Application of an unmanned robot for water pollution monitoring

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The aim of the project

Provide an automated solution for water area monitoring

Tasks

- Create / find a suitable body, engine, control and steering system
- Create a sensor system with the possibility to promptly add / replace sensors according to the customer's wishes
- Organize data acquisition, transfer, storage, visualization
- Offer various monitoring schemes:
    - full water area scan
    - surveying problem areas
    - moving towards the pollution source in automatic mode

Possible application

- 3D mapping of water bodies
- Mapping of water quality sensor readings
- Binding of all mappings to geographic coordinates / geographic map
- Placement of markers / markers at certain points (marks on the electronic map or a marker (a float with an anchor in nature)
- Special orders:
    - identification of the type and source of pollution in cases of legal disputes
    - movement towards the source of pollution, incl. successively from different sides, thereby revealing the point pollution site
    - underwater space scans with a camera in shallow water bodies

IT solutions

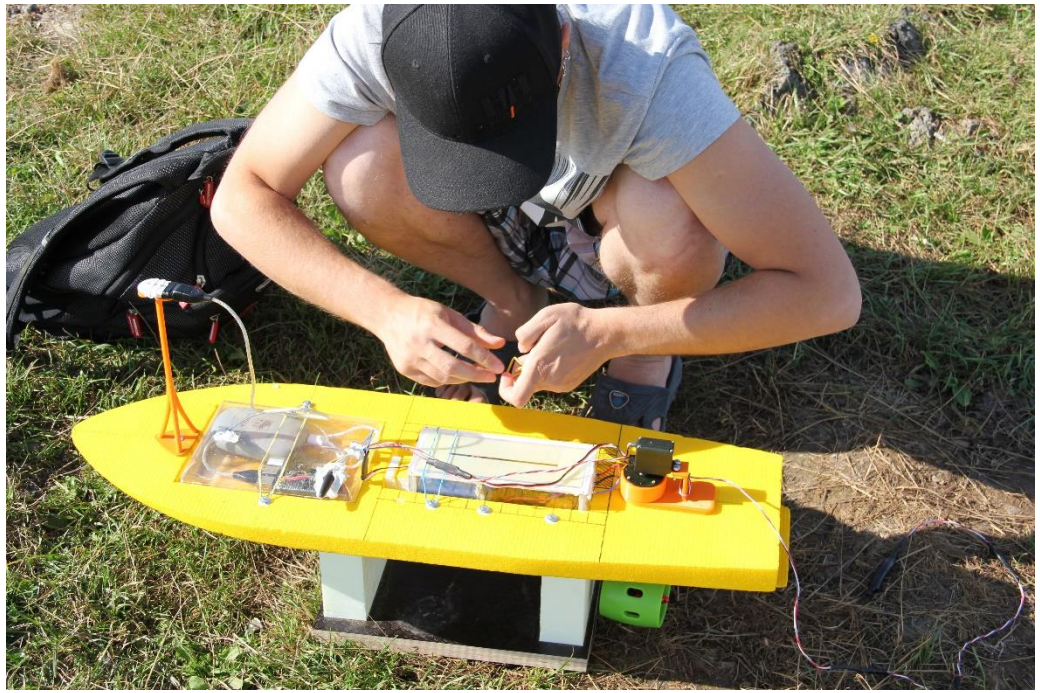
Transmission and storage of the structure of the read data on a network server ("in the cloud")

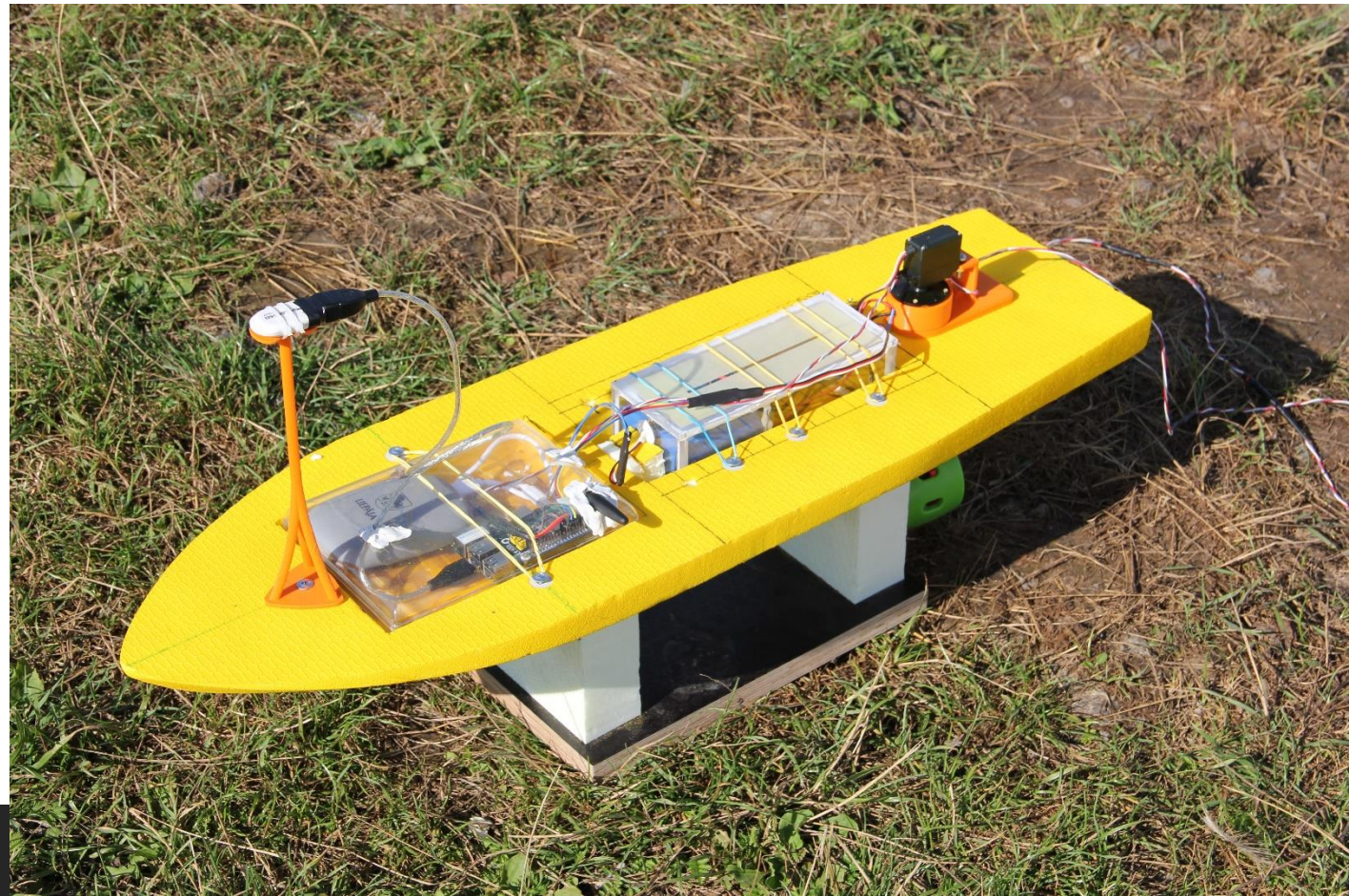
Construction of 3D maps on the user's display in real time

Automatic alerts for exceeded threshold values

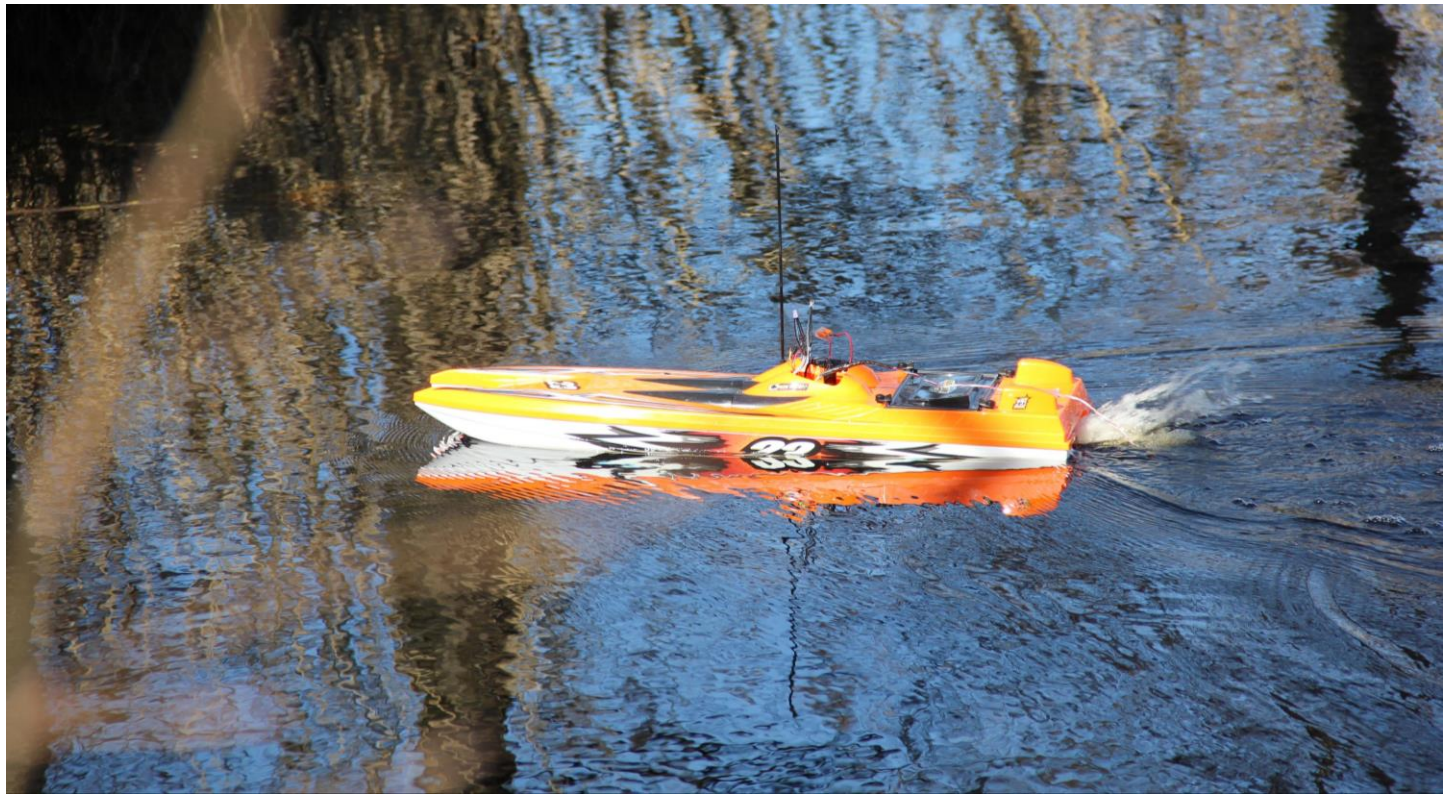
Automatically generated recommendations for further action

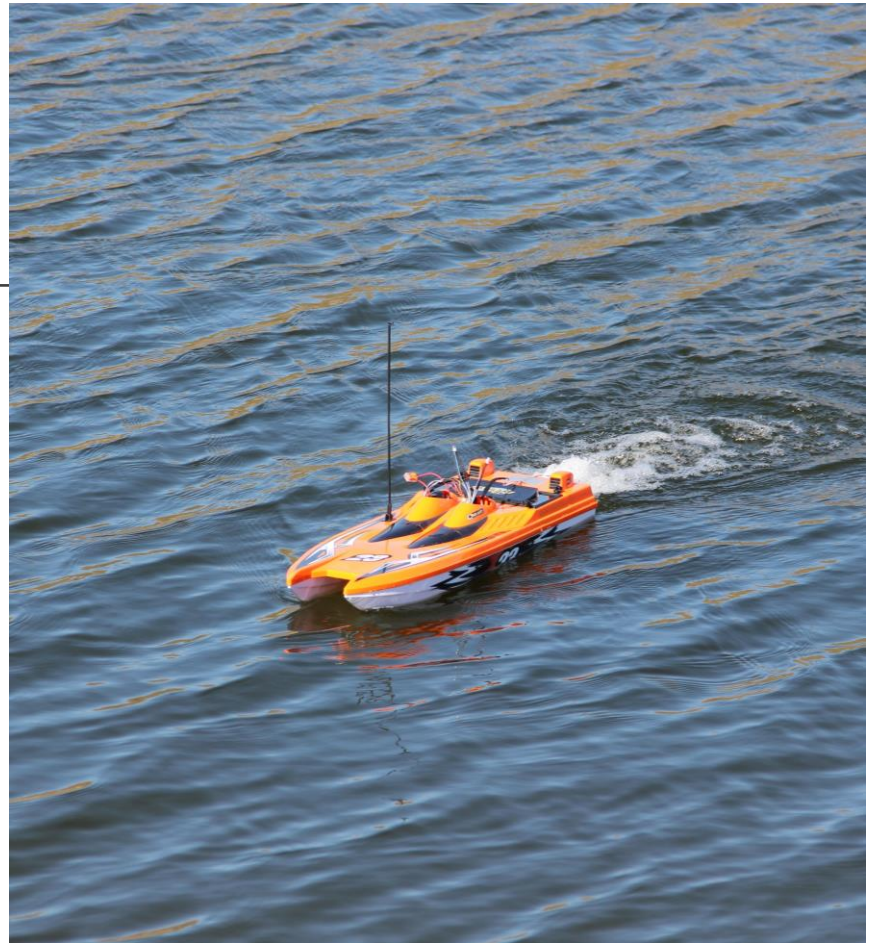
1. model





2. model





3. model

Equipment with sensors

- GPS - provides vehicle positioning data points, obtains coordinates connecting each sensor for later use in 3D mapping
- Oxidation-reduction potential (ORP) (mV) – shows the probability of gaining electrons as a result of reduction (reducing agents) or losing electrons as a result of oxidation (oxidizing agents)
- Sonar altimeter (m) - measurement is a hydrological factor that affects other properties of the aquatic environment, such as sunlight intensity, oxygen availability, temperature, nutrient content, etc.
- Hydrogen power (pH) - the scale indicates the acidity or alkalinity of the environment, which affects the metabolism of hydro-ecosystems, e.g. solubility of chemicals, rate of environmental chemical reactions, corrosivity of underwater infrastructure, physiology of invertebrate exoskeleton, etc.

Equipment with sensors

- Temperature (ºC) - is an abiotic ecological factor that significantly controls the survival and comfort of organisms, and accordingly shapes the entire ecosystem setting
- Total amount of dissolved solids (TDS) (µS/cm or mS/cm) - is an integrative indicator for evaluating water quality - electrical conductivity data indirectly reflects the total amount of solids dissolved in water, indicates the presence of salts and various pollutants in the water area
- Dissolved oxygen (mg/l) - the measurement of this sensor is a limiting ecological factor in aquatic ecosystems: the presence of gaseous oxygen in waters is crucial for the survival of almost all hydrobionts
- Turbidity (Secchi Disk, JTU, etc.) - is an indicator of water clarity, i.e. its optical quality: water can be transparent or cloudy, muddy, brown. Water clarity can be reduced by the presence of suspended solids and dissolved colored substances / dyes

Results 1

lejupielādēt Drukāt

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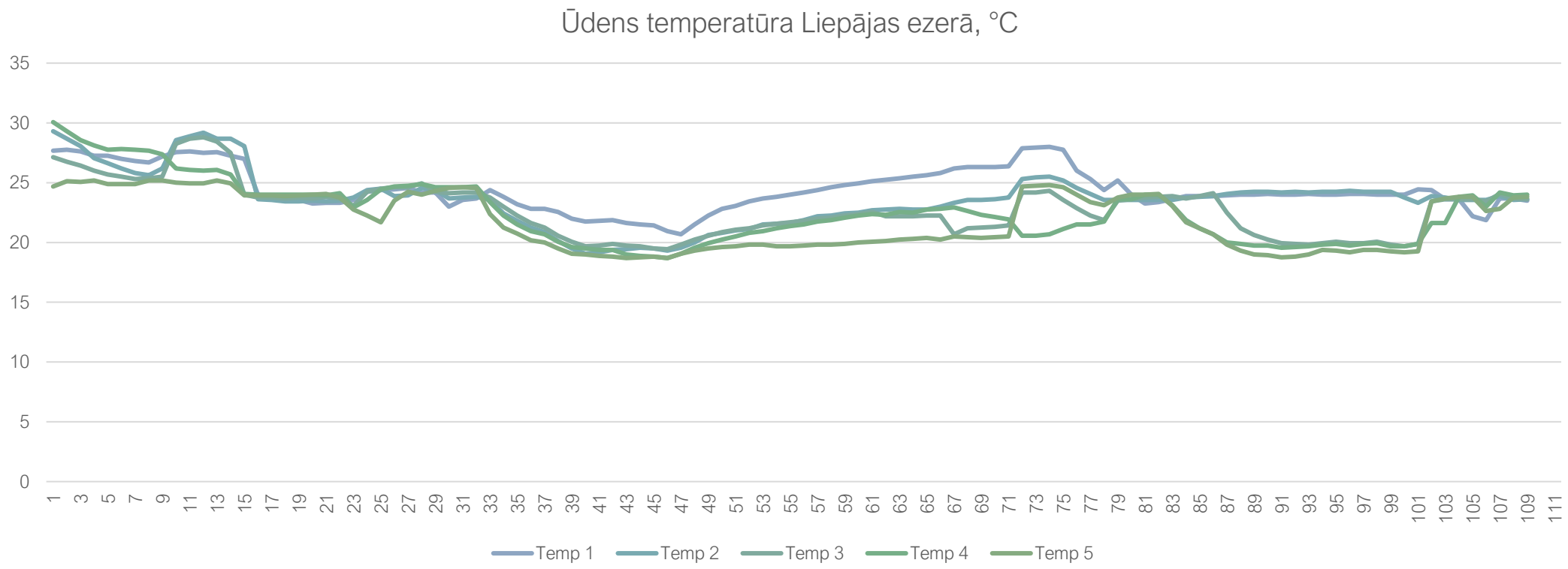
Results 2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25
20
15
10
5
0
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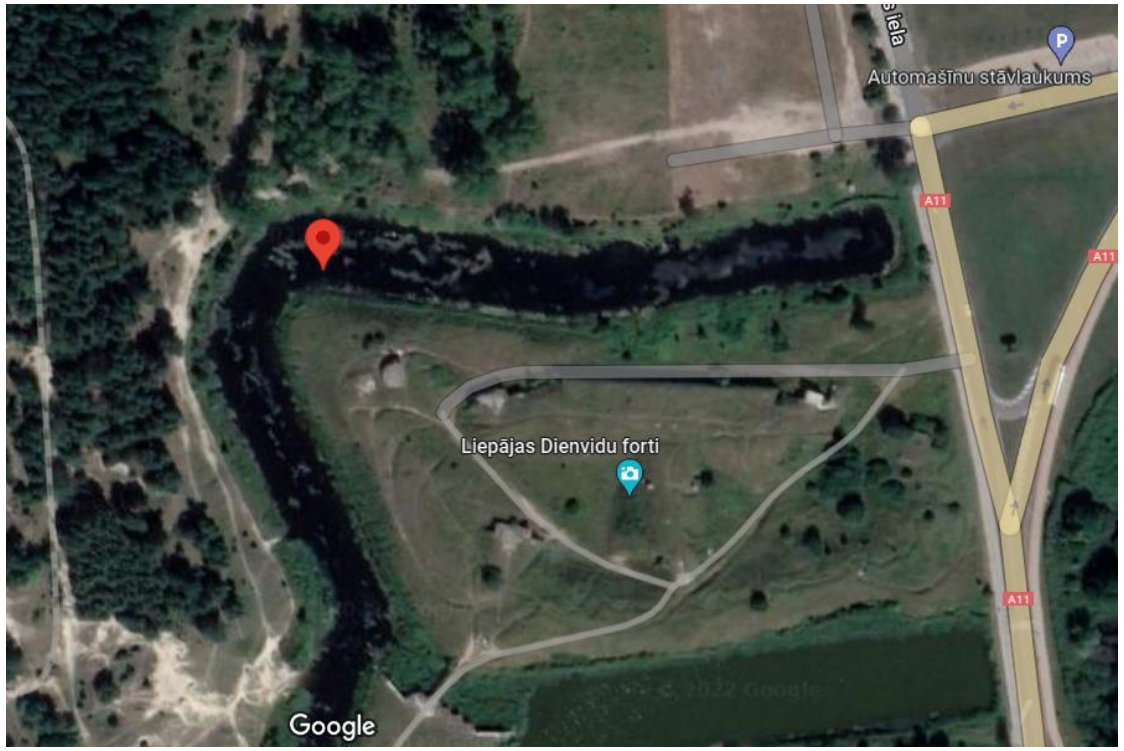
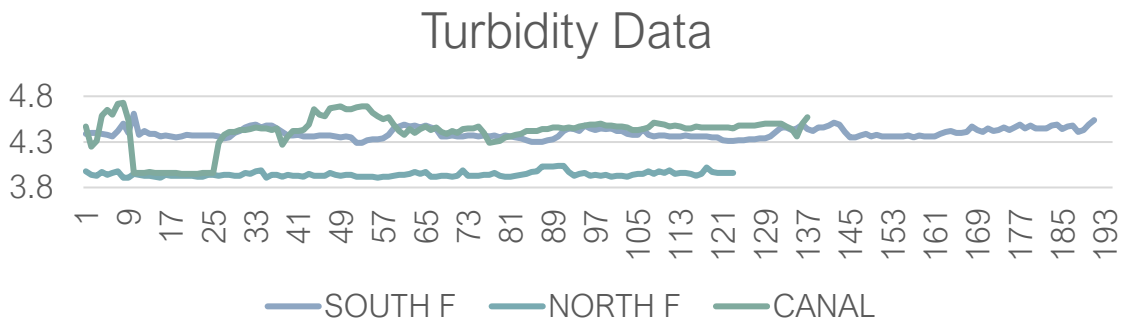
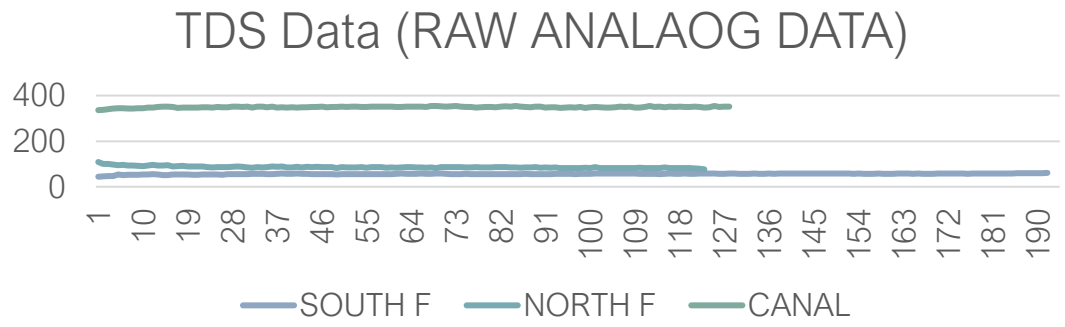
Temp 1
Temp 2
Temp 3
Temp 4
Temp 5

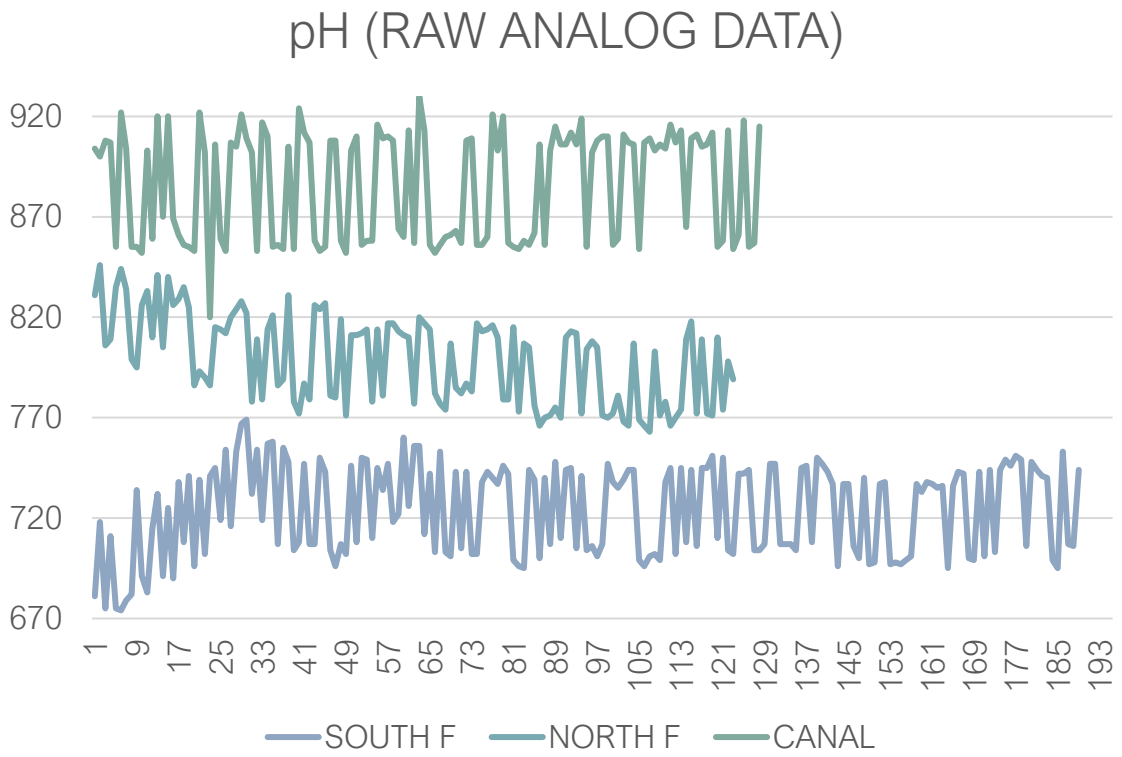
Results 3 (GPS)



Results 4 –Turbidity, TDS, pH







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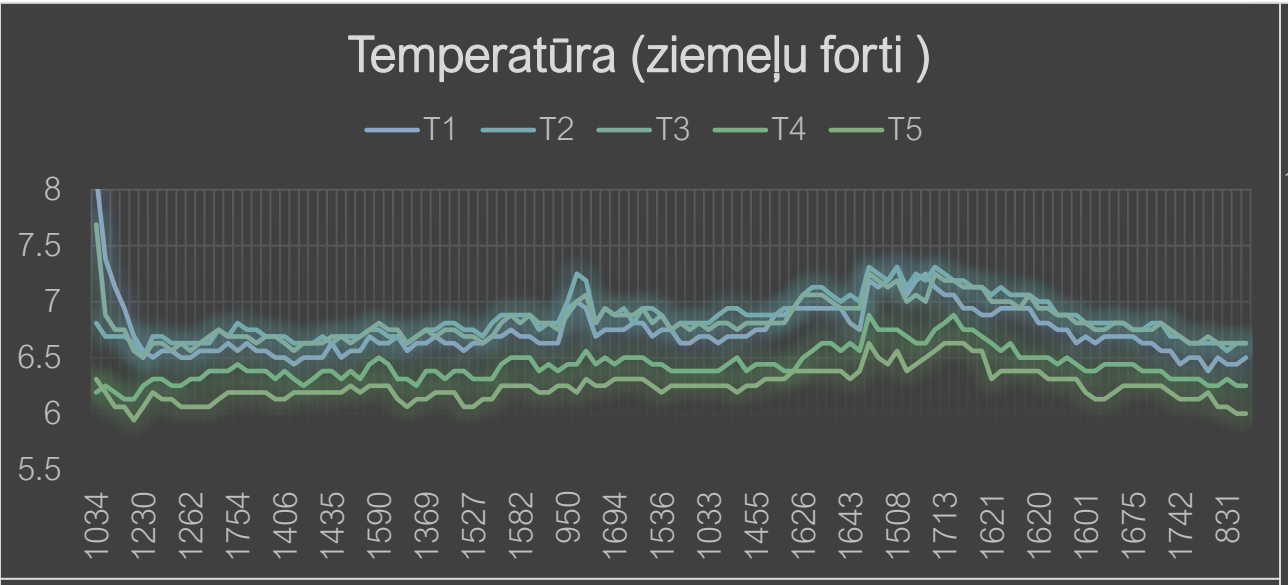
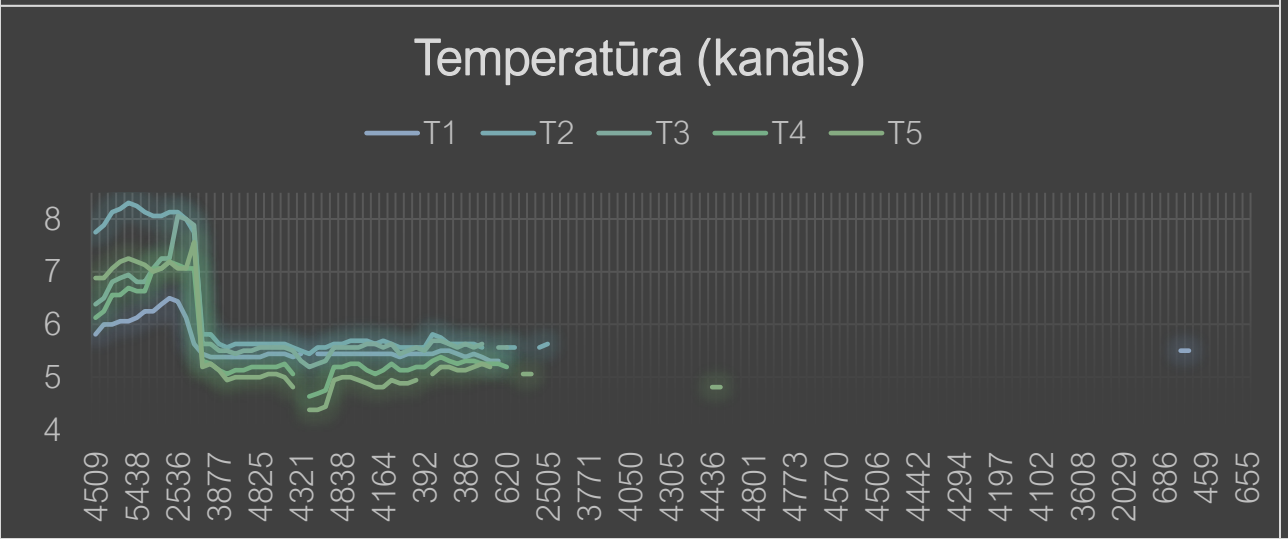
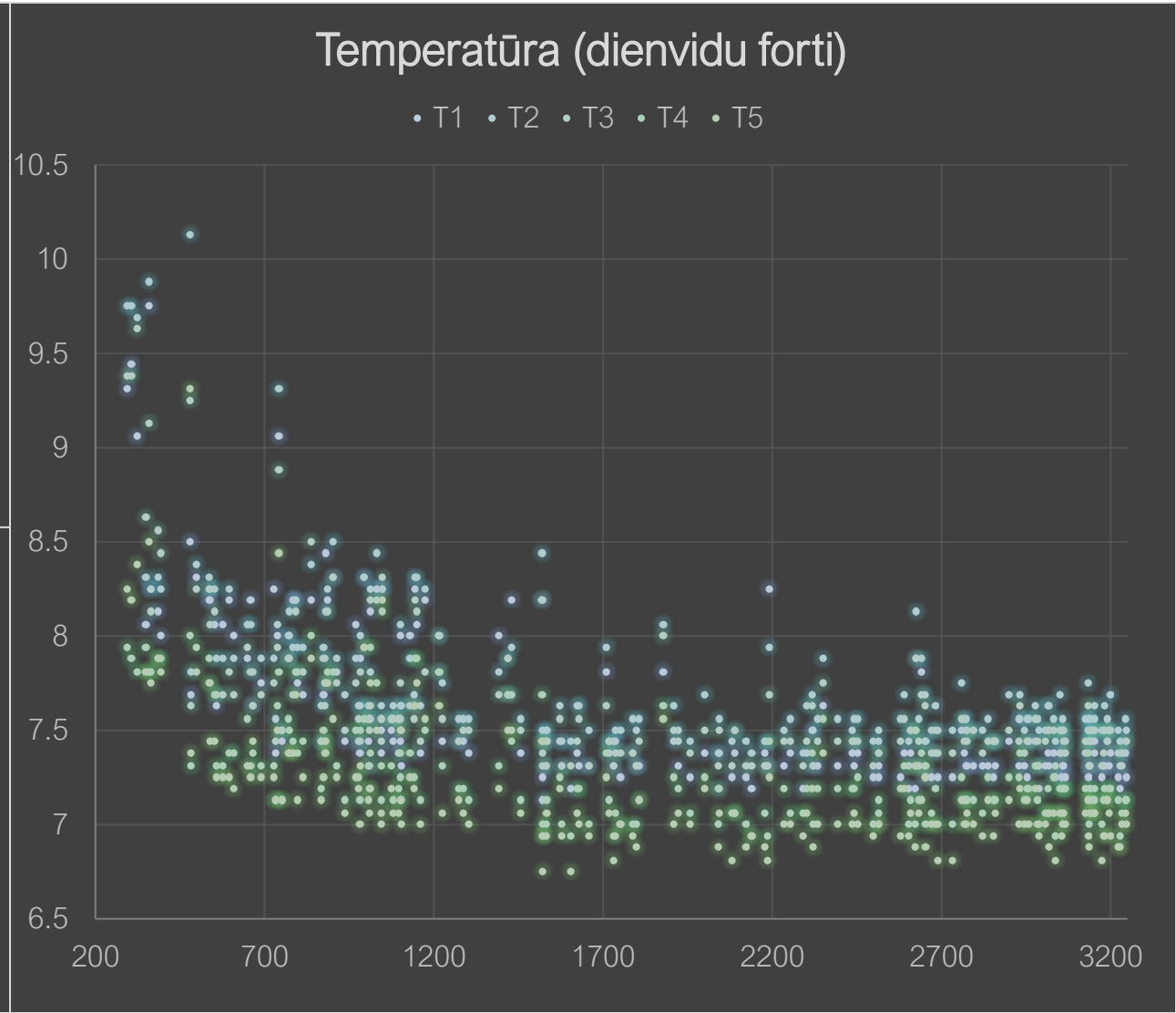
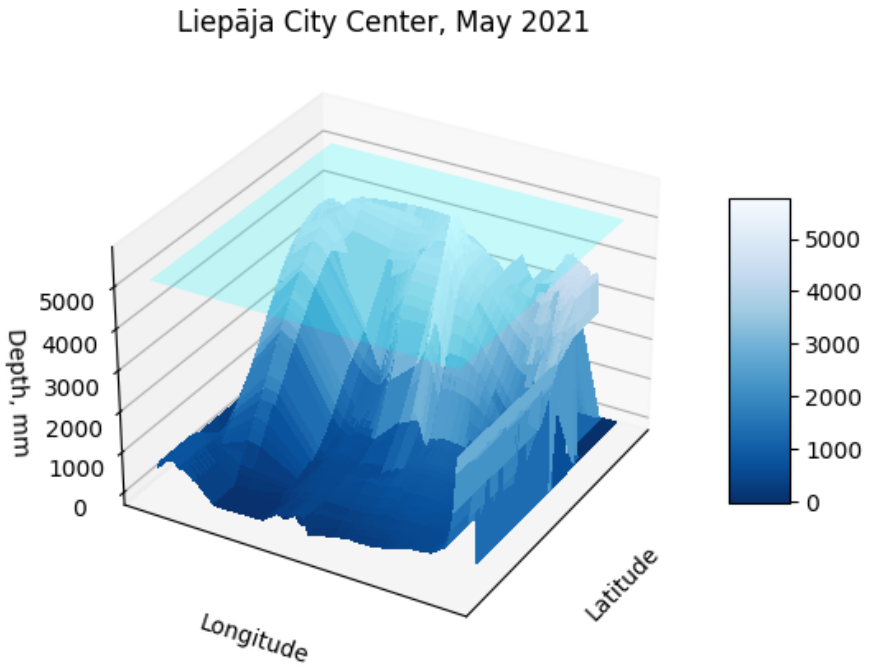
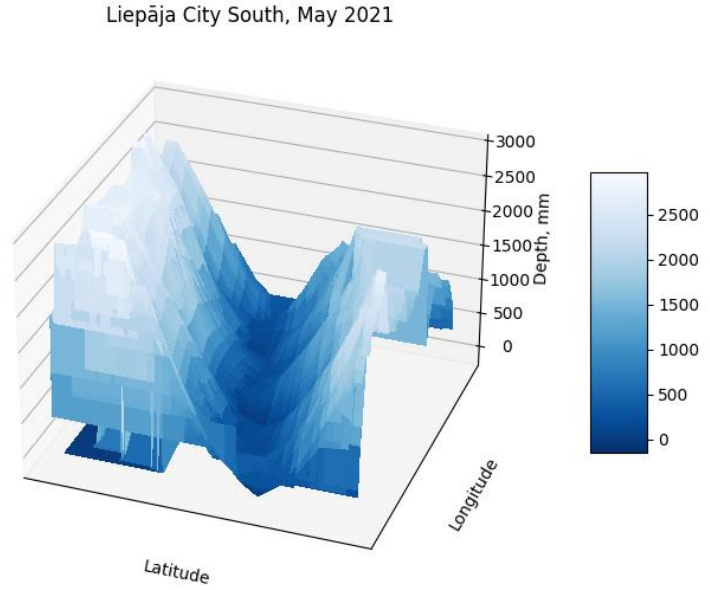


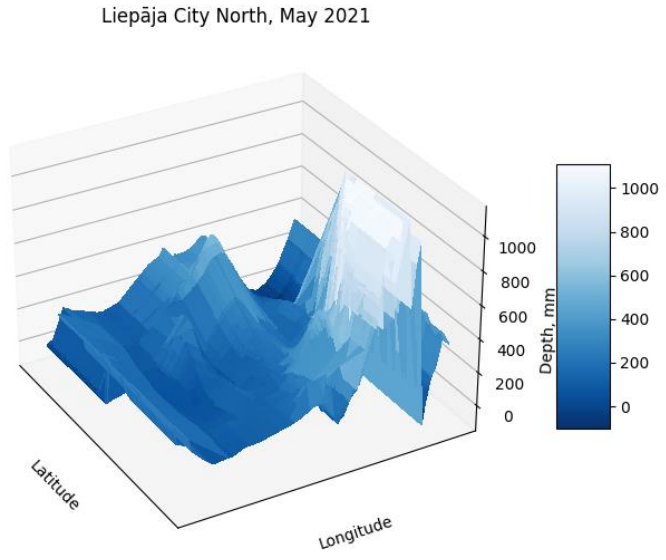




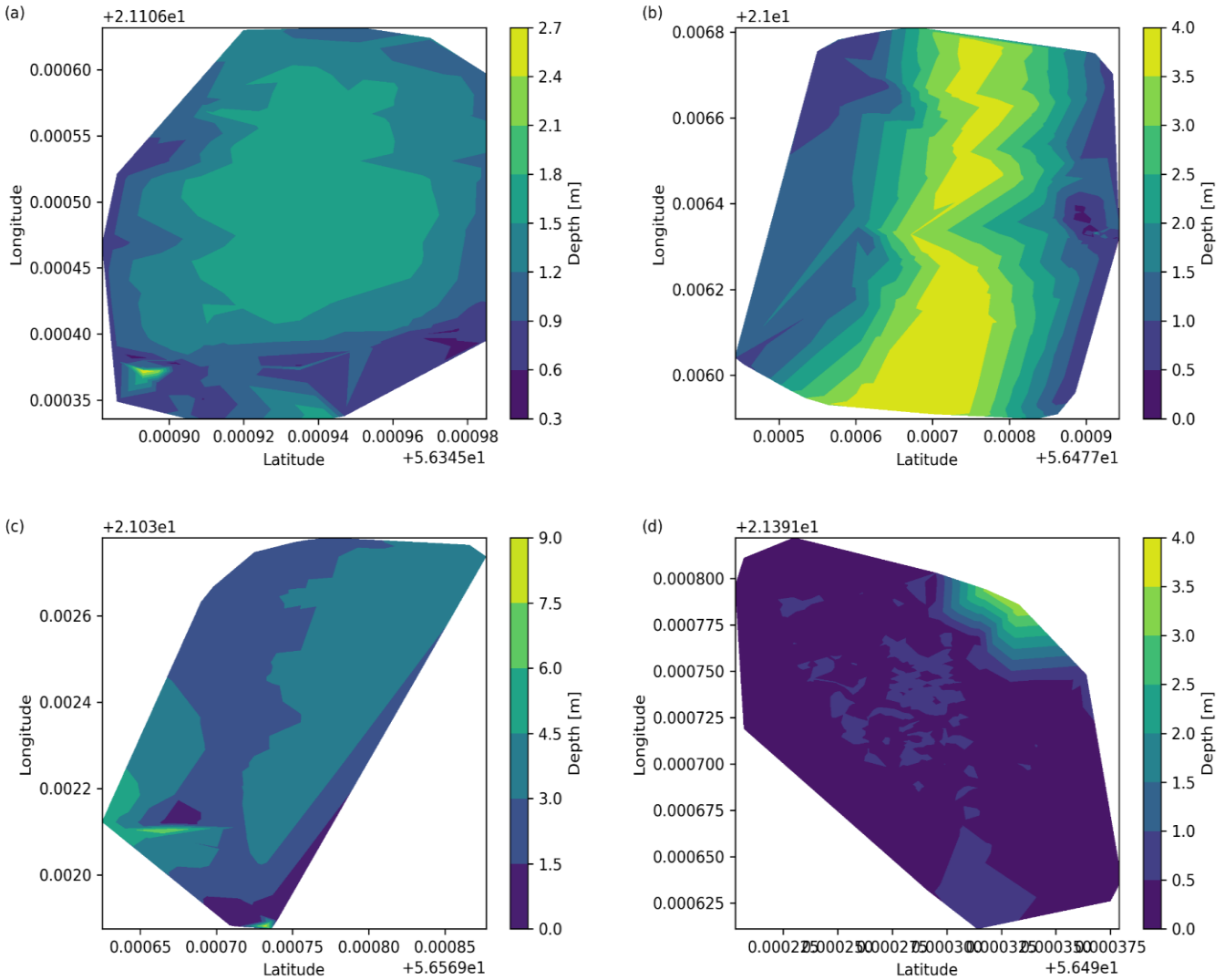
Results 5 (3D mapping)







Results 6 (colormaps of depth)



Contacts for water area monitoring orders

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