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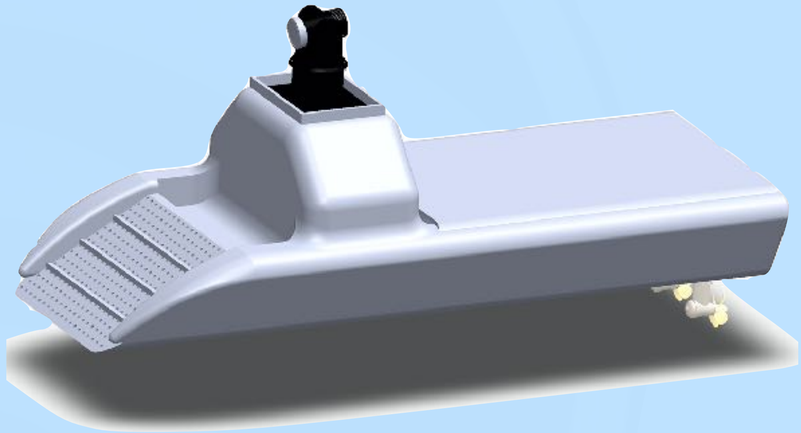
Mustafa EROL
mustafa@iwrobotx.com
info@iwrobotx.com

Autonomous Sea Cleaning Vessels & Ship Technologies

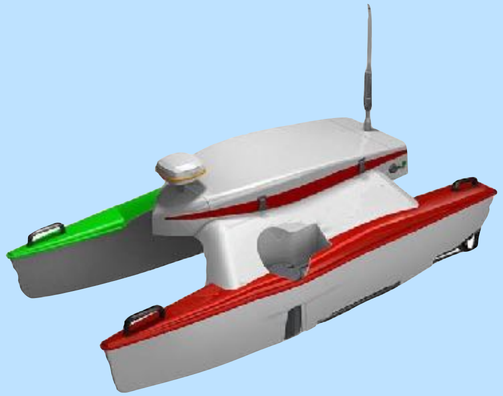
Air Vehicles

Autonomous Air Vehicles



Marine Vehicles

Autonomous Sea Cleaning Vehicles



Sea Robot

Autonomous Sea Cleaning Robots

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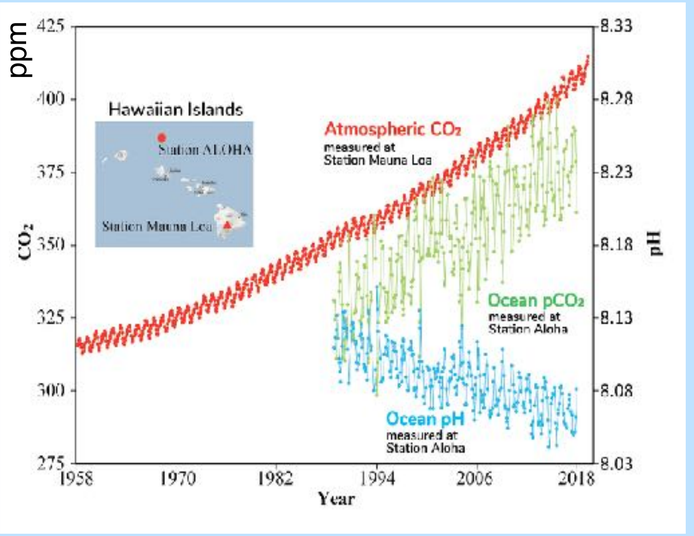
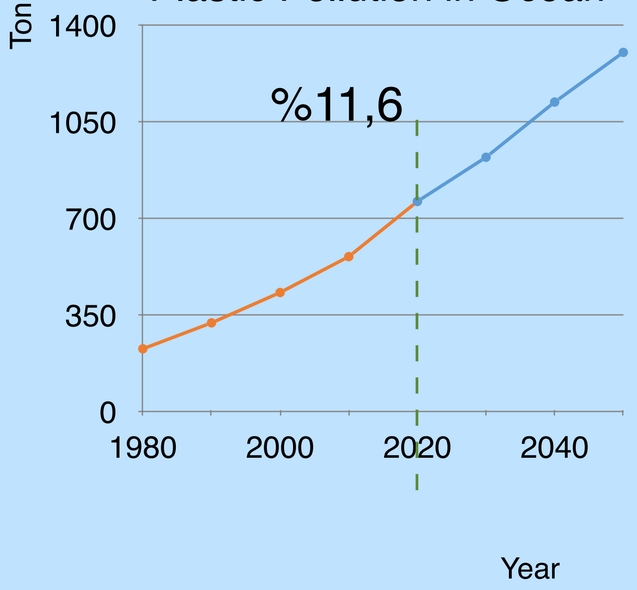
Problem

Acidification in Ocean



Plastic Pollution in Ocean



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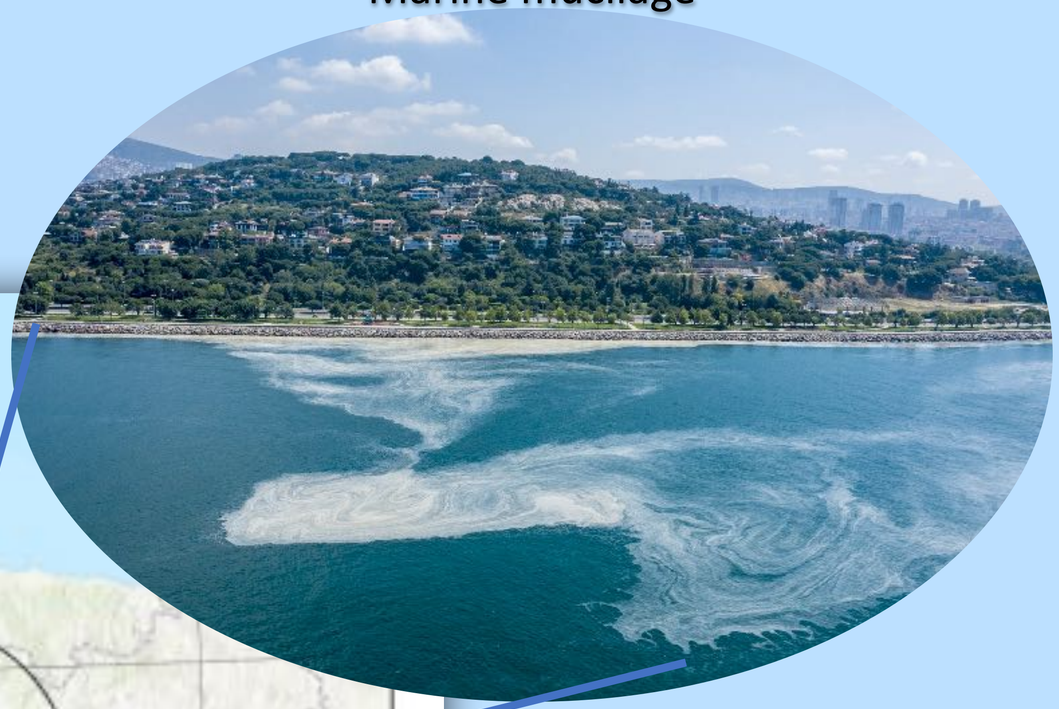
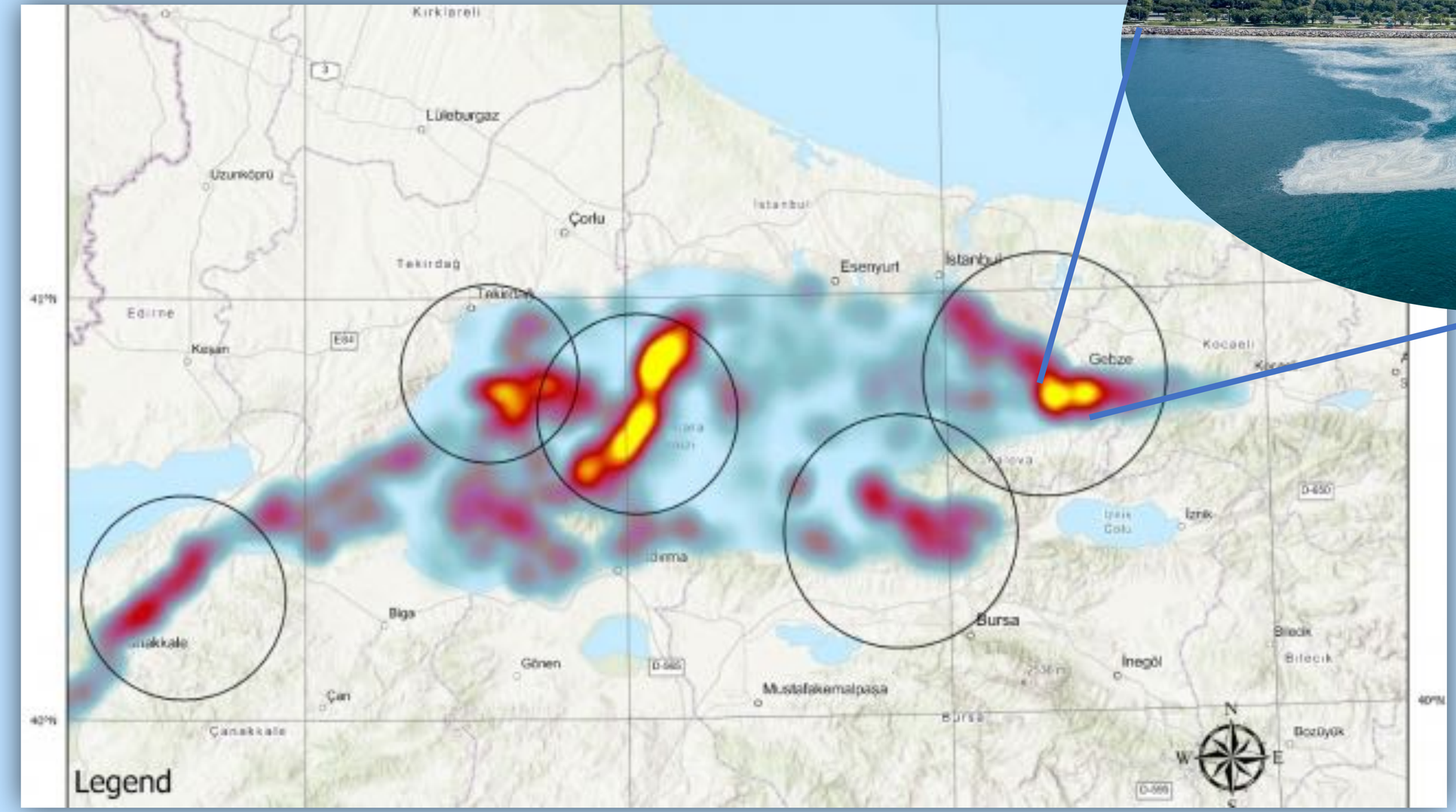
Background & Motivation

What is mucilage?
(sea saliva)

Background & Motivation



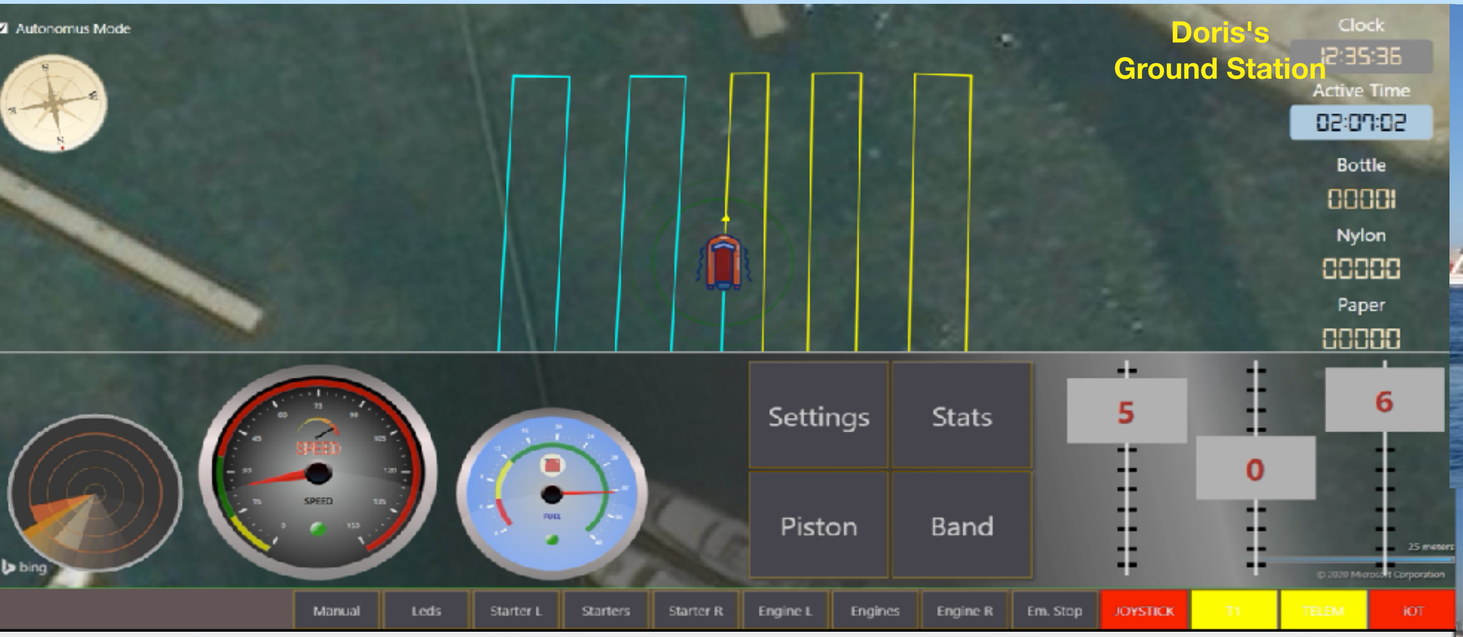


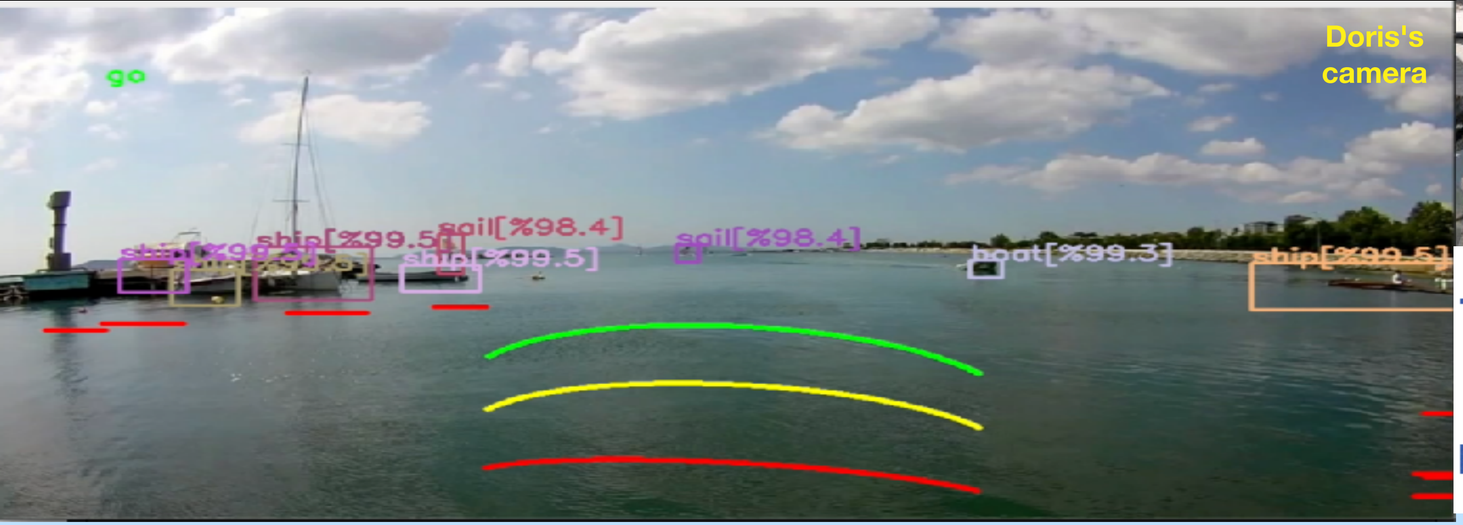
Started: November 2020

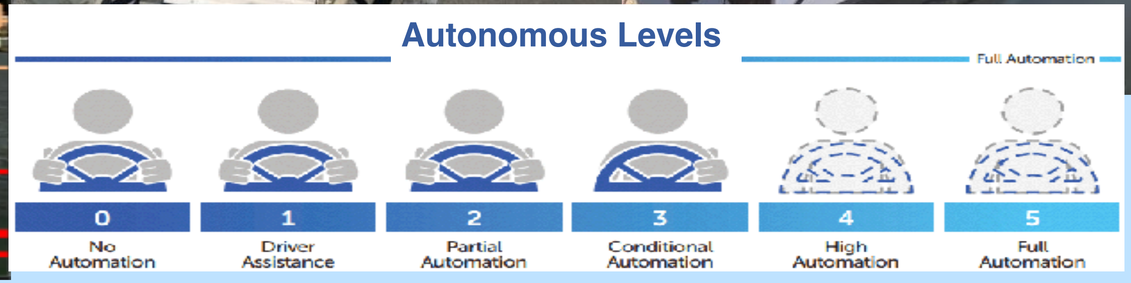
Thickened: June 2021

Autonomous Sea Vessels

Doris: Autonomous Sea Cleaning Vehicle With Level-5

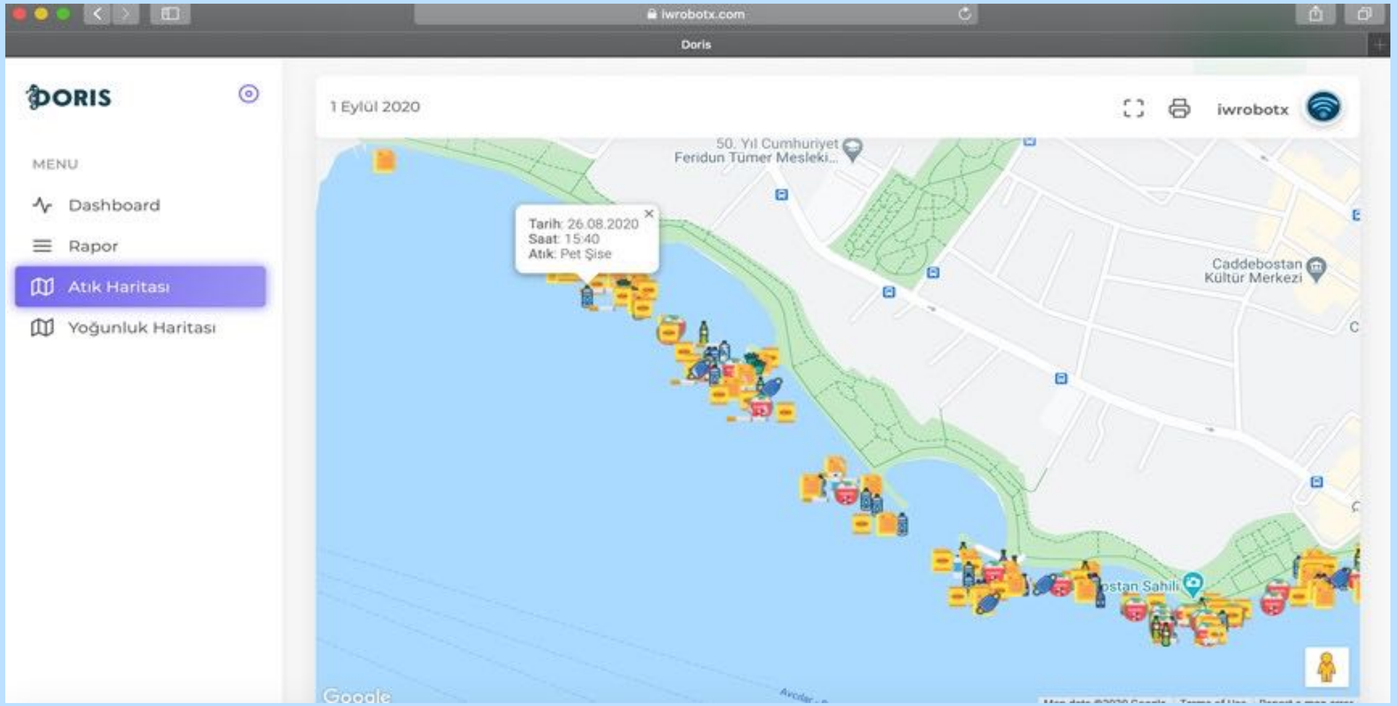


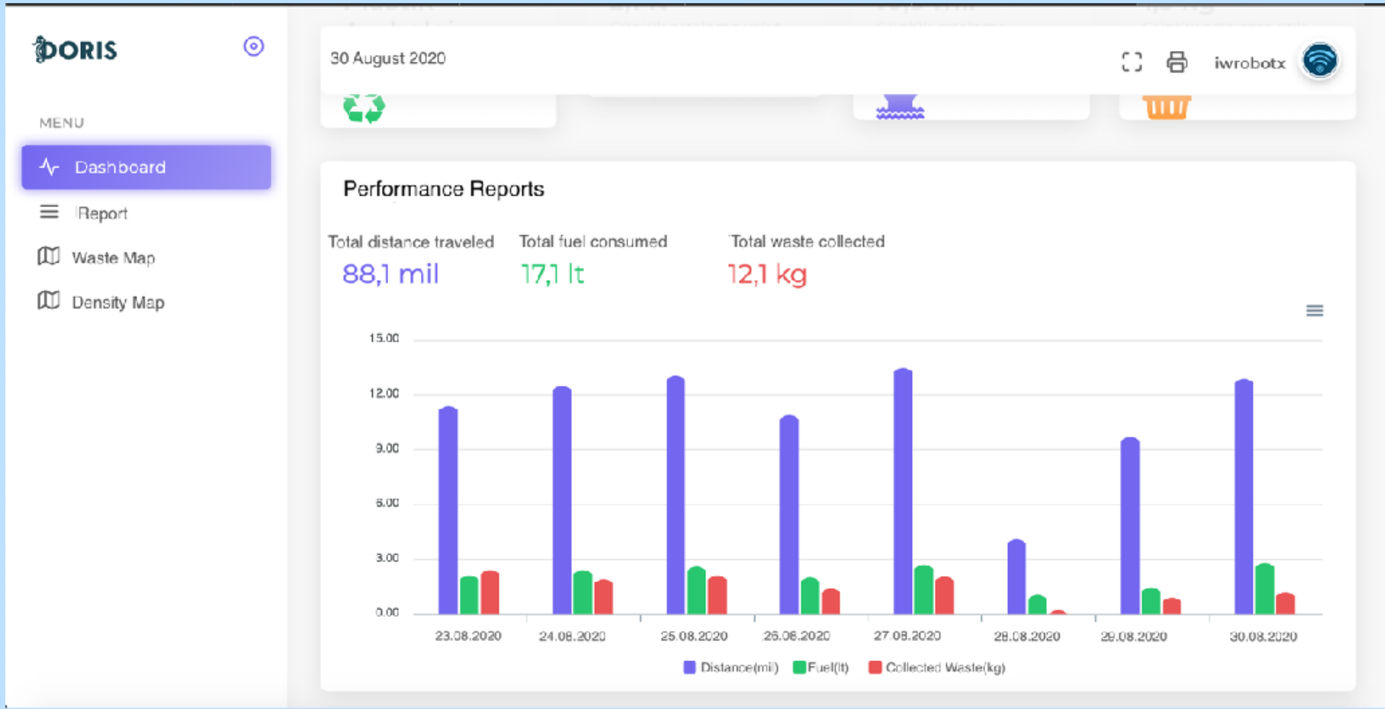




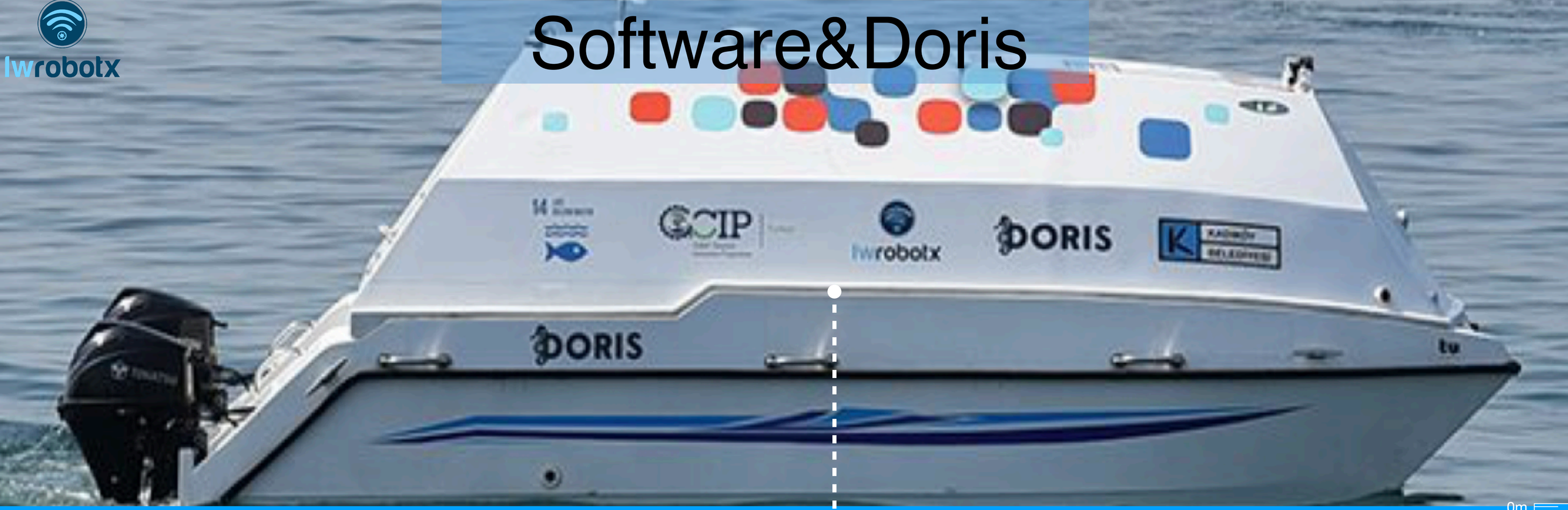
DORIS

- Solid Waste Cleaning (Plastic, Glass etc.)
- Liquid Waste Cleaning (Petroleum, Oil etc.)
- Marine Mucilage Cleaning
- Waste classification & Map Creation
- Real Time Report Technology





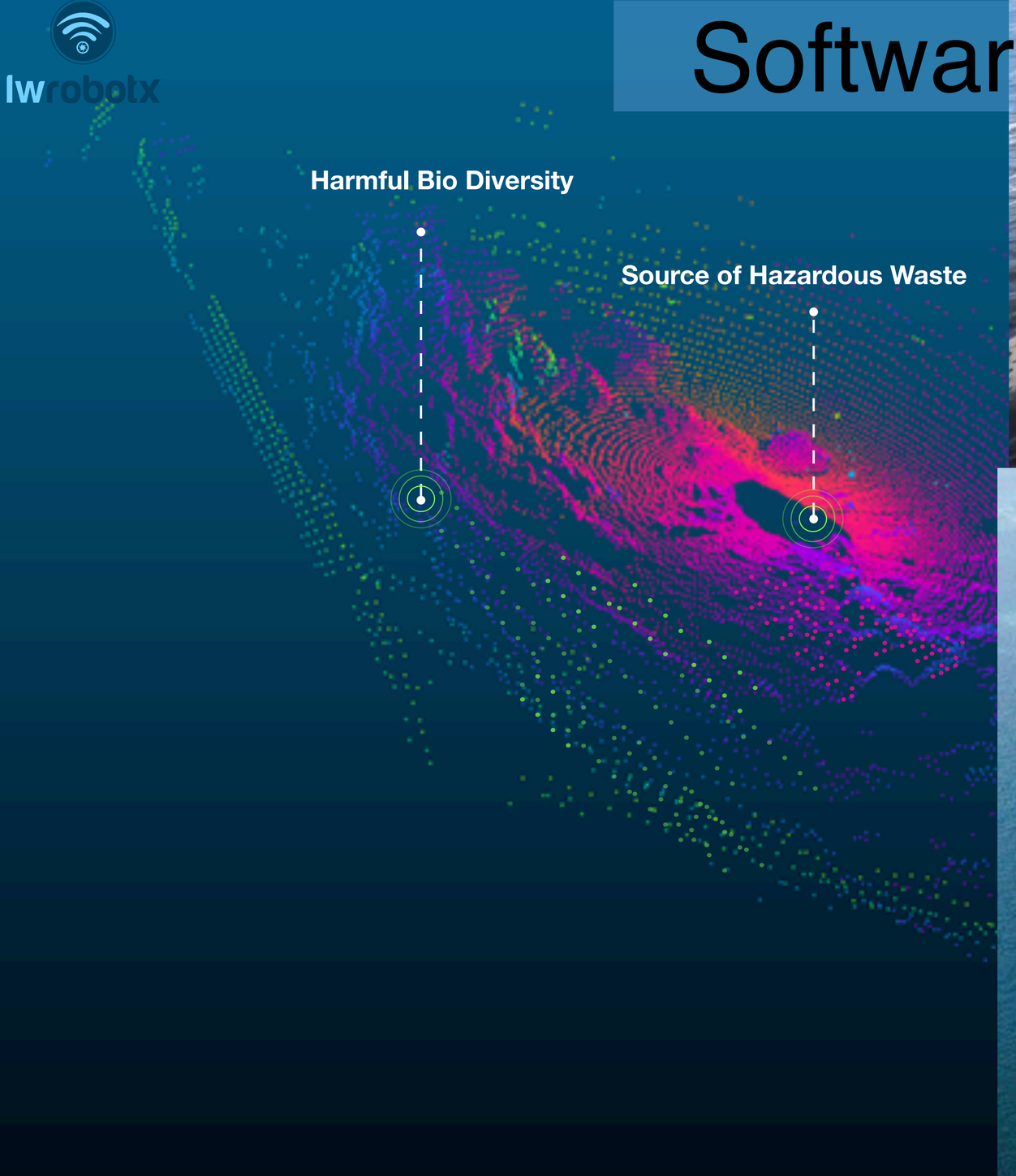
Software&Doris



- Seasons Change Map
- Sea Flow Map
- Oceanography
- Hydrography
- Climate Change
- Micro Plastic Map
- Sea Temperature Map
- Acidic Pollution Map(CO2, SO2,PO4,NH3)
- Biodiversity

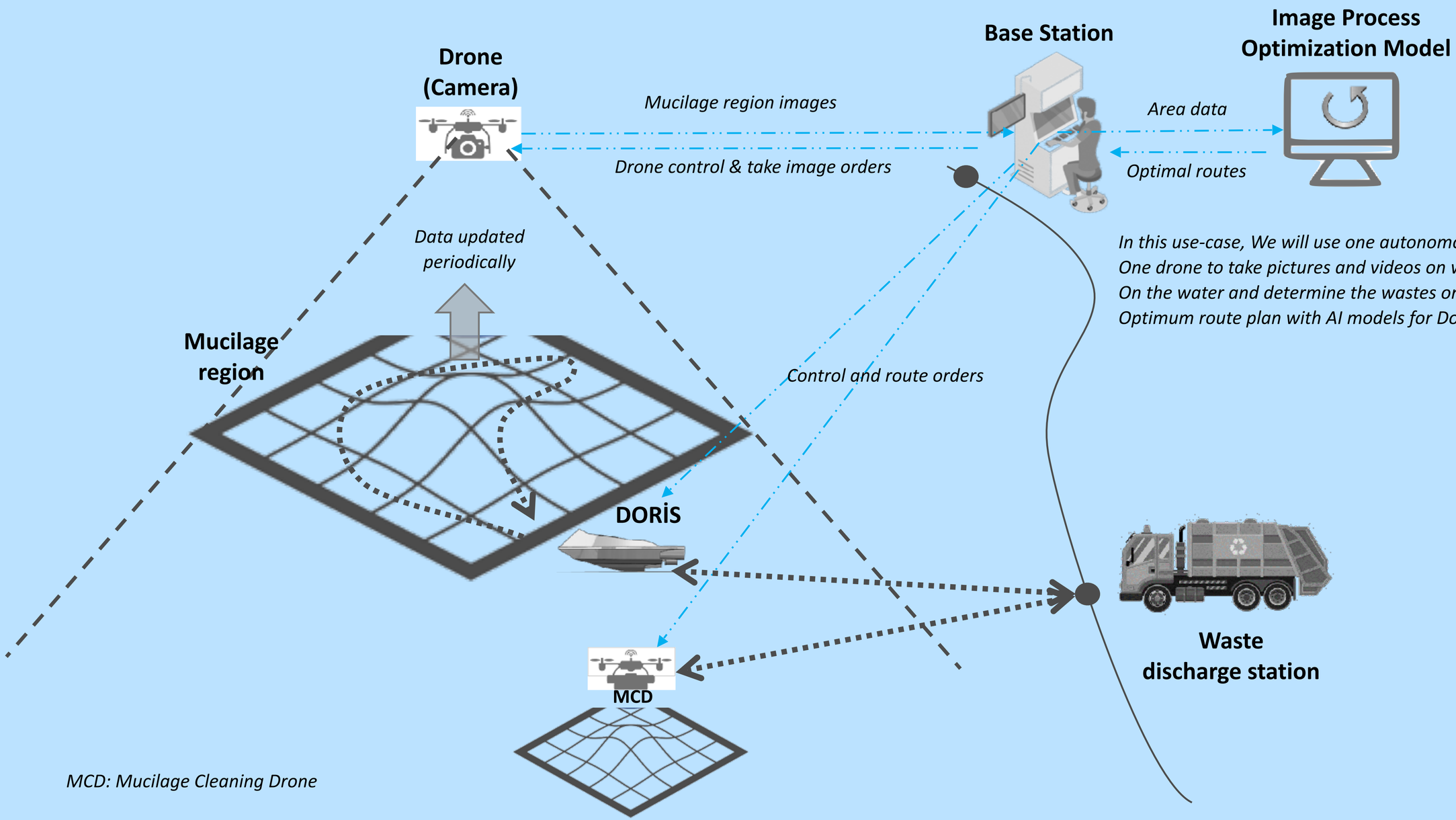
0m
20m
40m
60m
80m
110m
120m

Software&Doris



AIplan4EU Use-Cases

Route Planing for Autonomous Sea Cleaning Vehicles



In this use-case, We will use one autonomous sea cleaning Vessel (Doris), One drone to take pictures and videos on water surface. When drone fly On the water and determine the wastes on the water, we will make Optimum route plan with AI models for Doris to clean the sea surface.

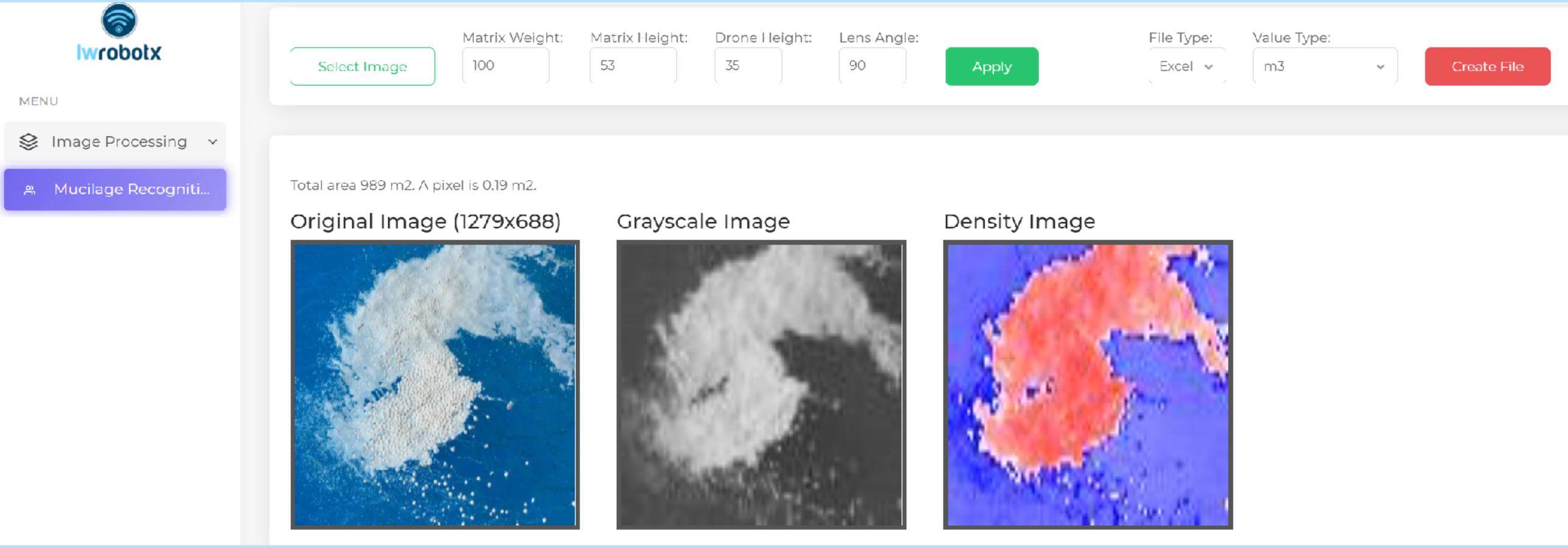
MCD: Mucilage Cleaning Drone

Modeling Approach

Step 1: Image Processing / Machine Learning

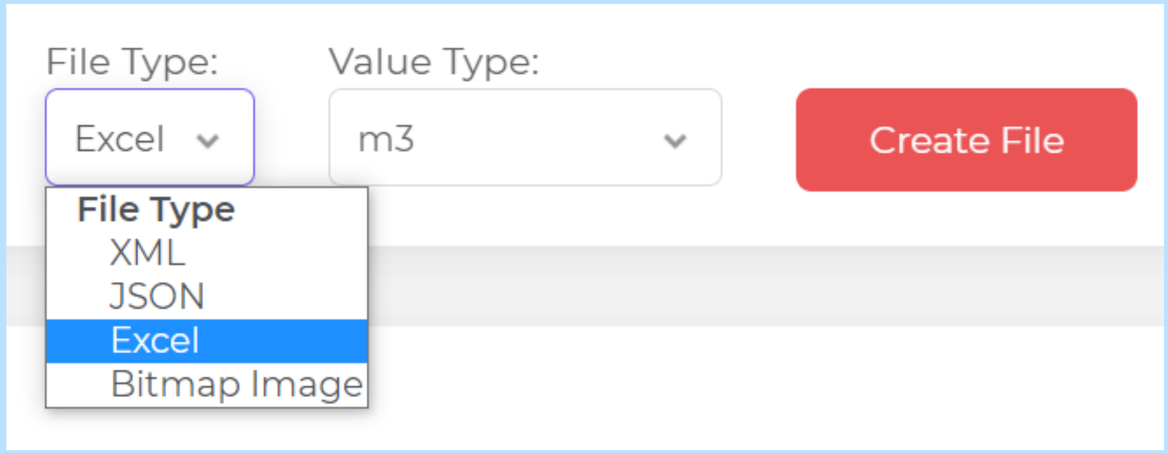
https://mucilage.iwrobotx.com/Home/Image

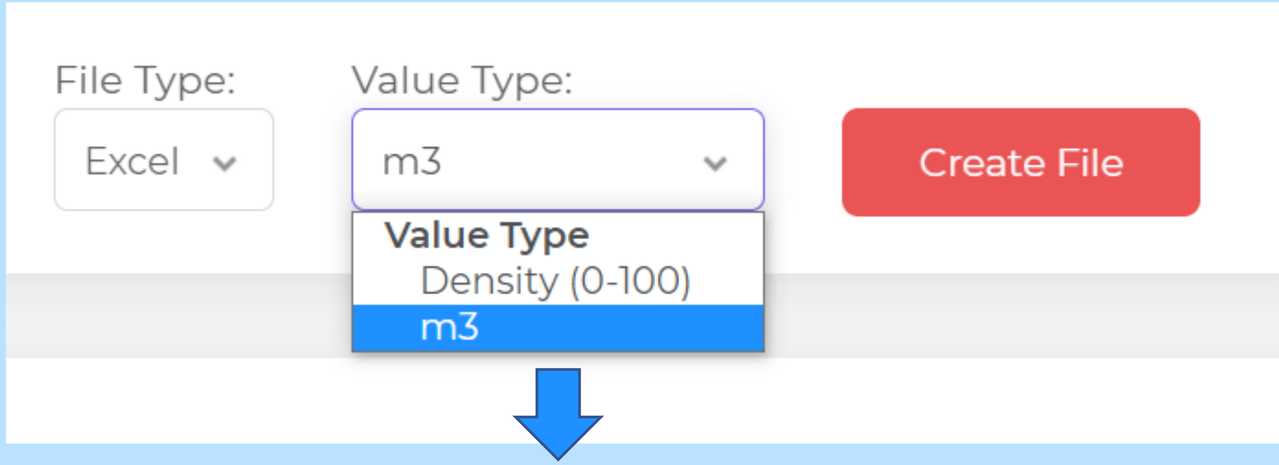
In this use-case, When drone fly on the water and we will use the software tool for determination of wastes on the water, we will develop optimum route plan with AI models for Doris.
Note: The software tool can detect only mucilage in this stage.



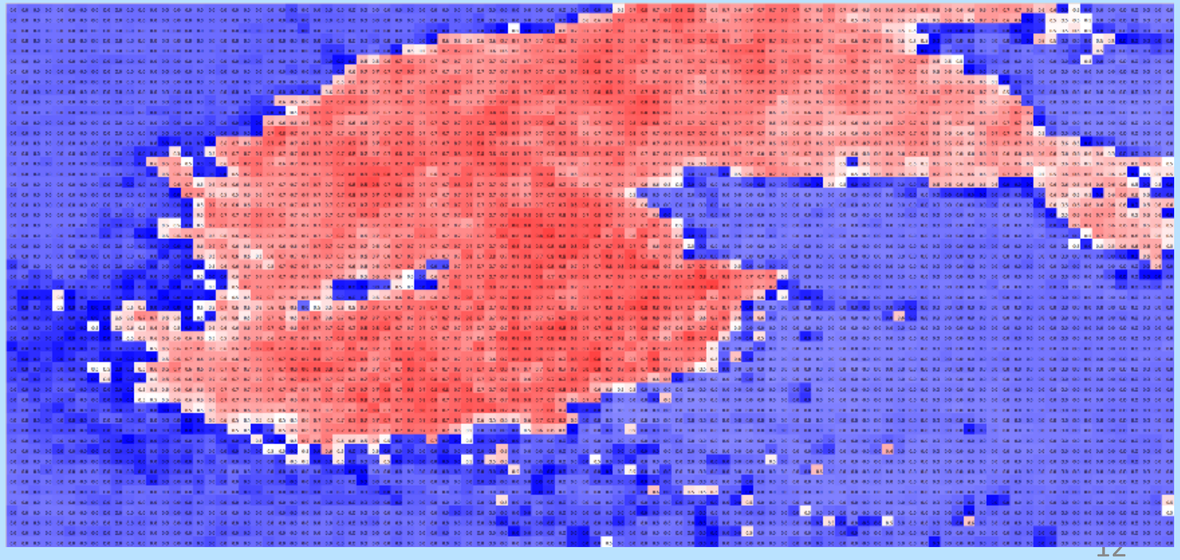
Modeling Approach

Step 1: Image Processing / Machine Learning



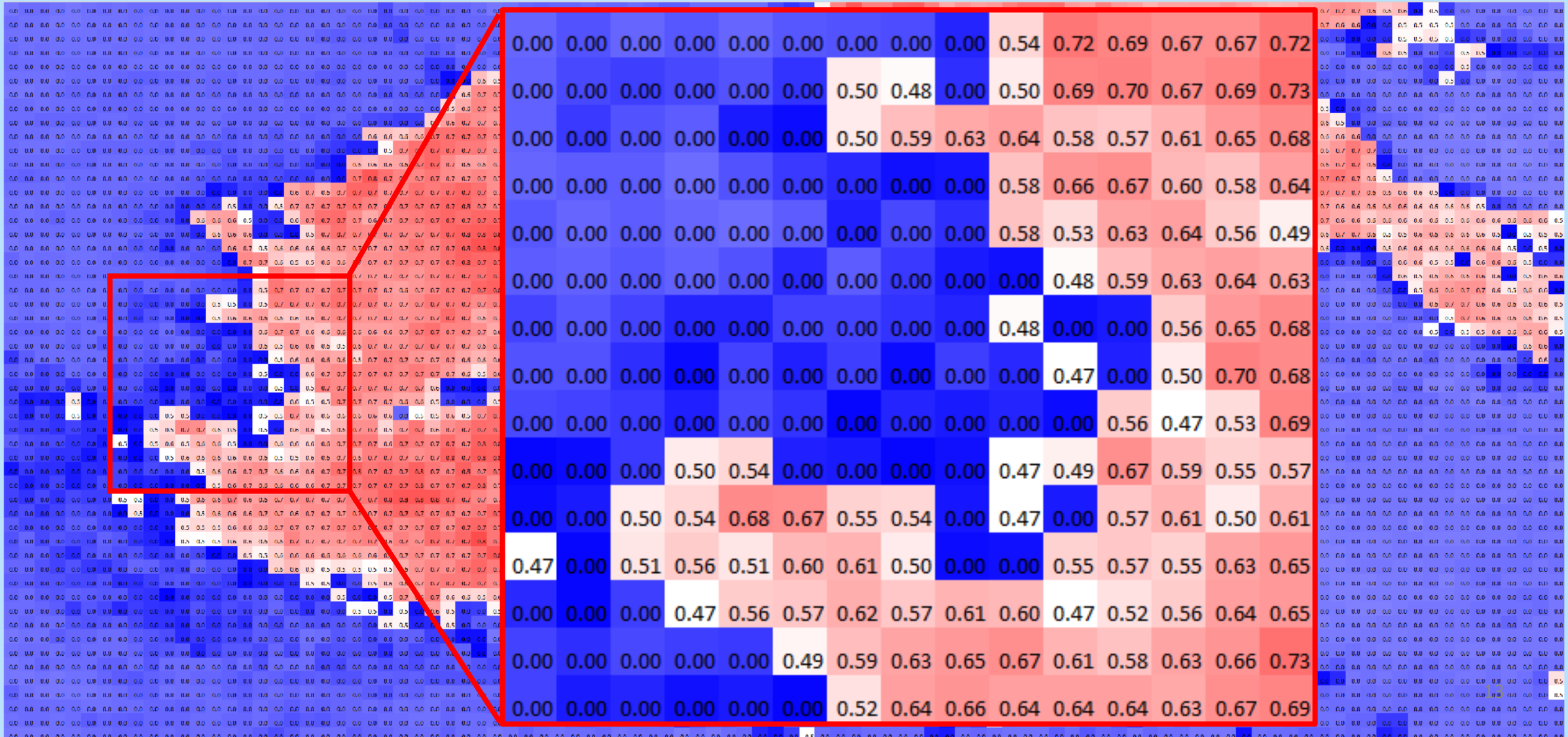


Each cell of the excel includes volume of the waste on the water, then we can separate sub areas for the waste, then we will develop a route plan for the sub areas of the waste on the water.



Modeling Approach

Step 1: Image Processing / Machine Learning



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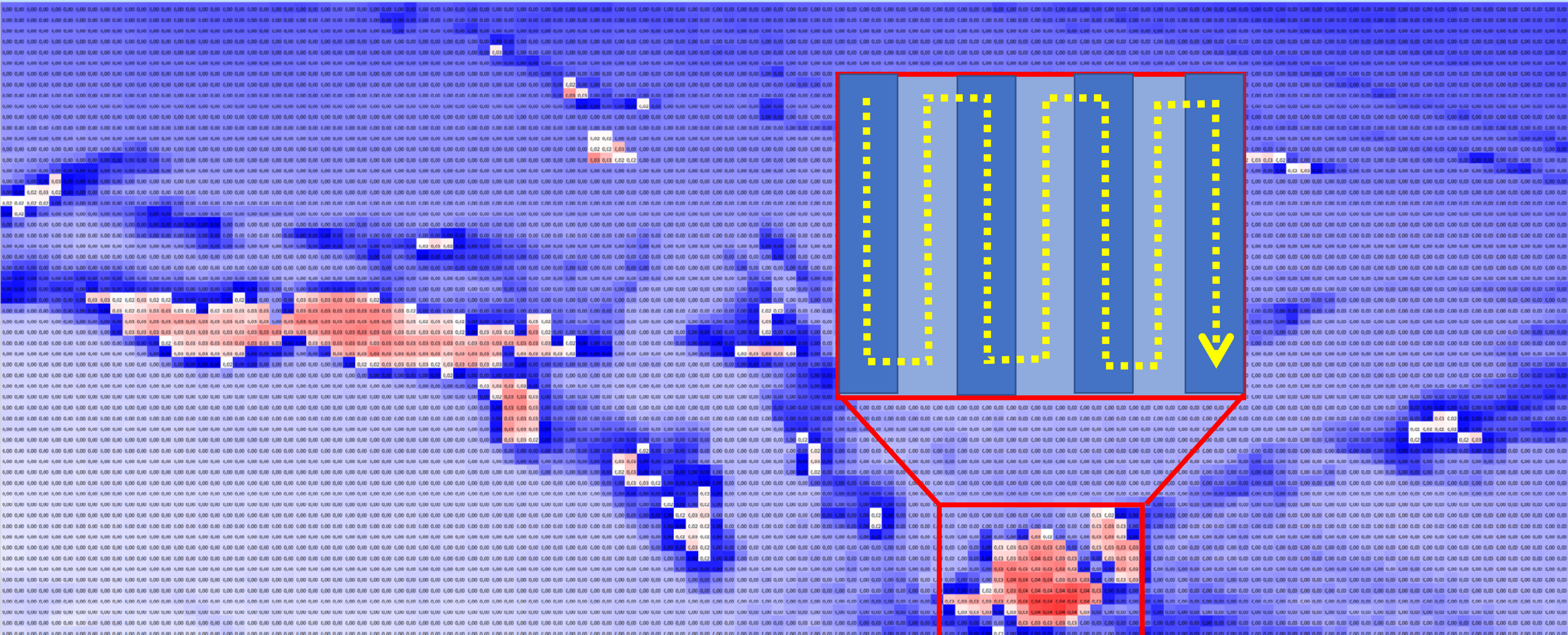
Modeling Approach

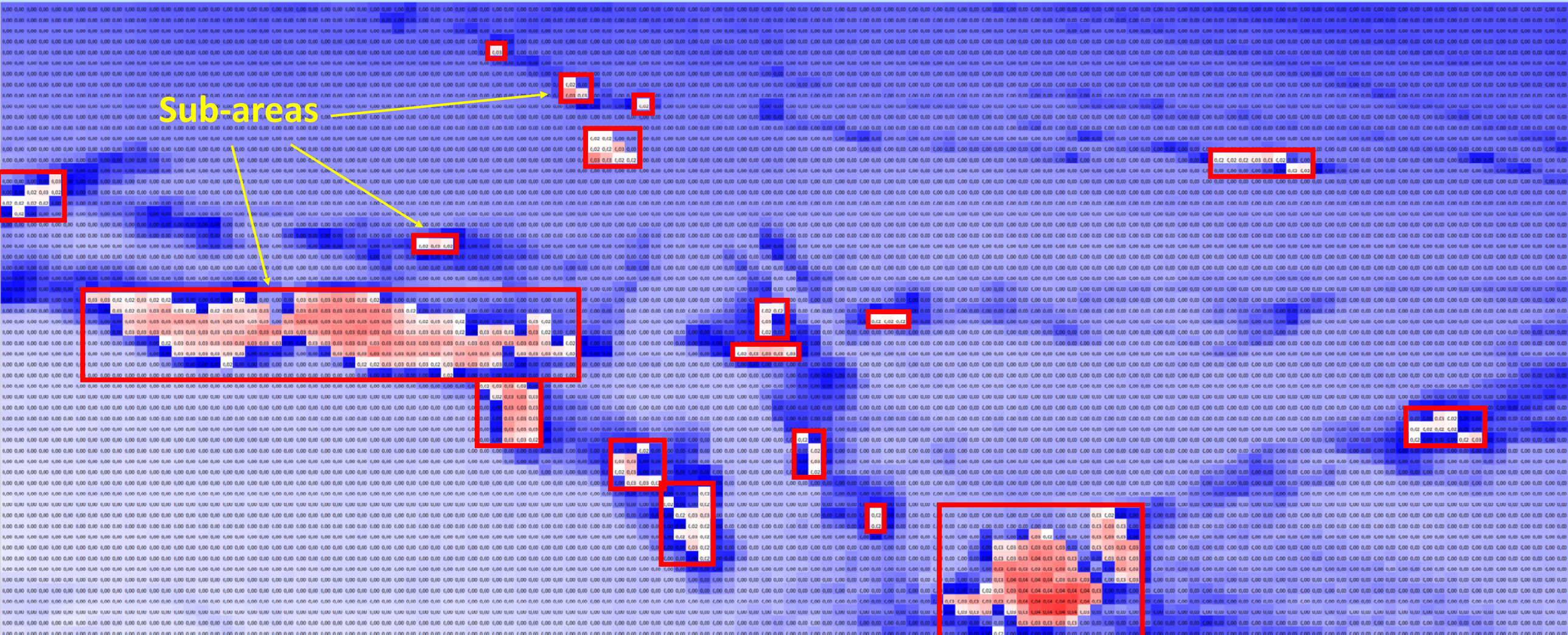
Step 2: Sub-Area Generation

AI model which we will develop will make route plan of each sub-area of the waste on water for Doris.



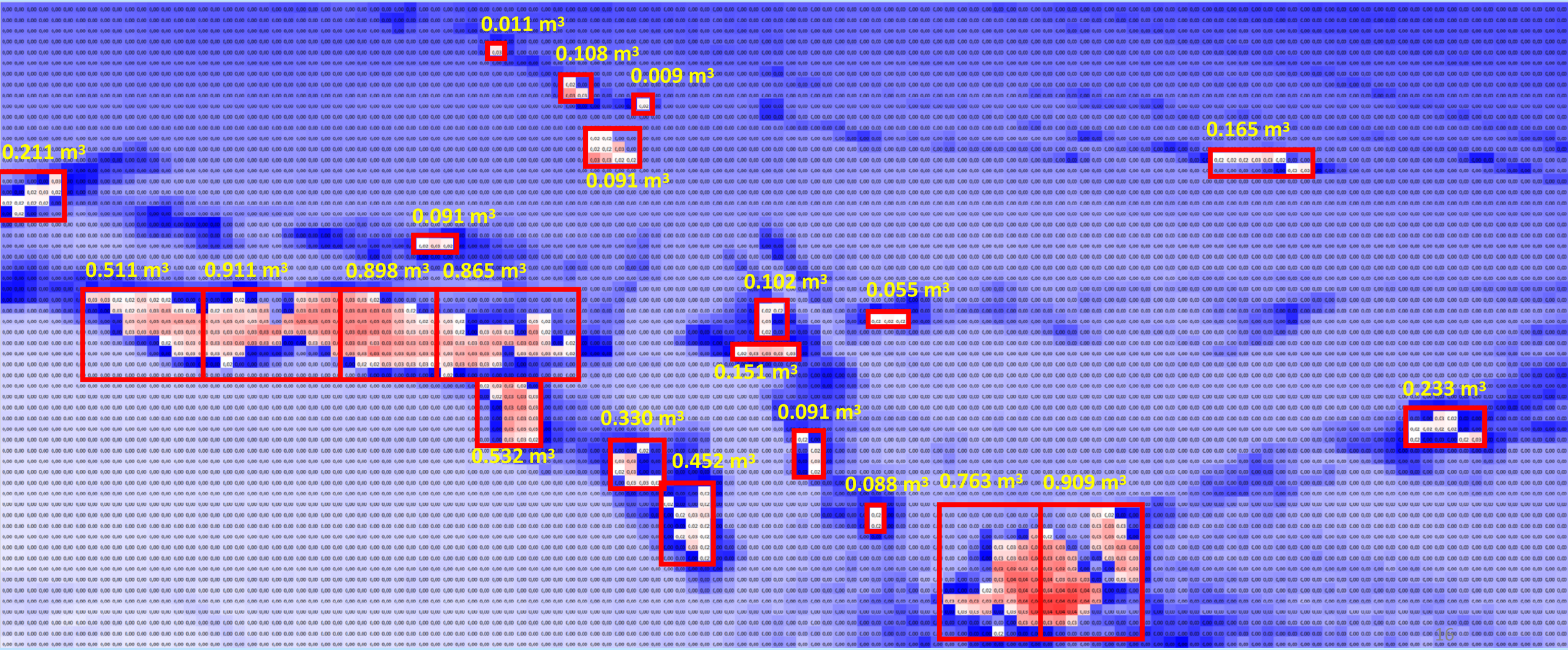
Modeling Approach

Step 2: Sub-Area Generation: Determine Islands



Modeling Approach

Step 2: Sub-Area Generation: Divide sub-areas > 1.05 m³

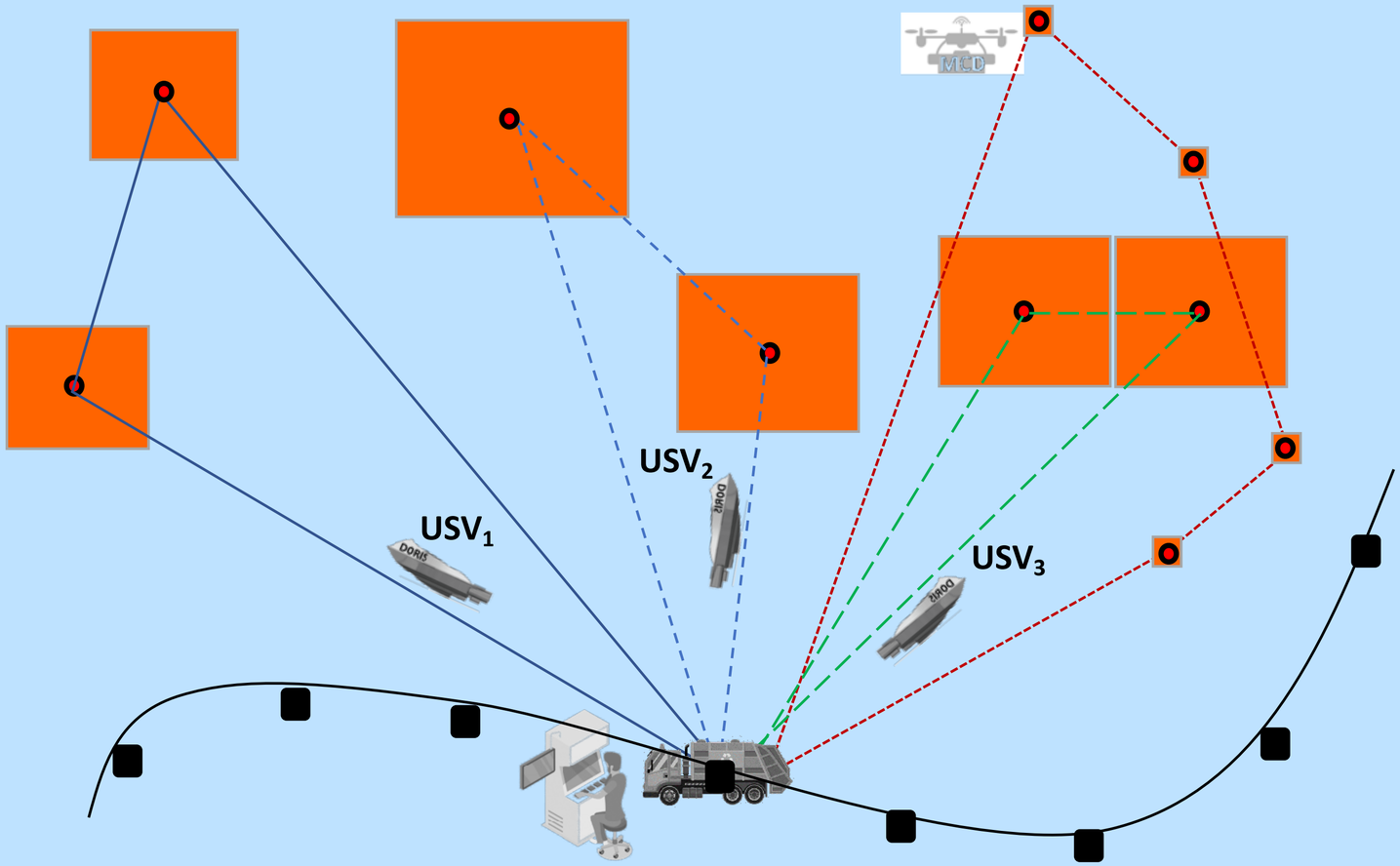


Modeling Approach

Step 3: Optimization Model for the Combined Routing and Location Problem

Combined Location and Heterogenous Multi-Vehicle Multi-Tour Routing Problem

We will develop optimal route plan for each sub-area of the waste on the water by using AI models



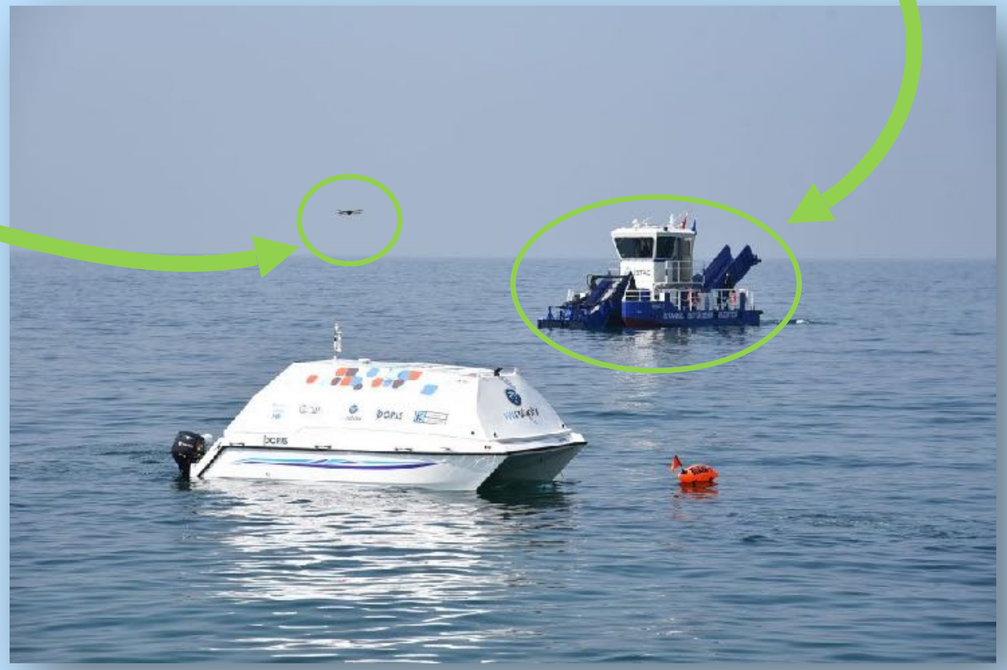
Problem Features

- Multiple vehicles types
- Multiple vehicles of each type
- Multi-tour TSP
- Capacitated vehicles
- Dynamic mucilage density

Sea Trials

We got some data for optimal route plan for each sub-area of the waste on the water, this is row data now, we can use this data which we collected from the sea surface in Istanbul for AI models for route planning.

- 10 days long
- Location: İstanbul, Kadıköy-Maltepe shoreline
- Total 76 hours of cleaning
- Assets: Doris, Drone vs ISTAC Cleaning Vessel



Sea Trials (Impact)

	Conventional Vessel (ISTAC)	Doris (Manuel Plan without AI models)	Doris + (will be Simulated/ Optimized Plan with AI)
Total Operation Time (Hours)	60	60	60
Total Waste Collected (m^3)	3.920	4.356	5.120
Mean Time to Collect 1 m^3 of Waste (hours)	15.31	13.77	11.72
Lt Waste Collected per Hour	65.33	72.60	85.33
Hourly Fuel and Crew Cost ($)	17.50	6.20	6.20
Cost Per m^3 Waste Collected ($)	267.86	85.40	72.66
% Improvement in Cost ($/m³)	Base	68%	73%
% Improvement in Waste Collection Rate (m³/hr)	Base	11%	31%

Conventional Sea Cleaning Vehicles

- Large size sea cleaning ships / vehicles
- All manuel ops. (ship command/control and mission planning)
- High costs (fuel, manpower, maintenance)

When we develop the route plan for Doris with AI models, we will show this data to municipalities, and we can implement the solutions for other conventional sea cleaning vessels, so we can reduce %60-80 the sea pollution in Marmama Sea.

İstanbul Municipality

Kocaeli Municipality

Bursa Municipality

İzmir Municipality

Bursa Municipality

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Core Team

Mustafa EROL - Founder (DE)

9 years Experience
Electrical Electronic Engineer
Msc Physics
+2 Hardware engineers
+3 Business Dev. And Sales

Feyzullah YILDIZ - Co Founder(TR)

7 years Experience Sr.
Software Engineer and
Dashboard Team Lead
+ 4 Software Developers

Nichole Yang- Autonomous Sw Developer (CN)

8 years Experience
Sr. Software Engineer
AI Team Leader
+ 3 Software Developers

Erdeniz Erol - Consultancy(TR)

16 years Experience
EU Projects,
Electric Vessels
elkon-tr.com

Abdulselam Arı - Consultancy (TR)

20 years Experience
Sr. Software Engineer

Ayhan Bağcı -Mechanical Dpt.(TR)

8 years Experience
Sr. Mechanical Engineer
Mechanical Team Leader
+2 Mechanical Engineers
+1 Naval Engineer

Nadir Tuna - Consultancy(TR)

25 years Experience
Sr. Naval Engineer
tunamarin.com

Selcuk Eltemak - Consultancy(TR)

25 years Experience
Sr. Mecatronic Engineer
eltemak.com.tr

News

Gaziantep - Rumkale

T.C. GAZİANTEP VALİLİĞİ

Rumkale'yi Doris Temizleyecek

İnsansız Deniz Temizleme Aracı Doris Rumkale'de göreve başladı. Sürücüsüz görev yapabilen insansız deniz temizle aracı Doris, GAP projesi kapsamında Gaziantep'in Yavuzeli ilçesinde kazandırıldı. Doris; üzerindeki sensörler ve kameralar vasıtası ile su yüzeyindeki nesneleri tanıyor ve suyun üzerindeki atıkları topluyor.

Yalova

GAZETE GEBZE

MÜSİLAJ İÇİN 'DORIS ROBOT' GÖREVE HAZIR!

SABAH

İnsansız Deniz Temizleme Aracı Doris'ten Kadıköy Karnesi

İnsansız deniz temizleme aracı 'Doris', Kadıköy kıyılarında 10 gün boyunca yaptığı temizliği raporladı. Doris, 10 günde deniz yüzeyinden yüzde 40'ı plastik olmak üzere 12 kilogram çöp topladı.

İHA

Kadıköy Sahillerini 'Doris' Temizleyecek

Kadıköy sahillerini 'Doris' temizleyecek İnsansız deniz temizleme aracı Denizati 'Doris' Kadıköy Caddebostan Sahili'nde ilk kez denizle buluştu. Karadan verilen sesli komutla deniz yüzeyini temizleyen 'Doris', deniz kirliliğinin de verilerini toplayarak

Hürriyet

Kadıköy Sahillerini İnsansız Deniz Aracı Temizleyecek

İnsansız deniz temizleme aracı Denizati 'Doris' Kadıköy Caddebostan Sahilinde ilk kez denizle buluştu. Karadan verilen sesli komutla deniz yüzeyini temizleyen 'Doris', deniz kirliliğinin de verilerini toplayarak Kadıköy sahillerinin atık haritasını çıkarttı.

Milliyet

İnsansız Tekne 'Doris' Denizden Çöp Topladı

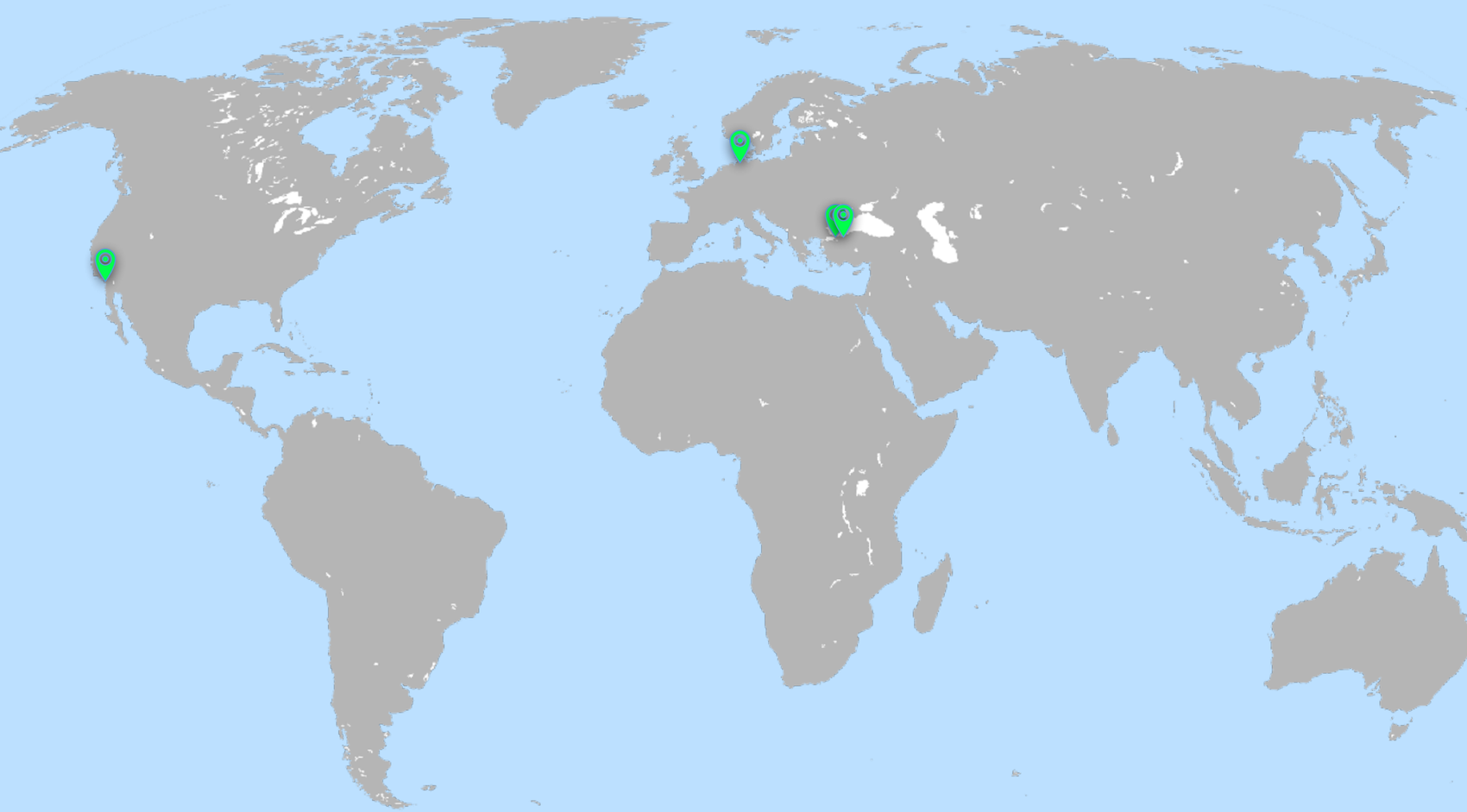
İnsansız deniz temizleme aracı Denizati 'Doris' Kadıköy Belediyesi iş birliğiyle, Caddebostan sahilinde ilk kez denizle buluştu.

Kocaeli

Pendik

Kadıköy

Locations



Gebze Adres

Adress: Cumhuriyet Mh. 2254 Sk. Gebze
T. Unv. Apt. No: 2 / G.Y.T. Enst Gebze/ Türkiye

İstanbul Adres

Sanayi mah. Teknopark bulvarı.

No: 1/4/C İç kapı No: Z08 34906 Pendik/İSTANBUL

Hamburg Adres

Am Sandtorkai, 4, Hamburg, Hamburg 20457, DE

US Office

2275 Huntington Dr, 914, San Marino, California 911

IWROBOTX

Mustafa EROL
mustafa@iwrobotx.com
info@iwrobotx.com

Sea Trials

	Conventional Vessel (ISTAC)	Doris
Engine	250 HP	20 HP
Material	Stainless steel	Carbon fiber
Data Collection	No	Yes
Personnel Requirement	4 (on board)	1 (at shore)
Draft (cm)	180	70
Sweep width (mt)	2.1	2.0
Fuel Consumption (lt/hr)	4.5	0.2
Cleaning Speed (kts)	4	3
Wastewater Capacity (ton)	2.3	1.05
Size (mt)	7 x 3.2 x 2.8	5 x 2.65 x 2
Weight (kg)	2780	850

What We Need

First step, In this project, we will develop route plan for Doris to clean sea surface by using AI models which we will develop and implement on Doris
Second step, we will get data with Doris from the sea surface by using AI models which we will develop and implement on Doris
Finally, we will build a new consortium for Horizon project, and we will develop collision preventing tools, risk optimization, fusion data optimization, Autonomous drive optimization, waste category optimization and etc. for autonomous sea cleaning Vessels, then we will show the project impact in sea cleaning industry.

Autonomous Ship Collision Preventing System

- Collision Preventing System Tools
- Fusion Data Optimization
- ECU Data Optimization
- Location Data Optimization

ASV & Drone Route Optimization

- ASV Route plan optimization
- Drone Route Plan Optimization
- Autonomous Drive Optimization

Sensor and AI Tool Technologies

- Waste Categories Optimization
- Image&Video Data Optimization
- IP Library Data Optimization
- Risk Optimization for Sensor Data
- Autonomous Drive Optimization
- Data Storage on Cloud Server