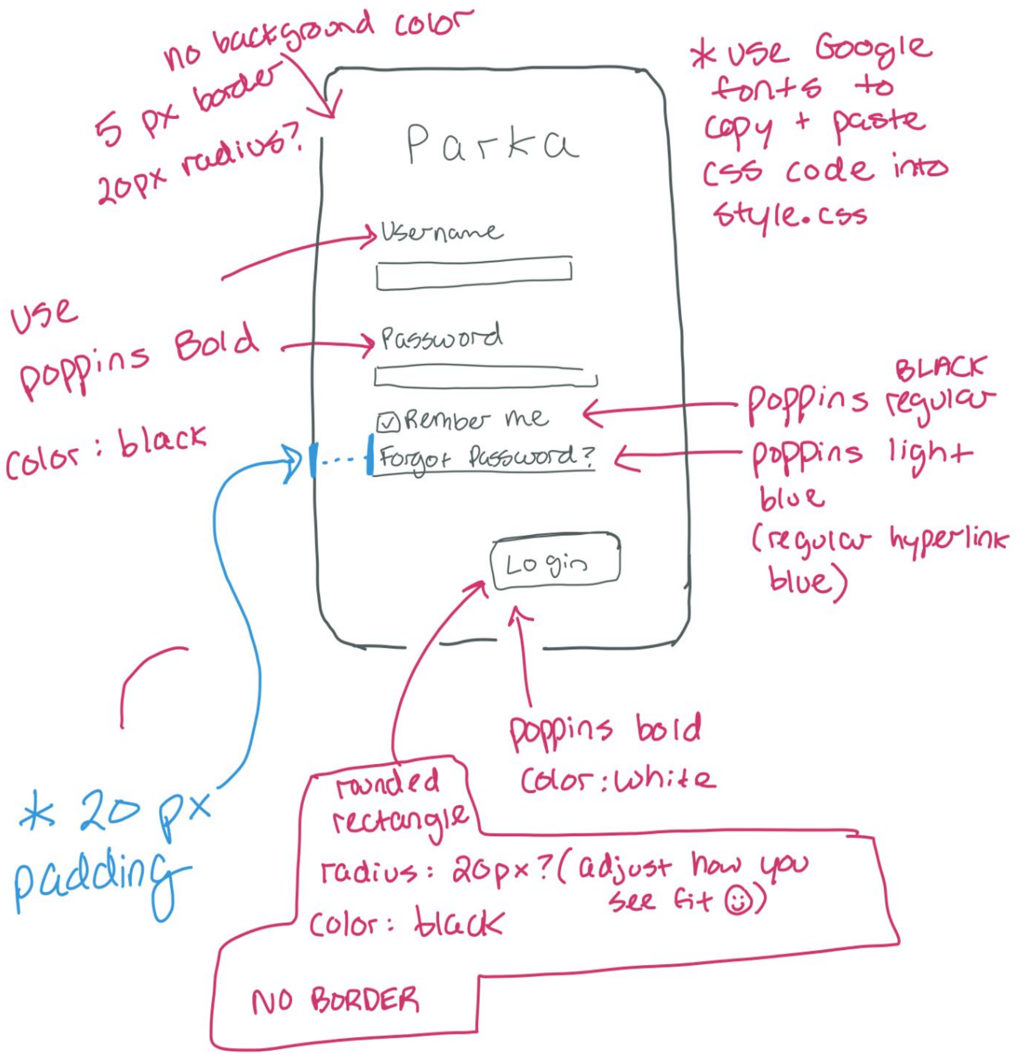
Revit

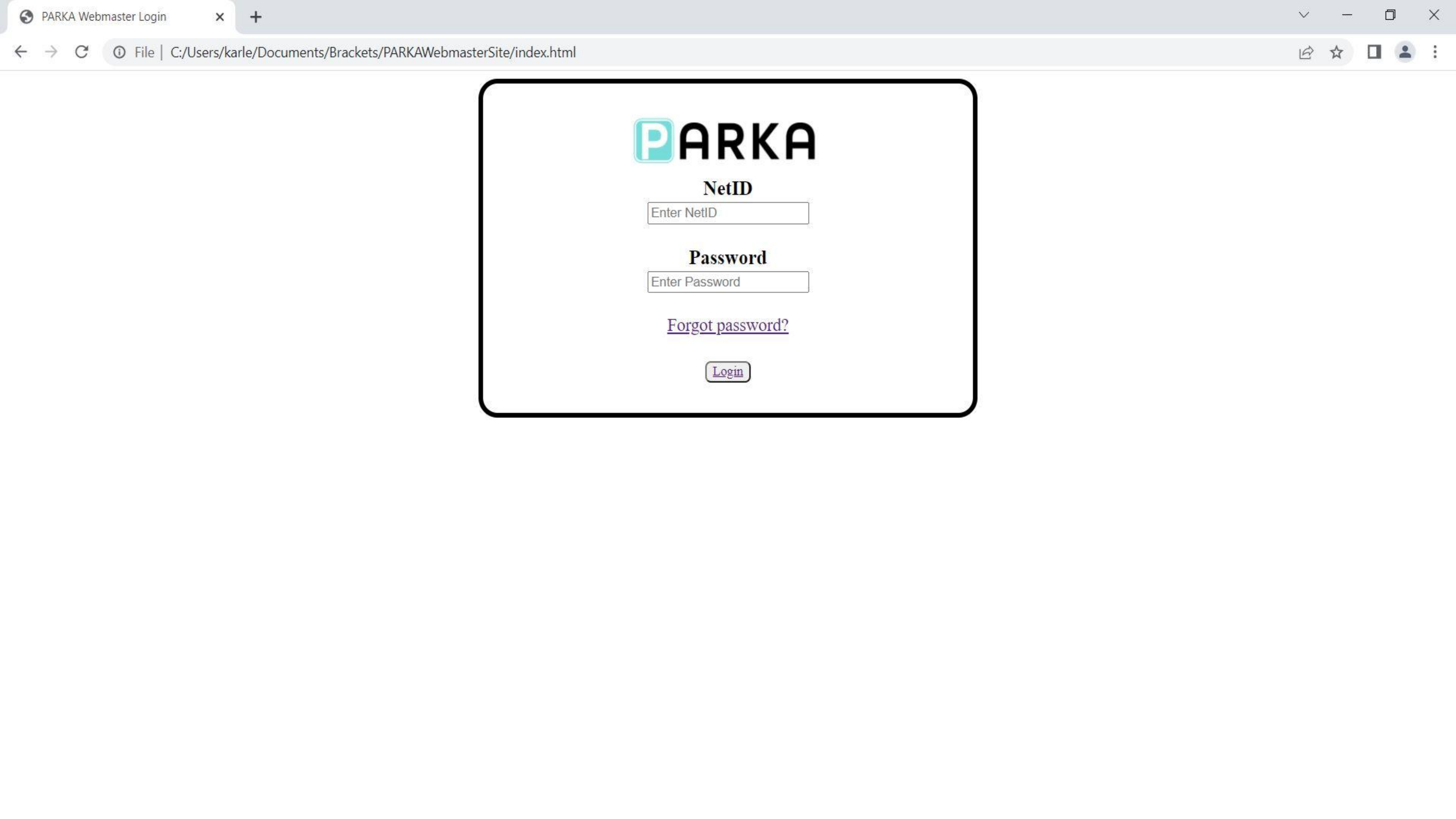
Revit is a software used to design and build architectural models

PARKA

Webmaster Site Design

- Intended for desktop
- Simple design
- Collaborative effort




PARKA Webmaster Login
File
C:/Users/karle/Documents/Brackets/PARKAWebmasterSite/index.html

PARKA

NetID

Enter NetID

Password

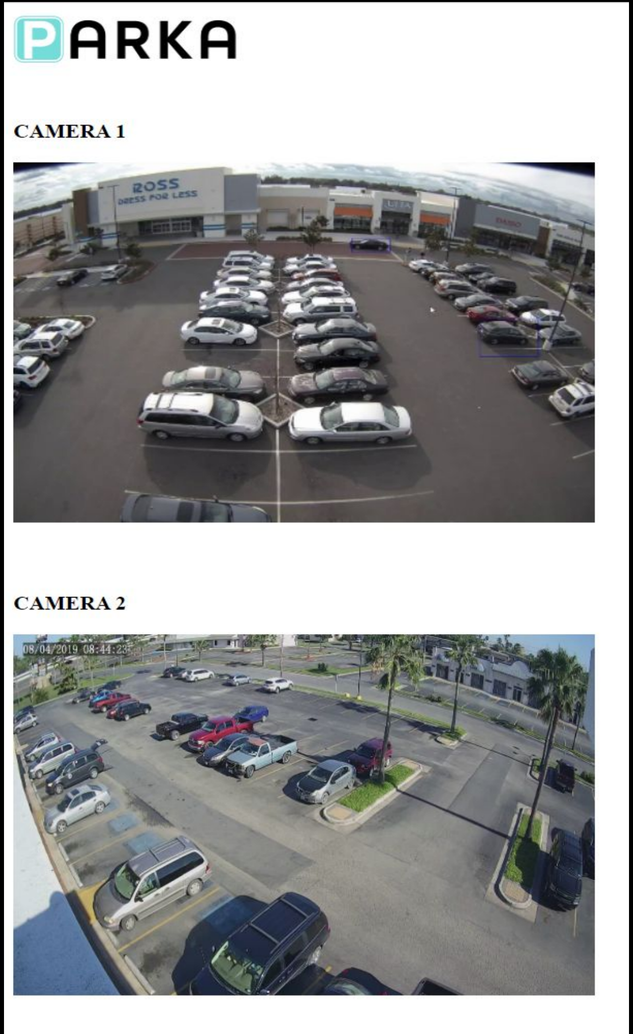
Enter Password

Forgot password?

Login

Webmaster Site

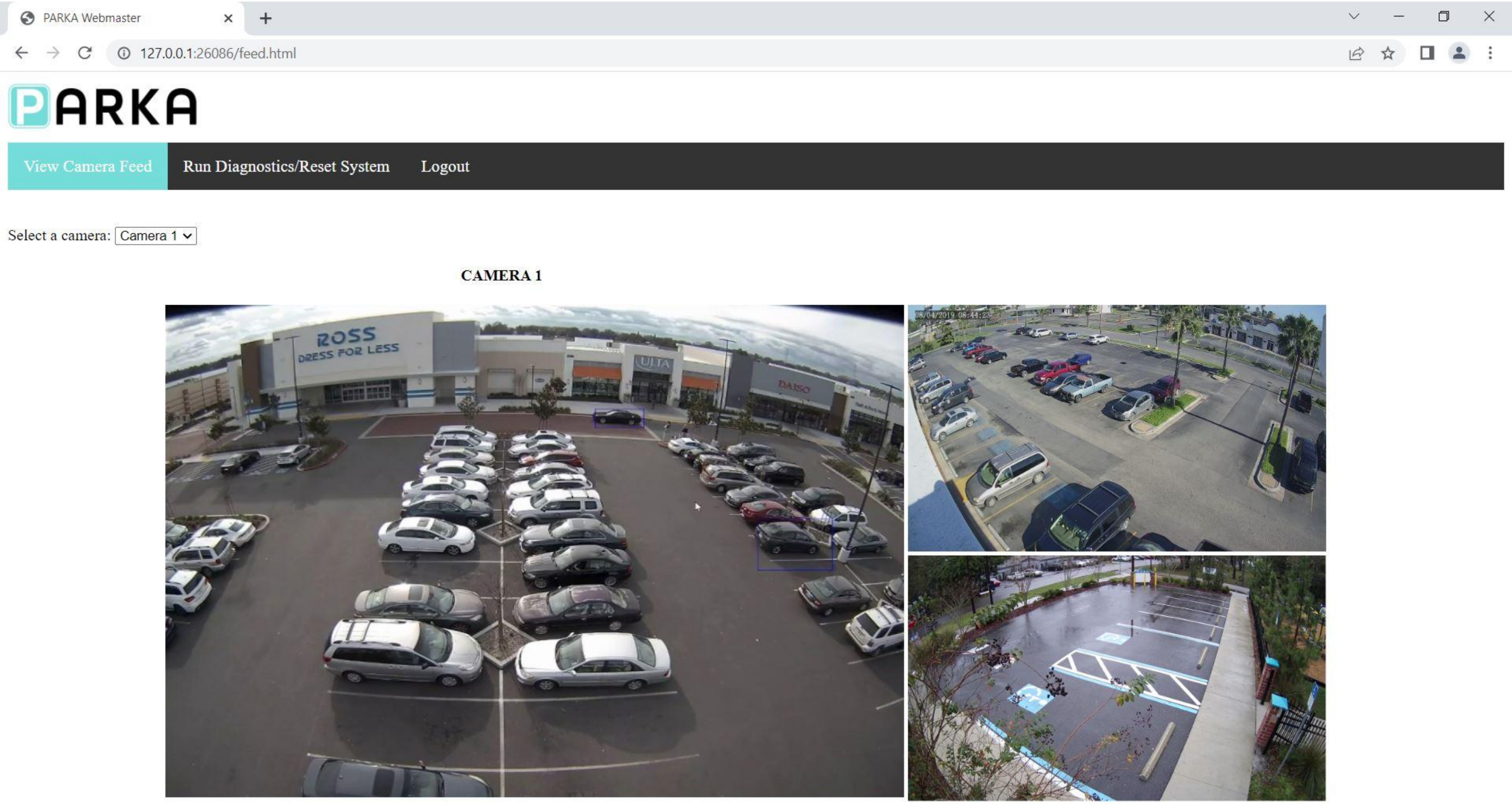
- Secure login
- Access to camera feed
- Ability to run diagnostics tests and reset system
- Warning message before running tests/reset



PARKA

CAMERA 1

CAMERA 2

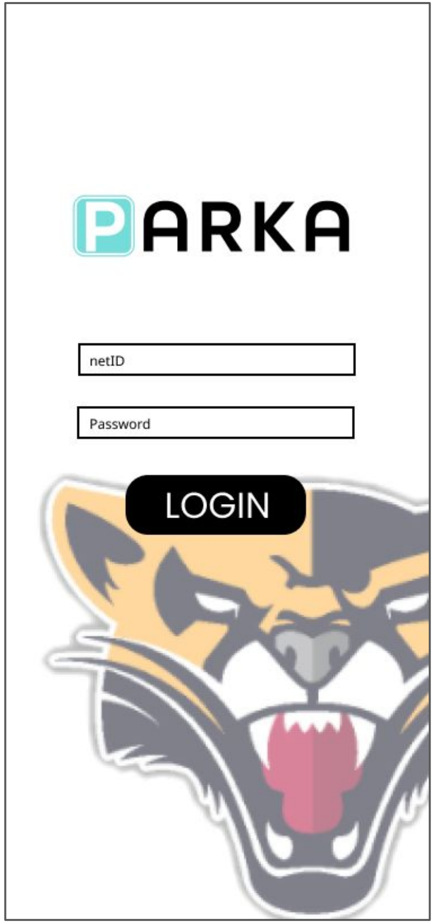


Select a camera: Camera 1

CAMERA 1

PROTOTYPE

PARKA

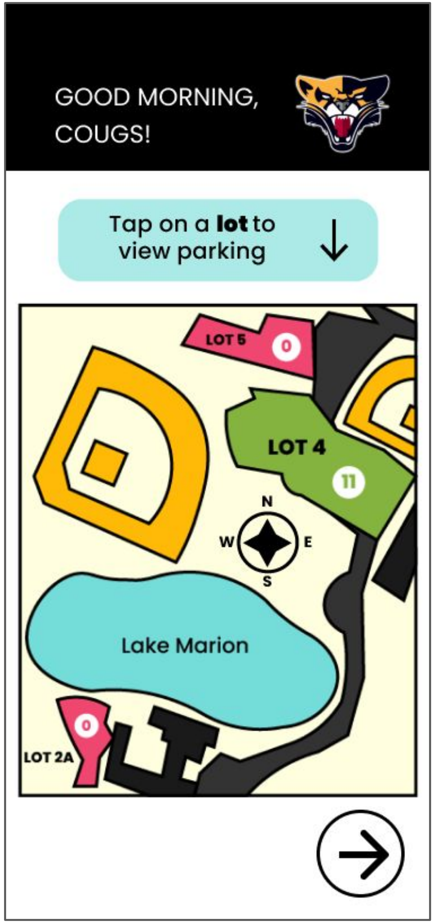


PARKA

netID

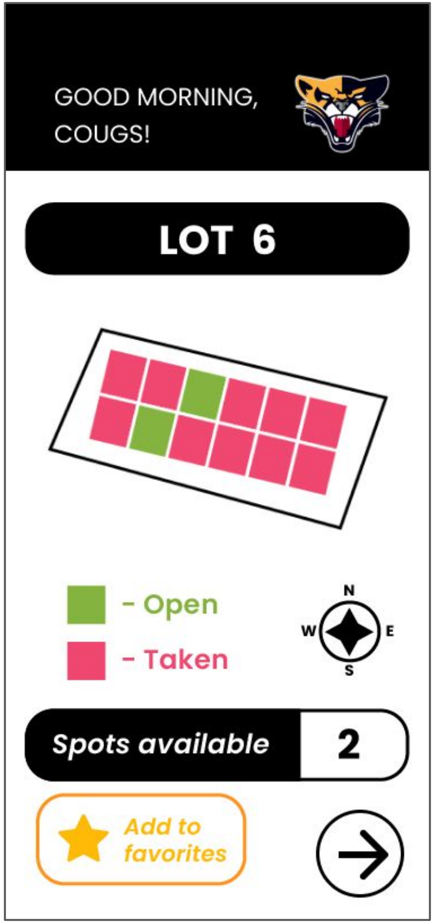
Password

LOGIN



GOOD MORNING,
COUGS!

Tap on a **lot** to view parking



GOOD MORNING,
COUGS!

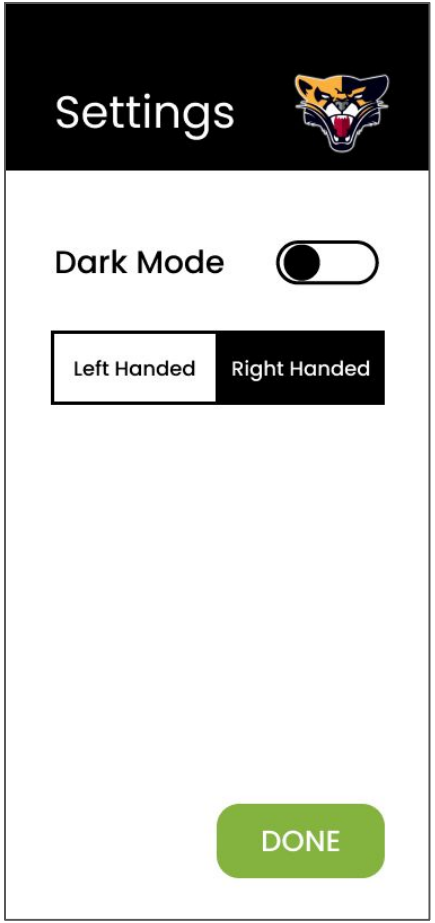
LOT 6

🟩 - Open

🟥 - Taken

Spots available 2

Add to favorites



Settings

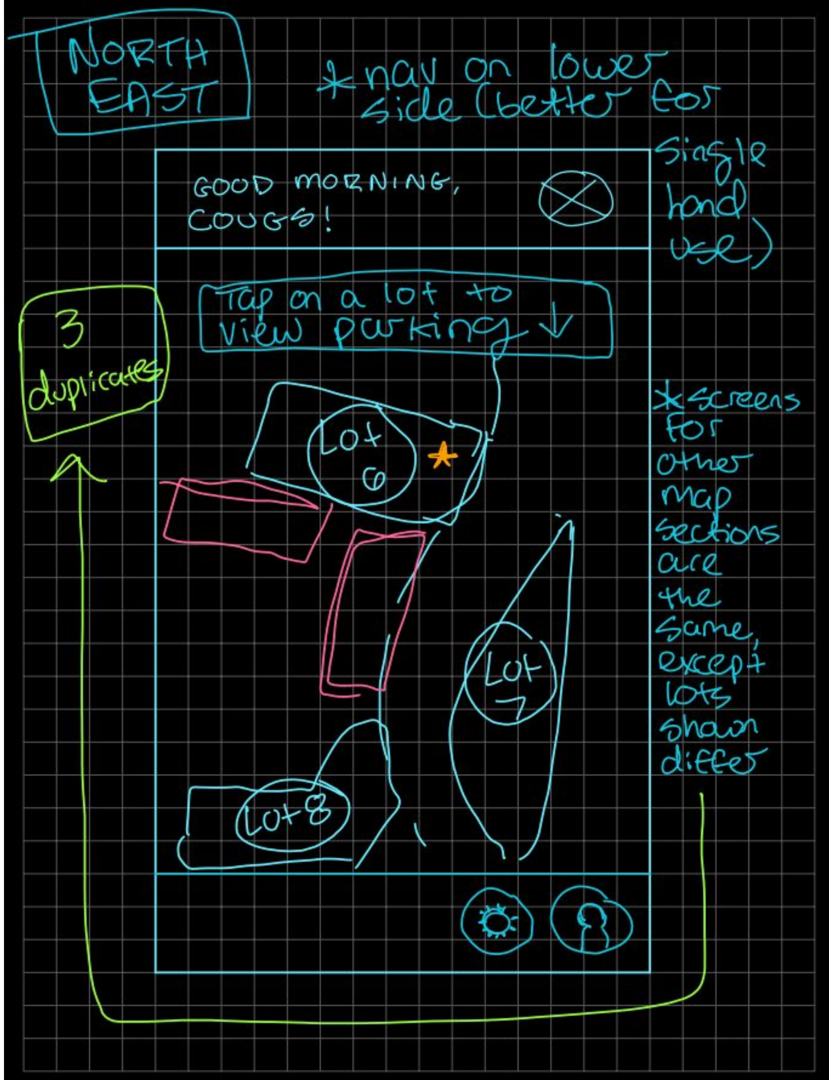
Dark Mode ○

Left Handed [✓ Right Handed]

DONE

Design Goals

- Easy to navigate
- Single-handed use
- Keep it simple
- Fun and clean design


NORTH EAST
* nav on lower side (better for single hand use)
GOOD MORNING, COUGS!
Tap on a lot to view parking ↓
3 duplicates
Lot 6
Lot 7
Lot 8
* screens for other map sections are the same, except lots shown differ

Figma

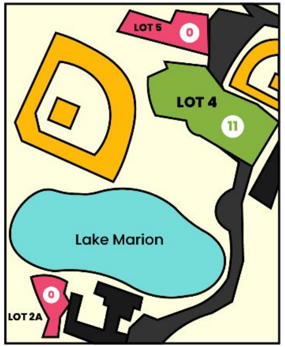
Art Assets

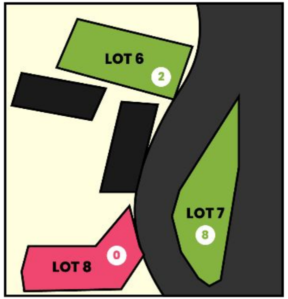
Tap on a **section** to view parking ↓

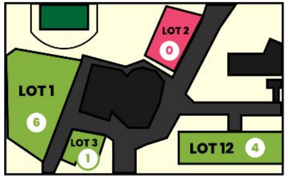
Tap on a **lot** to view parking ↓

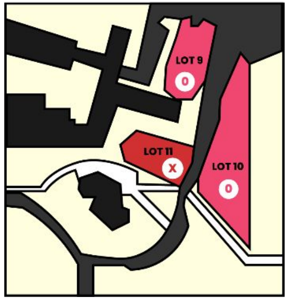
★ *Remove from favorites*

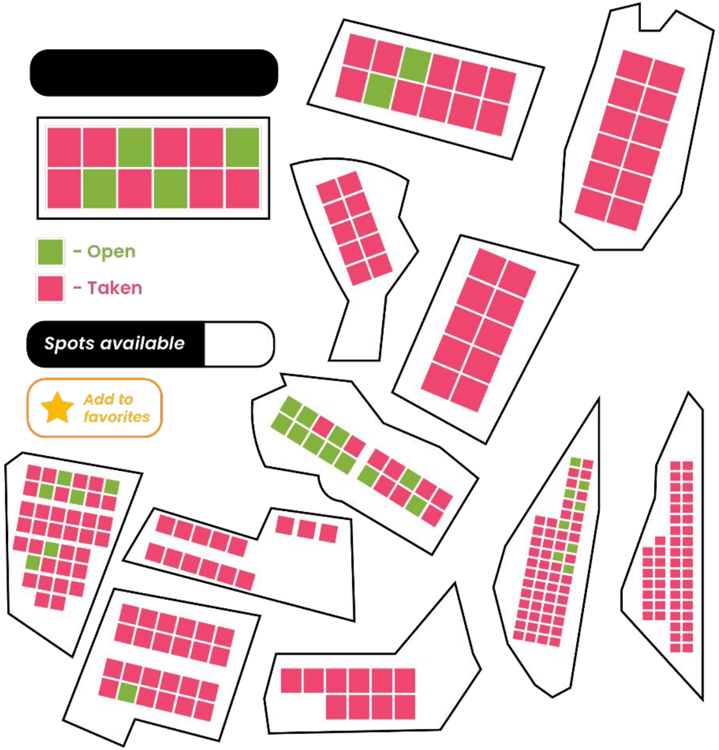
FONT: POPPINS











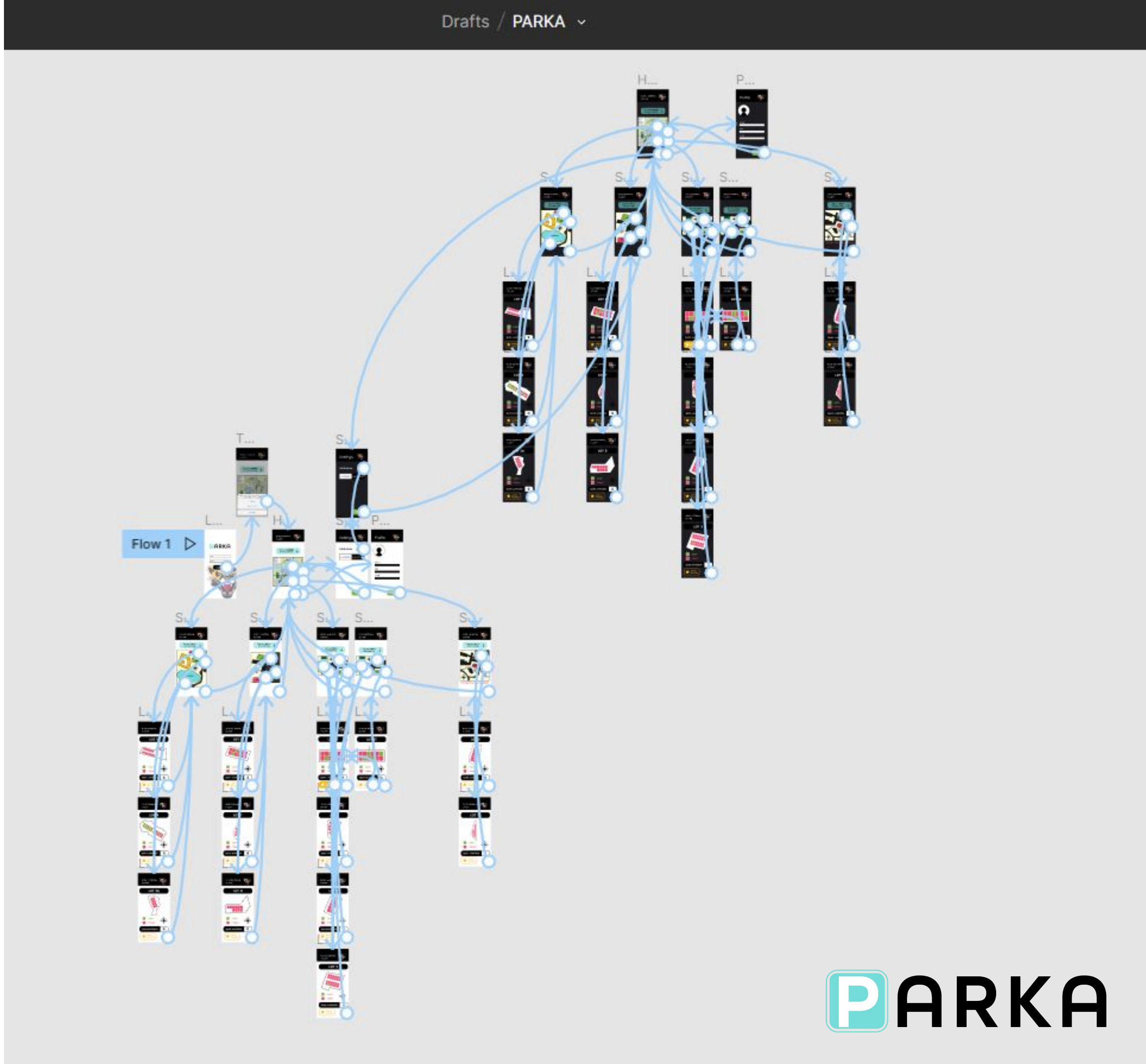
🟩 - Open

🟥 - Taken

Spots available

★ *Add to favorites*

Figma



PARKA

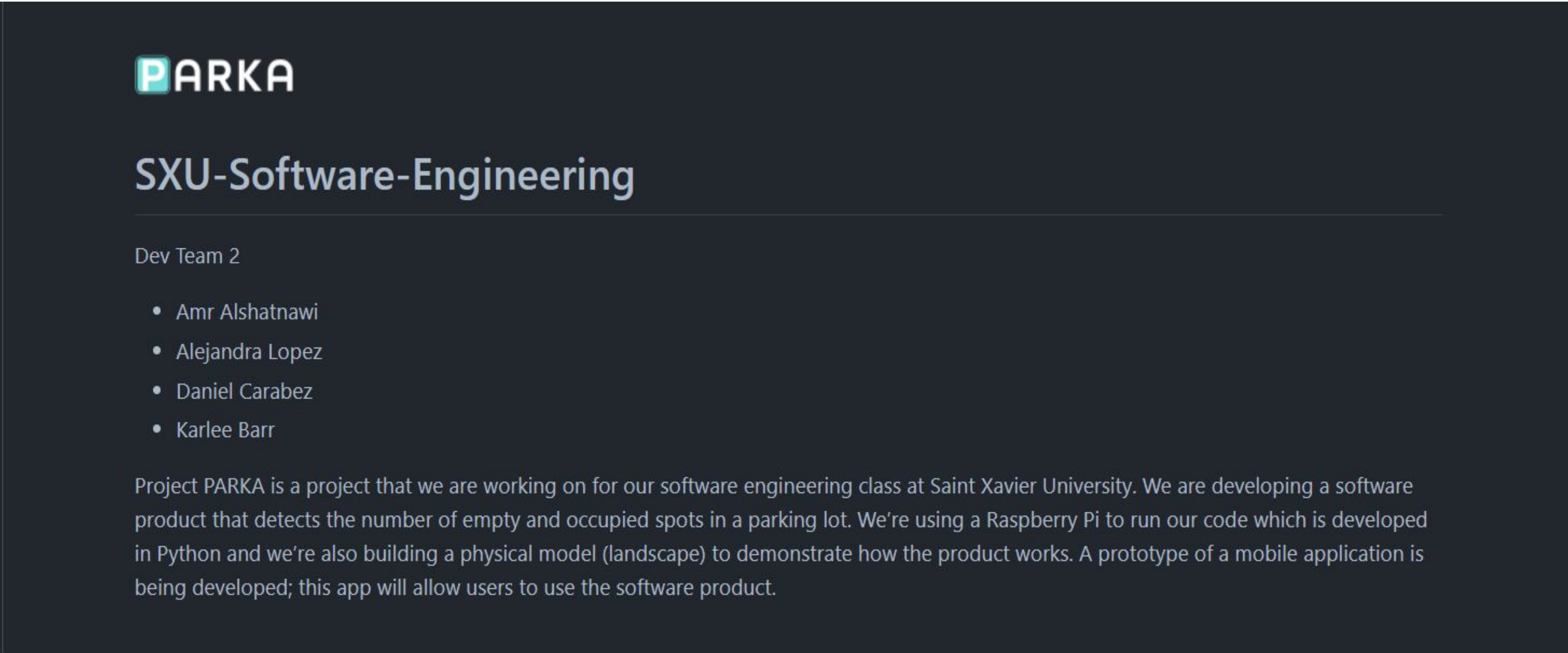
Did Tuckman’s Ladder apply?

Forming Storming Norming Performing

- What was it like to work in a team?
- What were your lessons learned?
- What were your takeaways?
- What was really difficult?
- What was easier than you thought it would be?

PARKA

GitHub



PARKA

SXU-Software-Engineering

Dev Team 2

- Amr Alshatnawi
- Alejandra Lopez
- Daniel Carabez
- Karlee Barr

Project PARKA is a project that we are working on for our software engineering class at Saint Xavier University. We are developing a software product that detects the number of empty and occupied spots in a parking lot. We're using a Raspberry Pi to run our code which is developed in Python and we're also building a physical model (landscape) to demonstrate how the product works. A prototype of a mobile application is being developed; this app will allow users to use the software product.

DEMO

You ready?