Search & Rescue – Underwater
Locating a UUV using a UAS and a hydrophone

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PROJECT DESCRIPTION

Goal

Find a distressed UUV (Unmanned Underwater Vehicle) transmitting a signal through an emergency pinger.

Approach

Submerge a hydrophone attached to a UAS (Unmanned Aerial System) at different locations in the water area containing the UUV. Then, process the received signal.
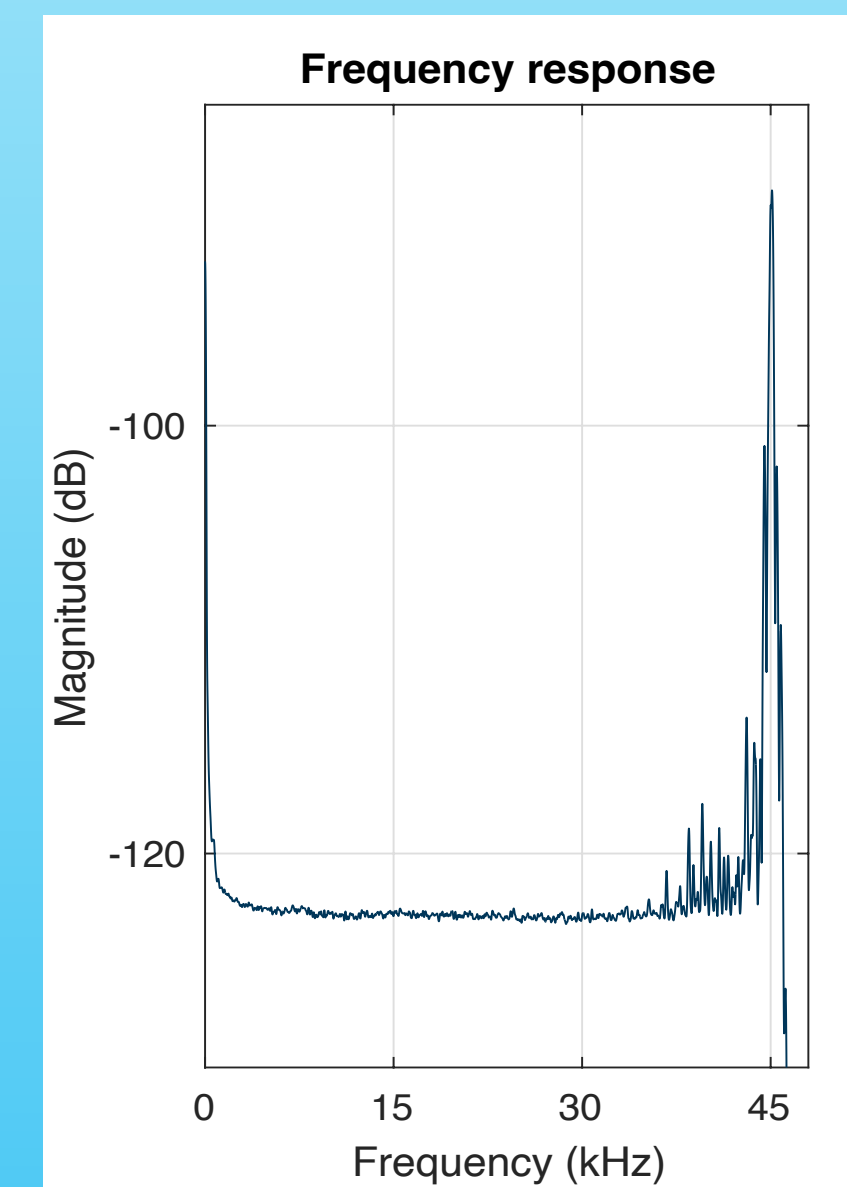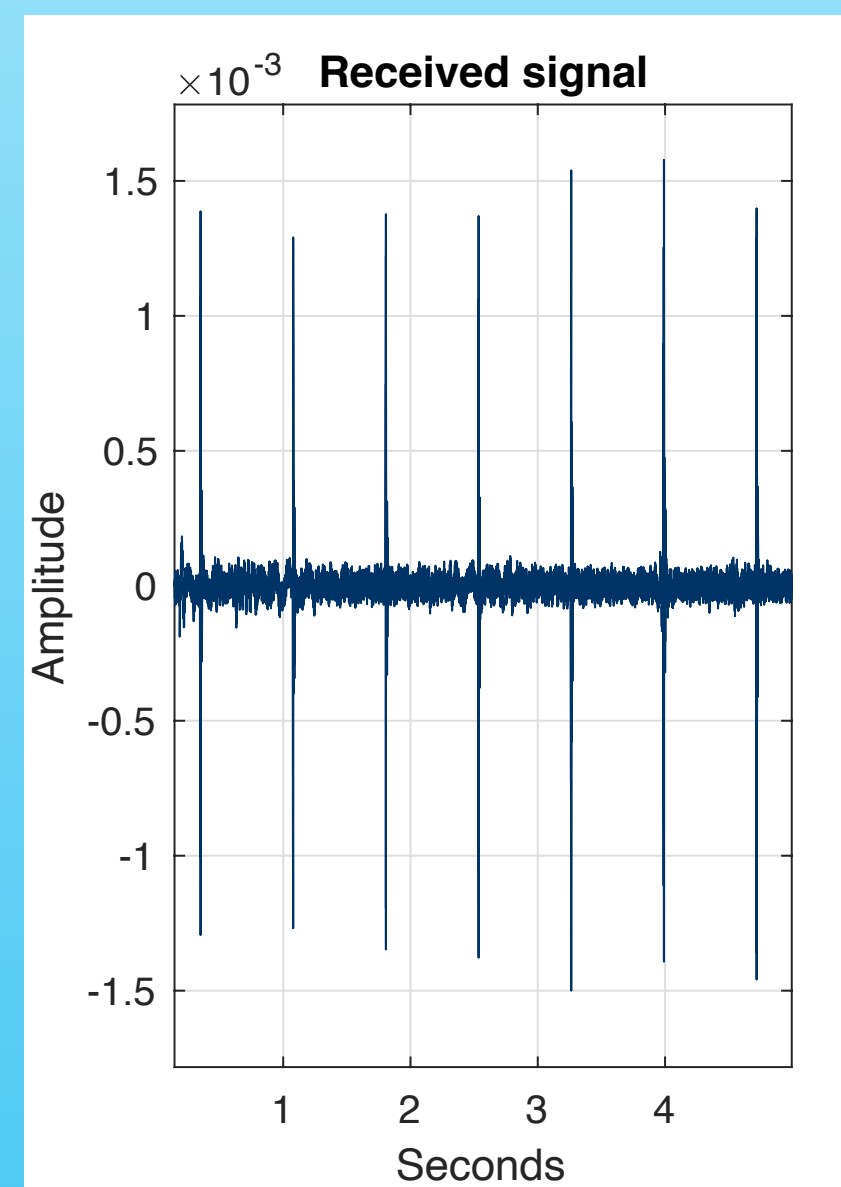
SETUP

GPS

UAS

Hand controller

Nano Pi

Base station

ROS2

Sound card

9m

Pinger

Hydrophone
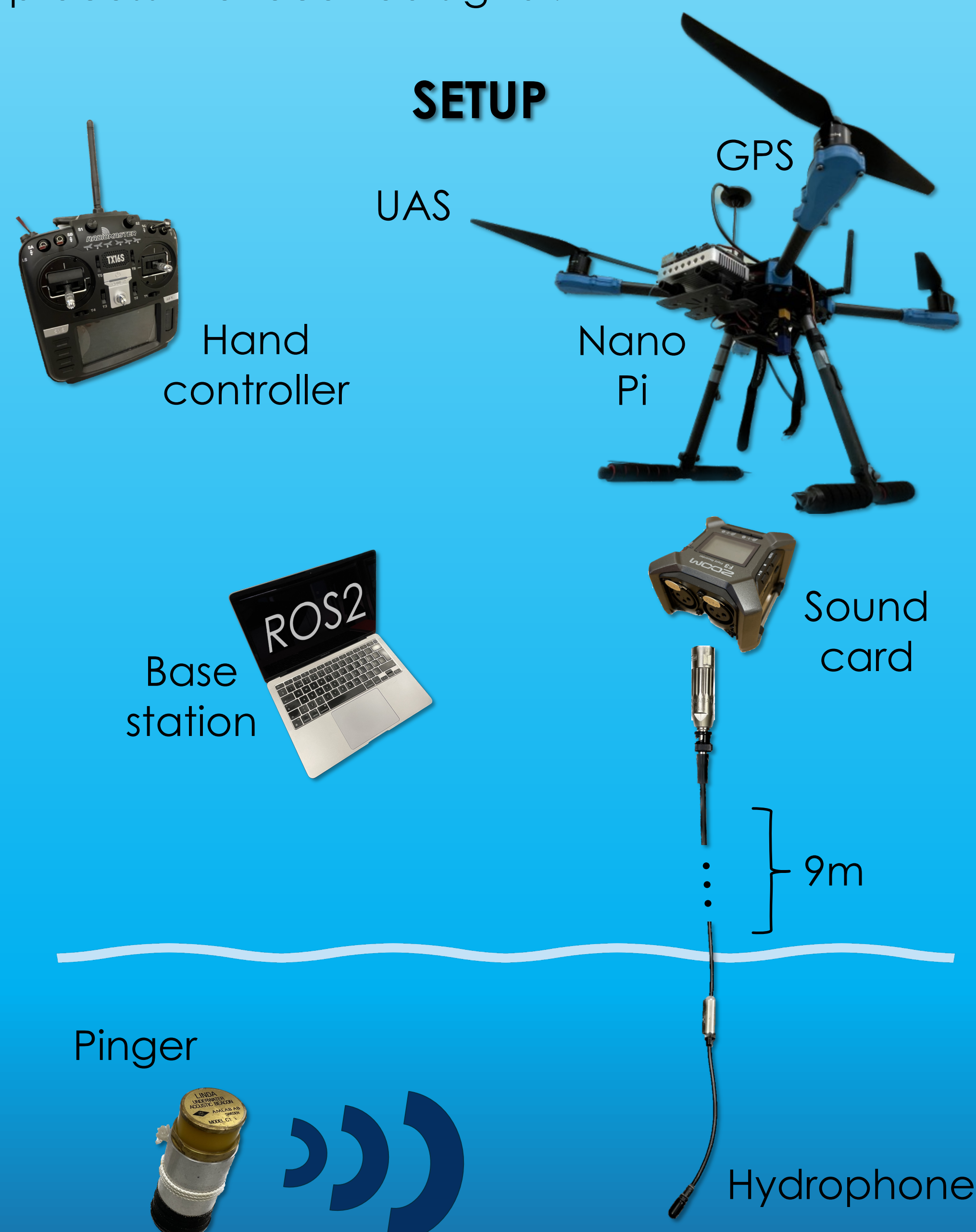
SIGNAL PROCESSING

Emergency pinger

Emitted a pulse with a frequency of 45 kHz every 0.7 seconds.

UUV position estimation

- RSS (Received Signal Strength)
- ML (Maximum likelihood) estimation
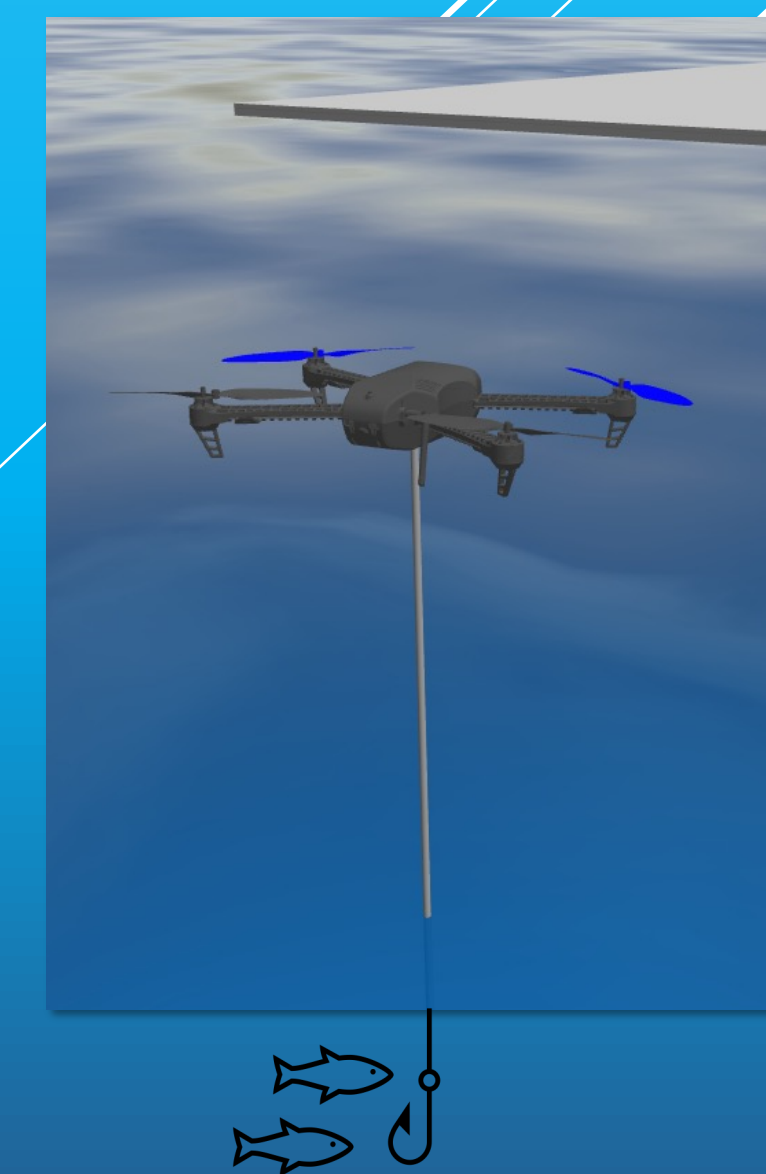- Minimize value function using Gauss-Newton

SIMULATION

Environment

GAZEBO

Sound propagation model

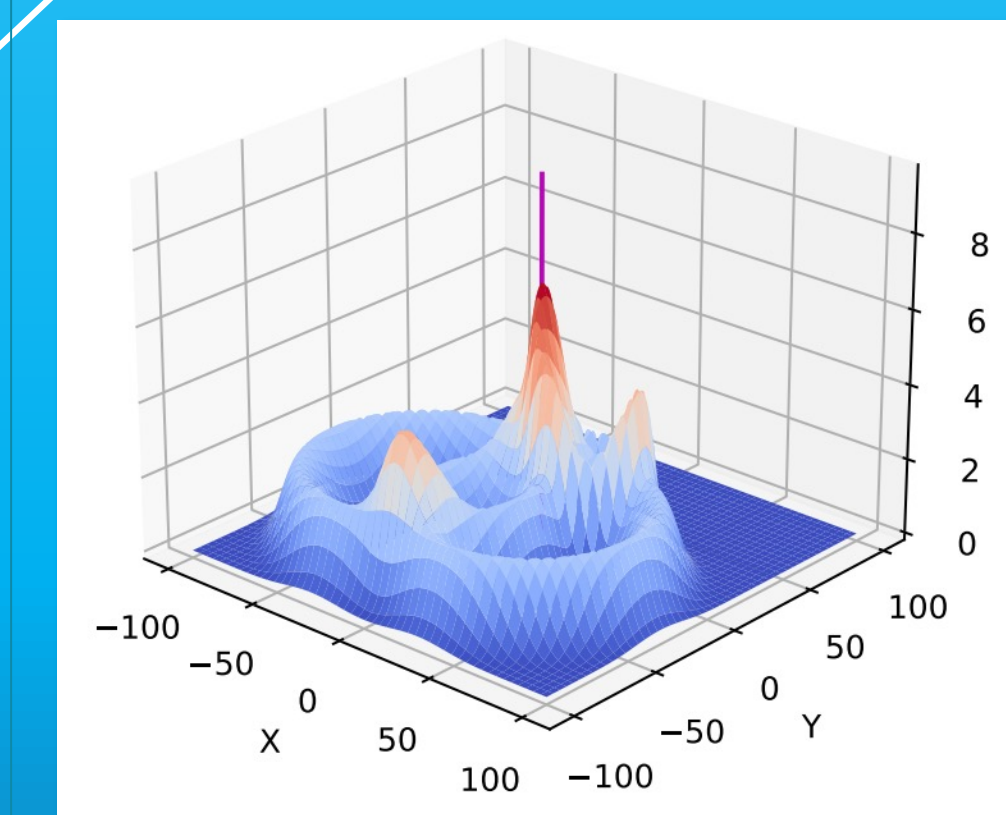$$y = \frac{s}{||x - p||^{\frac{\beta}{2}}}$$

REAL LIFE

The UAS flew autonomously to preselected locations using QGroundControl, submerging the hydrophone in every location. The mission was successful with takeoff, maneuvering and landing being performed gracefully.
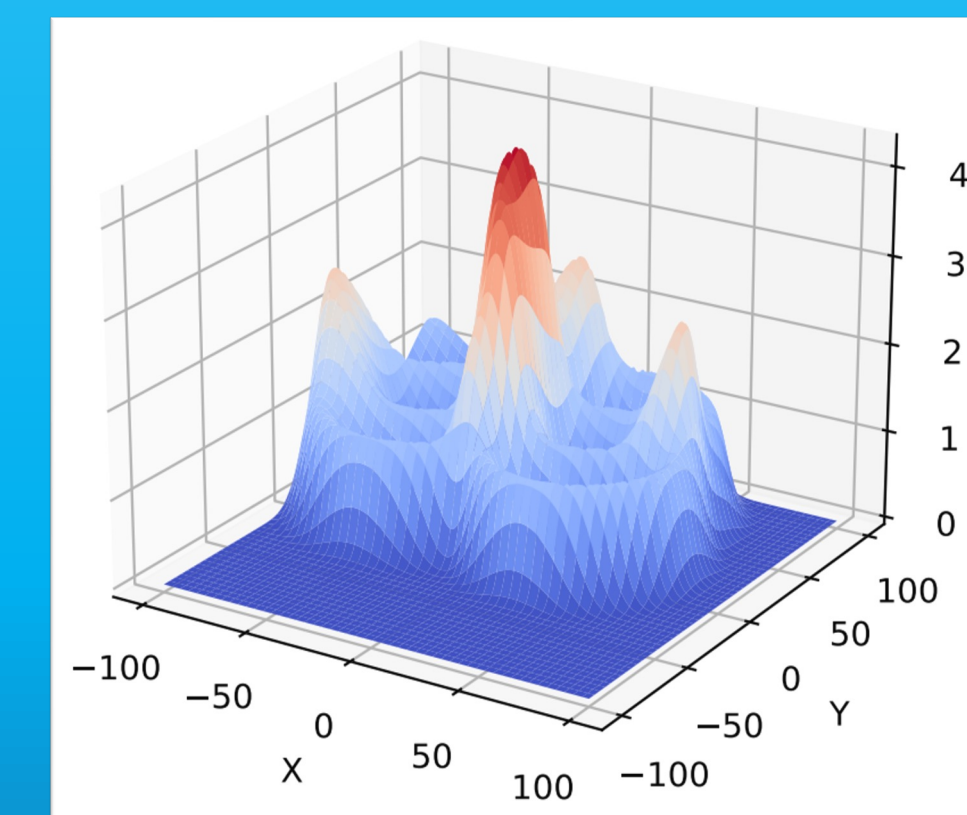

RESULTS

Simulation
Using 3 data points and ML estimation:

Error: approx. 1m

Real life
Using 4 data points and ML estimation:

Error: approx. 25m

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