



Water Resources Management of the Danube with ISME-HYDRO



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INTRODUCTION

- The exploitation of rivers and hydropower reservoirs involves daily monitoring of the water resources, the meteorological conditions, the status of the coast, the flood areas, etc.
- Providing with timely and easy to consume information, analytics and early warnings for current and upcoming statuses or events helps water resources managers and high level officials to adequately observe and plan operations for sustainable development of river areas.
- We present an intelligent web-based workflow - ISME-HYDRO that combines different methods of AI, e.g. linked data, deep learning and reasoning, to provide an integrated information system that ensures interoperability between spatial information of GIS systems, remote sensing information, symbolic and numerical data like meteorological data and proprietary measurements and creates an actionable knowledge value chain for the needs of rivers and hydropower reservoirs exploitation.
- On the example of water resources management of the Danube

METHODS

SEMANTIC INFRASTRUCTURE FOR WATER MANAGEMENT

- INFORMATION INFRASTRUCTURE
- NETWORK OF CONNECTED OBJECTS
- Easy interlinking
- Efficient storage
- Interoperability
- Easy extensibility
- NEURAL NETWORKS

METEOROLOGICAL AND ENVIRONMENTAL FACTORS

- Turbidity
- Surface reflection
- Precipitation
- Snow cover
- Soil moisture
- Wind
- Vegetation index
- Solar radiance
- Velocity

FORECASTING METHOD - EO4AI

- Satellite data
- Geospatial position
- In-situ measurements
- GAN
- CNN
- LSTM

IN-SITU MEASUREMENTS

- Discharge
- Water level
- Turbidity

FORECAST OF RIVER DYNAMICS

- Forecasted data for river discharge
- Bathymetry, riverbed
- TELEMAC

FORECAST MODELS

- 3 DAYS
- 5 DAYS
- 7 DAYS
- 30 DAYS
- TRAINING WITH HISTORIC DATA
- 5 years back for rivers
- 10 years back for dams
- meteorological factors from satellites
- liquid precipitation, solid precipitation and snow cover
- in-situ measurements
- Experiments with results for one year ahead with each model
- Performance estimated comparing forecast data with in-situ measurements

DISCUSSION

THE APPLICATION - ISME-HYDRO

INTEGRATION OF THE FORECASTED HYDRODYNAMIC MODEL INTO A WEB-BASED WORKFLOW BASED ON LINKED DATA E-INFRASTRUCTURE

FAIRWAY MODIFICATION VISUALIZATION

ALERTING

RESULTS IN GRAPHVIEW

RESULTS DOWNLOADED INTO EXCEL FILE

RESULTS

EXPERIMENTS RESULTS FOR WATER LEVEL ON THE DANUBE

EXPERIMENTS RESULTS DISCHARGE FOR THE DANUBE

COMPARISON OF THE RESULTS FROM OUR MODELS WITH THE OFFICIAL RESULTS FOR WATER LEVEL ON THE DANUBE

- Official forecast
- Training with 9 years of daily data
- Training with 5 years of daily data

COMPARISON OF THE PRECISION OF THE DIFFERENT MODELS

TELEMAC SIMULATION RESULTS

- Velocity (V (Velocity U and Velocity Y))
- Water Depth
- Free surface
- Bottom
- Friction Vel.
- Water Depth

DEPTH CRITICAL AREA AROUND SVISHTOV DANUBE RIVER

- Real data for January 2020
- Forecast for January 2020
- +5 day
- +10 day
- +15 day

CONCLUSIONS

ISME-HYDRO - AN INTEGRATED INFORMATION SYSTEM FOR THE BENEFIT OF WATER RESOURCES MANAGERS

- a disruptive web-based workflow
- that makes use of a combination of AI methods
- and delivers a viable and hands-on solution



WE ARE READY TO ASSESS & DEPLOY ALL AROUND THE WORLD.
LET'S DISCUSS: e-mail mariana.damova@mozajka.co | mobile +359885796530

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