231201

AutoPark

Autonomous Car Parking

THE ACADEMIC of TEL AVIV-YAFFO COLLEGE

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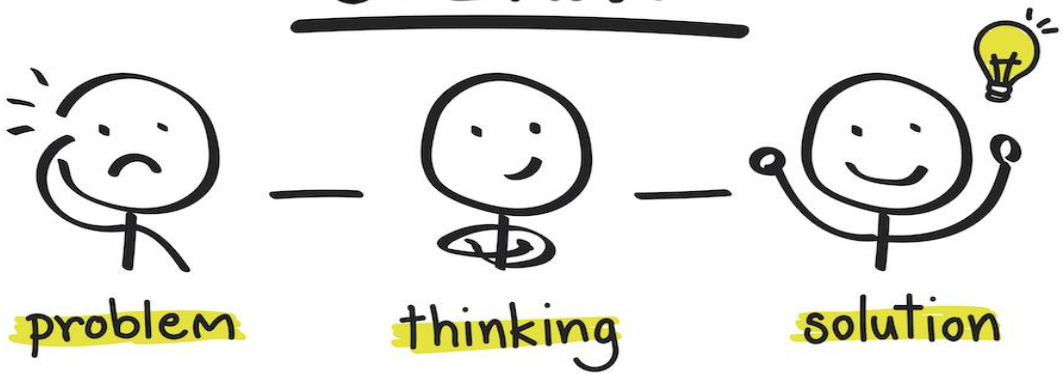
PROBLEM SOLVING



Traditional parking can be challenging and sometimes lead to collisions
The need arises to:
- Avoid parking crashes by using automatic parking
- Detect available parking slots accurately
- Safely guide the vehicle into the parking slot

Our innovative approach involves integrating cutting-edge technology:
- Utilizing ESP32 CAM and Android camera modules
-Implementing advanced image processing and object detection techniques

We provide a comprehensive solution by enabling autonomous parking:
- Real-time instructions sent to an electric car
- Empowering the vehicle to navigate and park autonomously within designated parking areas

Solution
Problem

Step 1 | Step 2 | Step 3 | Step 4

Scan car kit environment space:

Our system initiates by scanning the environment around the car kit and employs a camera to create a digital map of the surroundings

Detect objects in space:

Our cutting-edge image processing and object detection techniques come into play

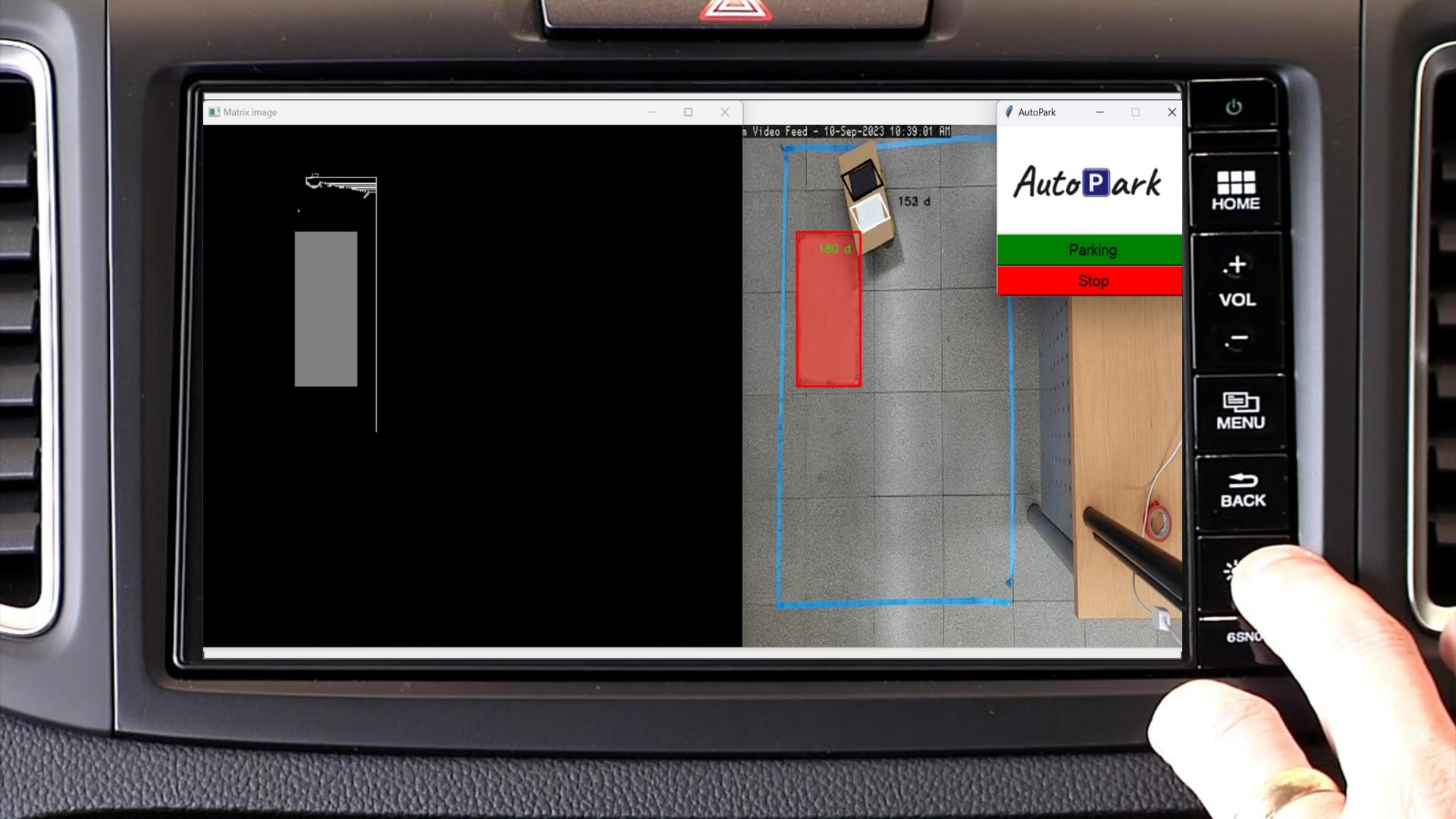
The system identifies borders, parking slots, and the car position

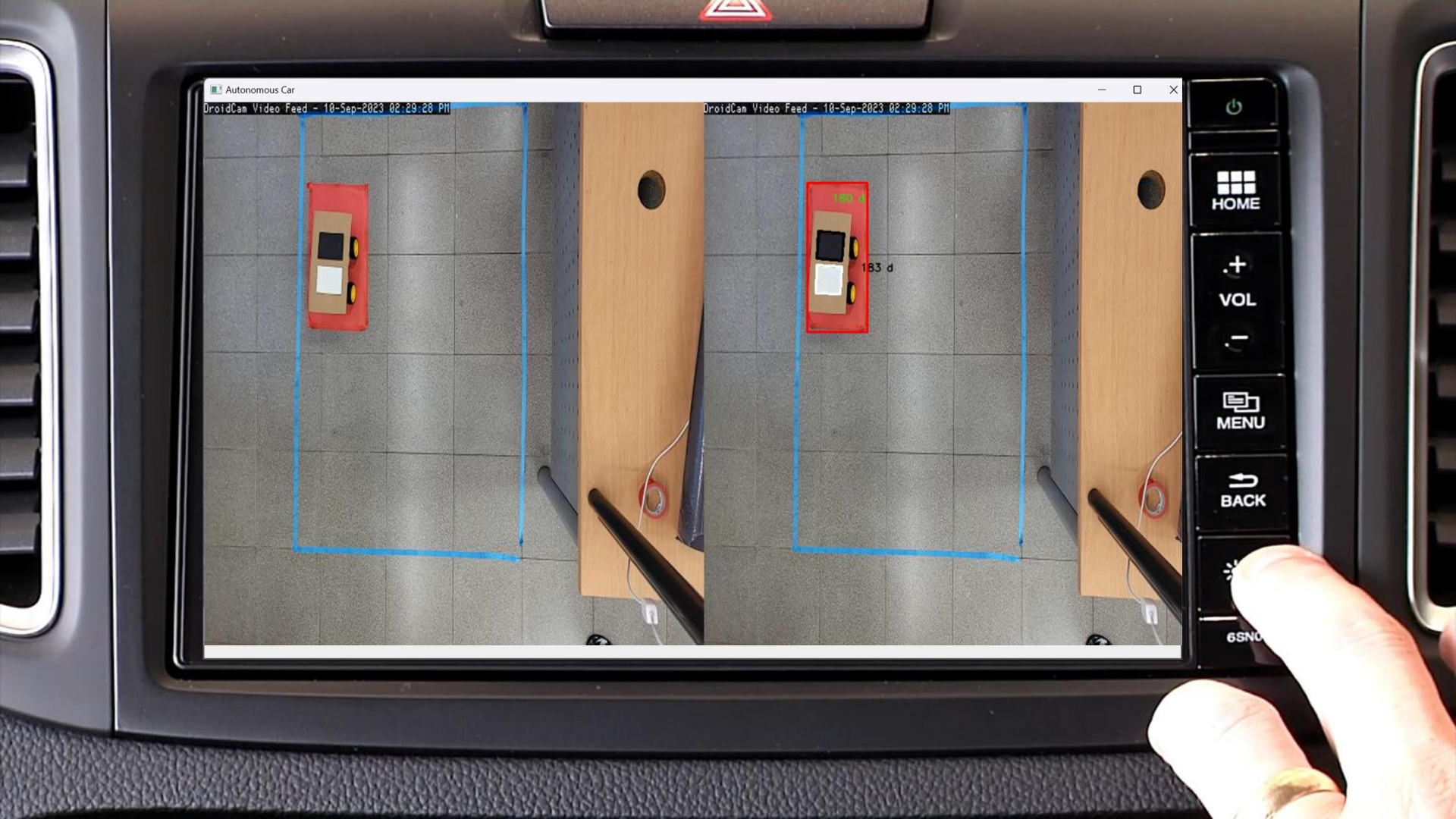
Move car autonomously to the parking slot:

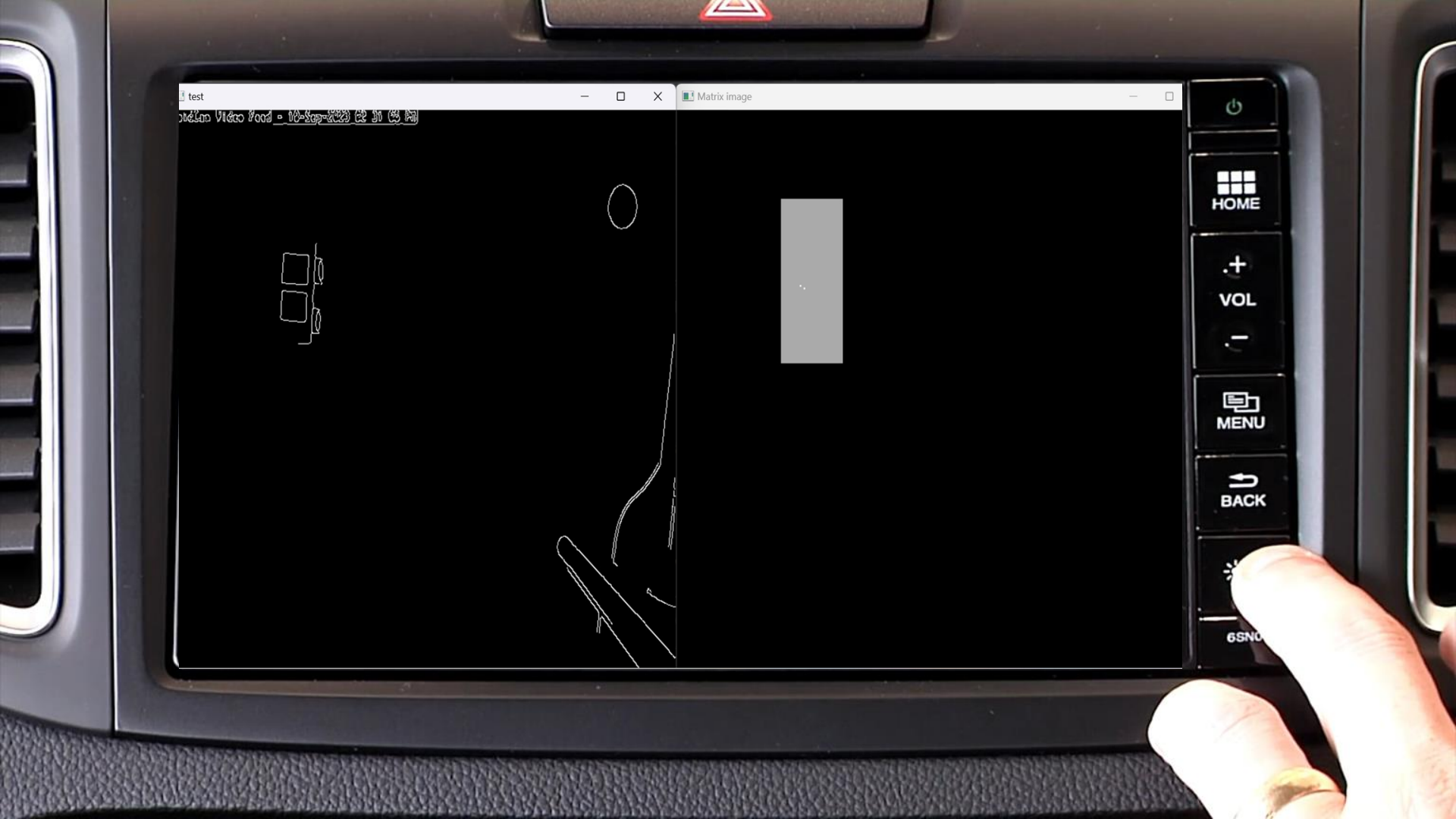
Leveraging real-time data and computations, the car autonomously navigates to the designated parking slot

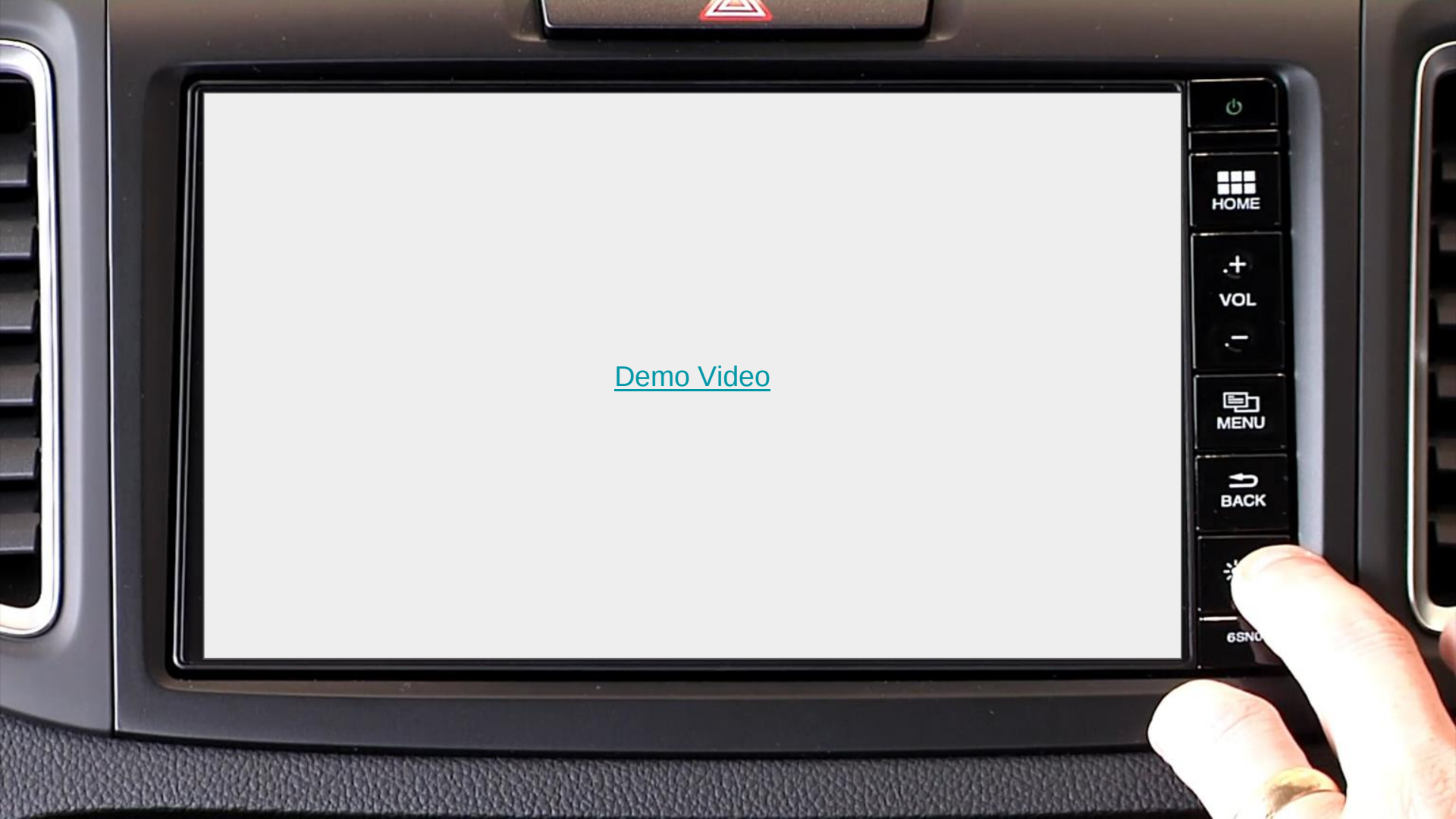
Successfully parking:

The final step involves skillfully maneuvering the car into the parking slot, With our system's guidance, parking is completed successfully, avoiding collision and errors


Matrix image
Video Feed - 10-Sep-2023 10:39:01 AM
153 d
180 d
AutoPark
AutoPark
Parking
Stop
HOME
VOL
MENU
BACK


Autonomous Car
DroidCam Video Feed - 10-Sep-2023 02:29:28 PM
DroidCam Video Feed - 10-Sep-2023 02:29:28 PM
180 d
183 d
HOME
VOL
MENU
BACK


test
Matrix image
HOME
VOL
MENU
BACK


Demo Video
HOME
VOL
MENU
BACK

How It Works

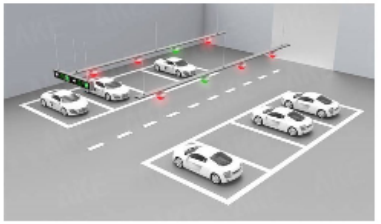
Flow Of Operations

Scan current state

Parse to grayscale matrix

2	3	2	2	1	1
19	15	6	7	10	4
68	46	8	27	25	26
115	67	26	40	32	27
170	120	67	63	40	26
220	200	150	112	66	48

Objects detection using OpenCV



Parse to system data structure matrix

1	1	1	1	1	1
2	2	3	1	1	1
2	2	3	1	1	1
1	1	1	1	1	1
0	0	0	4	4	4
0	0	0	4	4	4

Send moving orders to the RC car

HTTP server

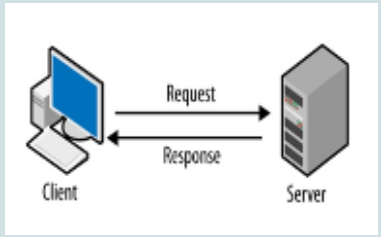
How It Works

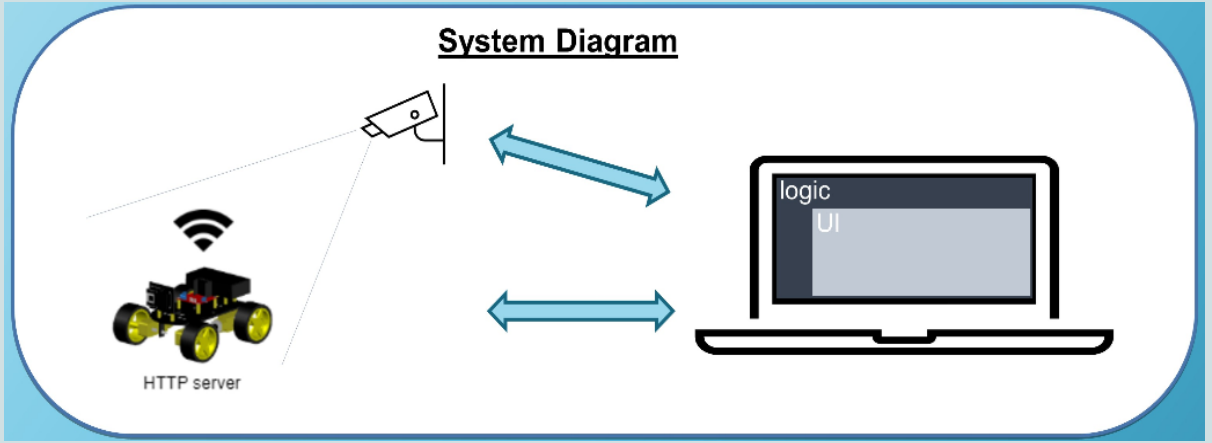
python

OpenCV

HTTP server

ARDUINO IDE


Request
Response
Client
Server


System Diagram
HTTP server
logic
UI

Other solutions can be made such as:

- **Guiding Car Between Lines:**
  Utilizing proximity sensors and predefined algorithms to navigate the car between designated parking and driving lines

- **Onboard Car Camera (POV):**
  Installing a camera directly on the car to provide a Point-of-view perspective during parking maneuvers

- **Incorporating Sensors or Indicators:**
  Implementing additional sensors or indicators around the parking area to assist in detecting and guiding the car

- **Autonomous Valet Parking (AVP):**
  Implementing a more comprehensive autonomous valet parking system, where the car can park itself and return to the driver when summoned

We appreciate your time and interest in our Autonomous Car Parking System project.

Our journey doesn’t end here. Feel free to reach out with questions or explore further collaborations.