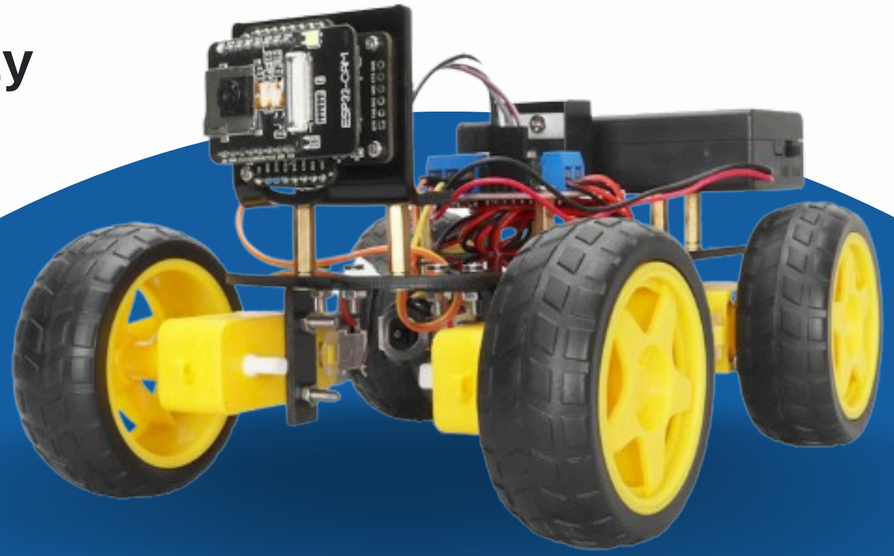
THE ACADEMIC of TEL AVIV-YAFFO COLLEGE

Project Number: 15006103

Virtual Rail Autonomous Vehicle

Talide

Delivering the Future, **Autonomously**



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Introduction

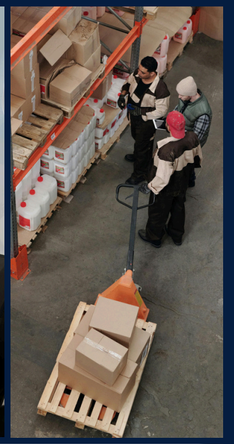
The logistics and shipping industry is crucial for global trade but struggles with challenges like faster delivery demands, cost reduction, and safety in complex environments.

We created an autonomous vehicle designed specifically for logistics, to help us meet our goals of improving how goods are transported within warehouses and cities.

Our aim is to transform logistics by integrating technology that can revolutionize the field and elevate it to higher standards.

Current Challenges in Delivery Logistics

Our audience includes logistics companies, warehouse operators, and municipalities who seek to enhance efficiency and overcome challenges in urban transportation and logistics.



Inefficiency & High Labor Costs

Manual processes slow down operations and increase labor expenses.

Increased Human Error

Errors in deliveries and inventory management are more common.

Lack of adaptation to peak demand

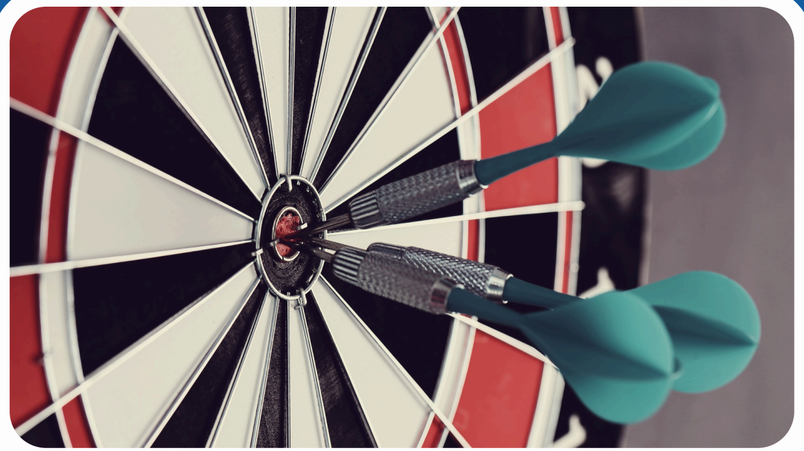
Difficulty in scaling effectively as demand increases.

How Autonomous Vehicles Address These Issues

Our solution provides the following benefits:

Boosts Efficiency & Cuts Costs

Automates tasks, reducing labor needs and speeding up operations.



Reduces Human Error

Accurate navigation and delivery reduce mistakes and misplacements.

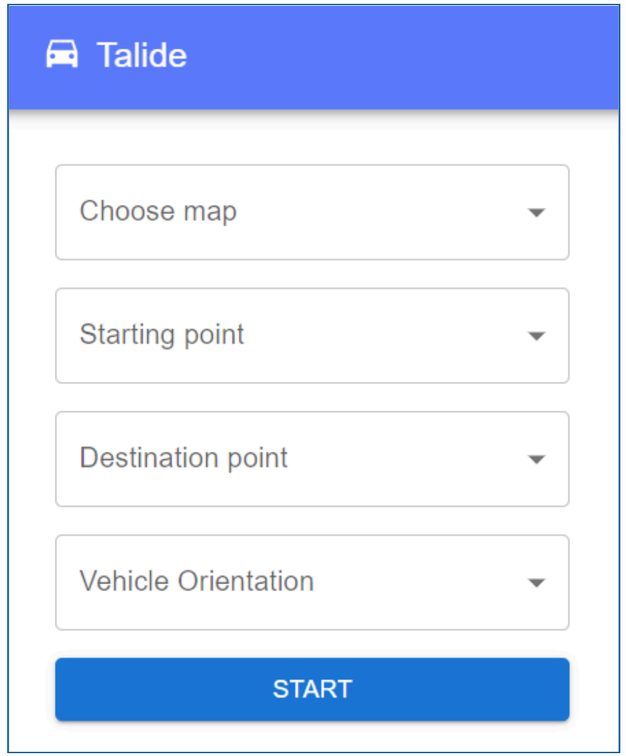
Adapts to Peak Demand

Easily adapts to increasing volumes and peak loads without extensive manual intervention.

Task Creation Overview

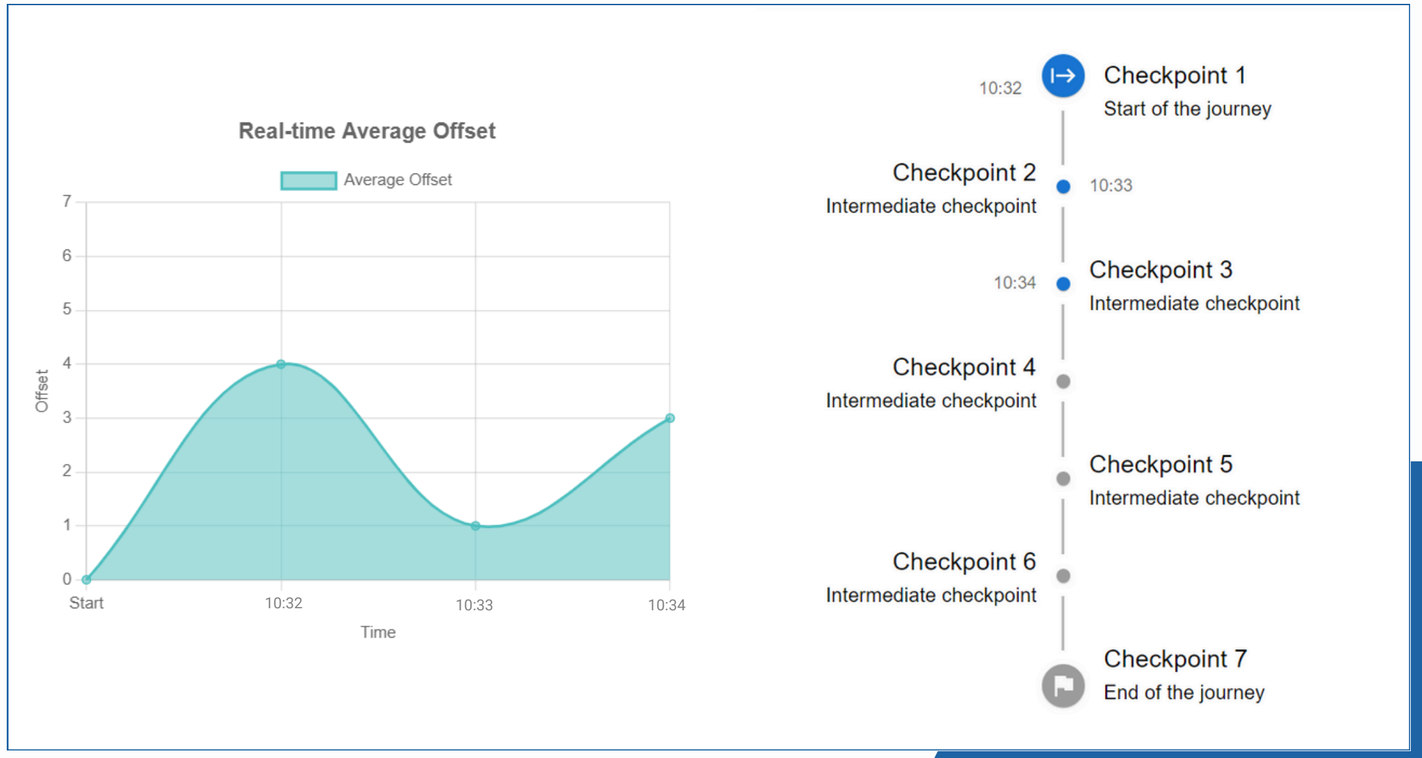
1

Here, users enter map details, start/end points, and vehicle orientation before initiating the delivery with the 'Start' button.



2

After starting a new delivery task, users are taken to the trip details page. Here, the timeline shows real-time vehicle positions, and the chart displays lane detection accuracy, offering key insights into the vehicle's performance.



Vehicle Navigation Along The Route

The vehicle’s navigation process begins with the server receiving delivery task details and calculating the optimal route, including checkpoints and turn instructions.
These instructions are sent to the vehicle’s control module, which drives the vehicle, processes a video stream to detect markers, and compares them with server instructions to execute the correct navigation actions, ensuring the vehicle stays on course.

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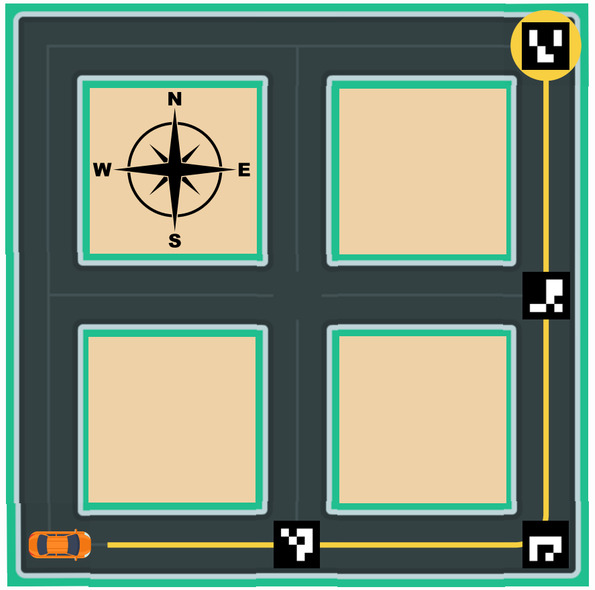

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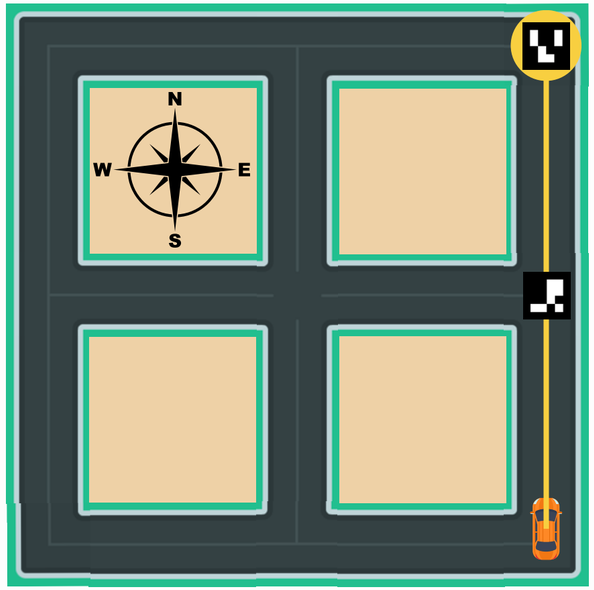

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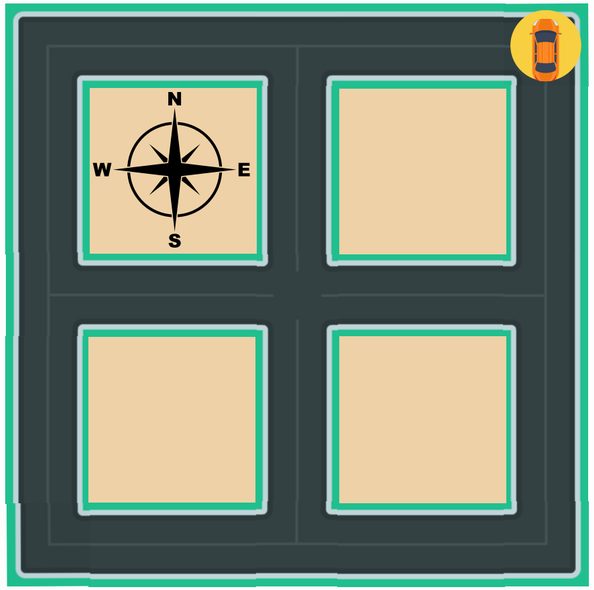
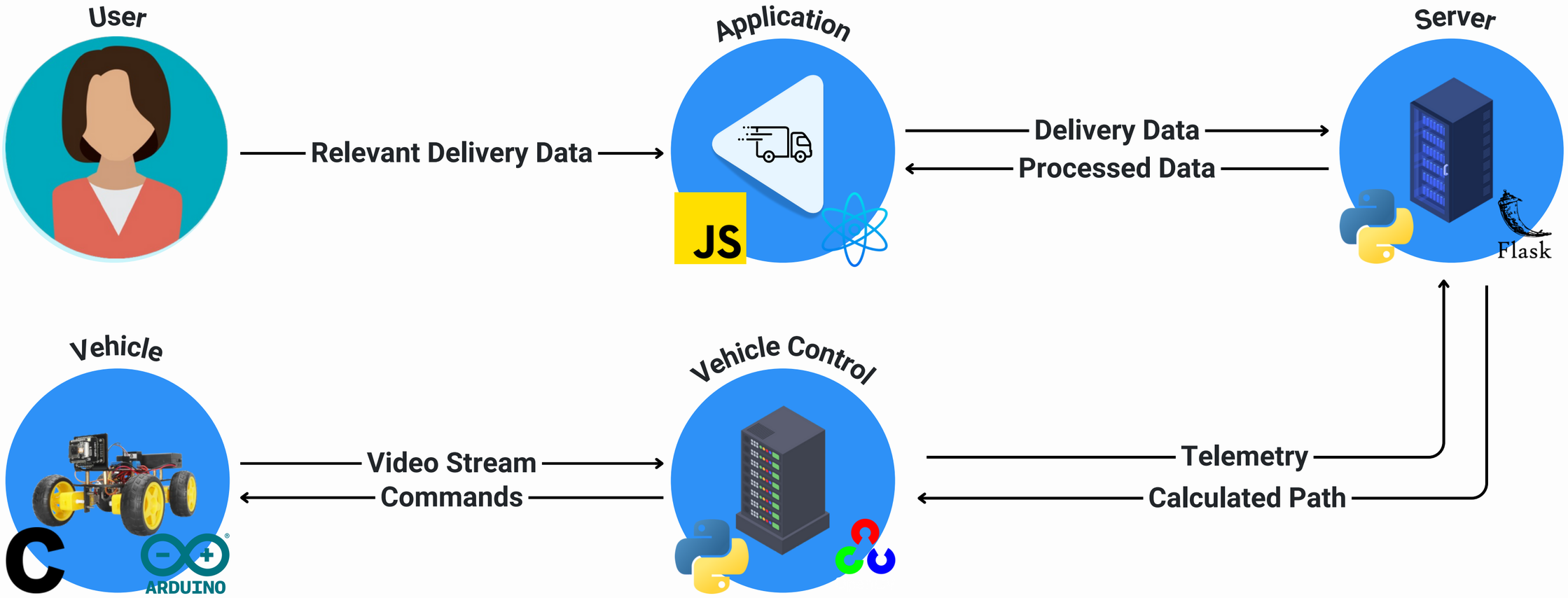
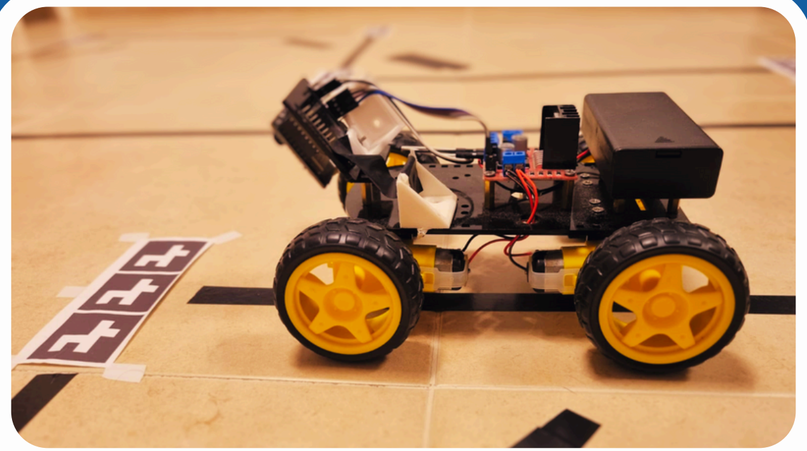


How Our System Works?



Key Components

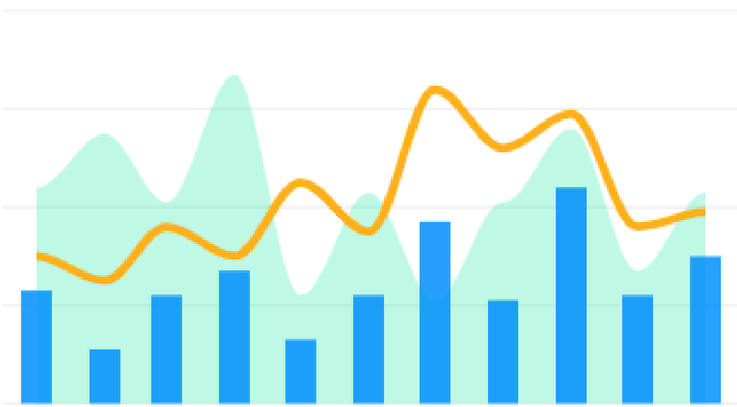


Using ArUco Markers as a Compass

The vehicle uses ArUco markers as a compass to determine its facing direction by analyzing the markers' yaw angles.

Lane Detection Algorithm

Our lane detection algorithm finds the lane position and can be adapted to different light conditions.



Telemetry and Statistics Display

Provides essential insights into vehicle performance, enabling monitoring of telemetry data, such as the accuracy of lane tracking.

Another Possible Solution

Autonomous vehicles can use different technologies for lane tracking, each with its own advantages and limitations.

One alternative solution is line tracking using light sensors.
This method is simple and effective.

However, our camera-based lane detection system offers more significant benefits.

While light sensors only detect a black path without providing any additional data,

Our solution can integrate lane color and shape into the detection process. By leveraging the camera, we analyze a range of visual data, including lane color, shape, and width, and detect various markers.

This results in more accurate and dynamic routing, making our approach a more versatile and robust solution for autonomous vehicle lane tracking.

Conclusion: Transforming Logistics with Advanced Technology

Our autonomous vehicle solution addresses key challenges in the logistics industry by integrating advanced technology.

By automating tasks, reducing human error, and adapting to peak demand, it ensures more efficient operations.

With telemetry and statistical analysis, users can monitor and optimize vehicle performance with precision.

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THANK YOU!