

RF MOBILE MAPPING

MOBILE MAPPING WITH THE RADAR RF ANTENNA ARRAY SUBSURFACE DETECTION SYSTEM OF THE MUNICIPAL INFRASTRUCTURE

TECHNOLOGIES

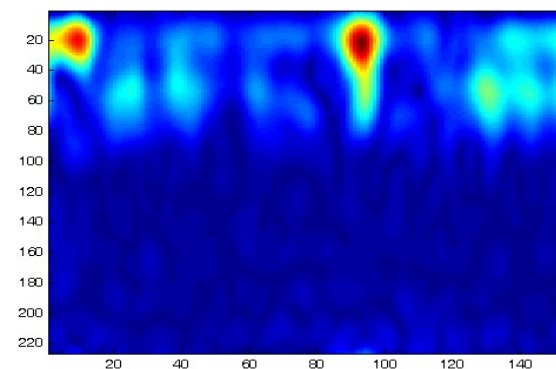
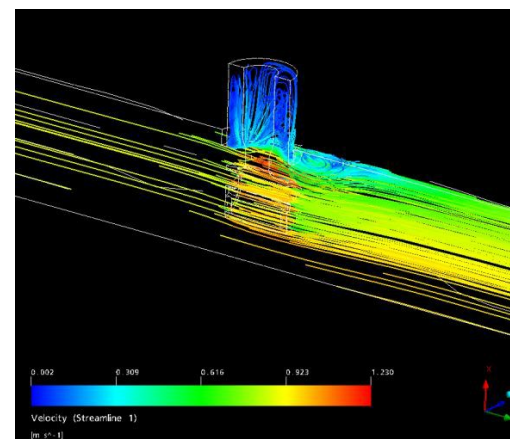
Mobile detection system integrates three basic methodologies for localization of the water mass flow losses in the pipeline distribution network.

- **MOBILE MAPPING**
- **MOBILE SENSOR NETWORK FOR THE REALTIME MEASUREMENTS OF THE PIPELINE DISTRIBUTION PERFORMANCE**
- **TRANSIENT CFD ANALYSIS**

Applied technologies are coupled in all stages of the project.
Stages of the project are defined as follow:

- **RF mobile mapping of the pipeline distribution network**
- **Localization of the water leakage**
- **Verification of the detected locations and quantities**

The system provides flexible selection of the technologies and could be defined as a part of the cost-effective strategy of the water mass flow losses reduction in the distribution pipeline network.



RF MOBILE MAPPING

MOBILE MAPPING PROCEDURES

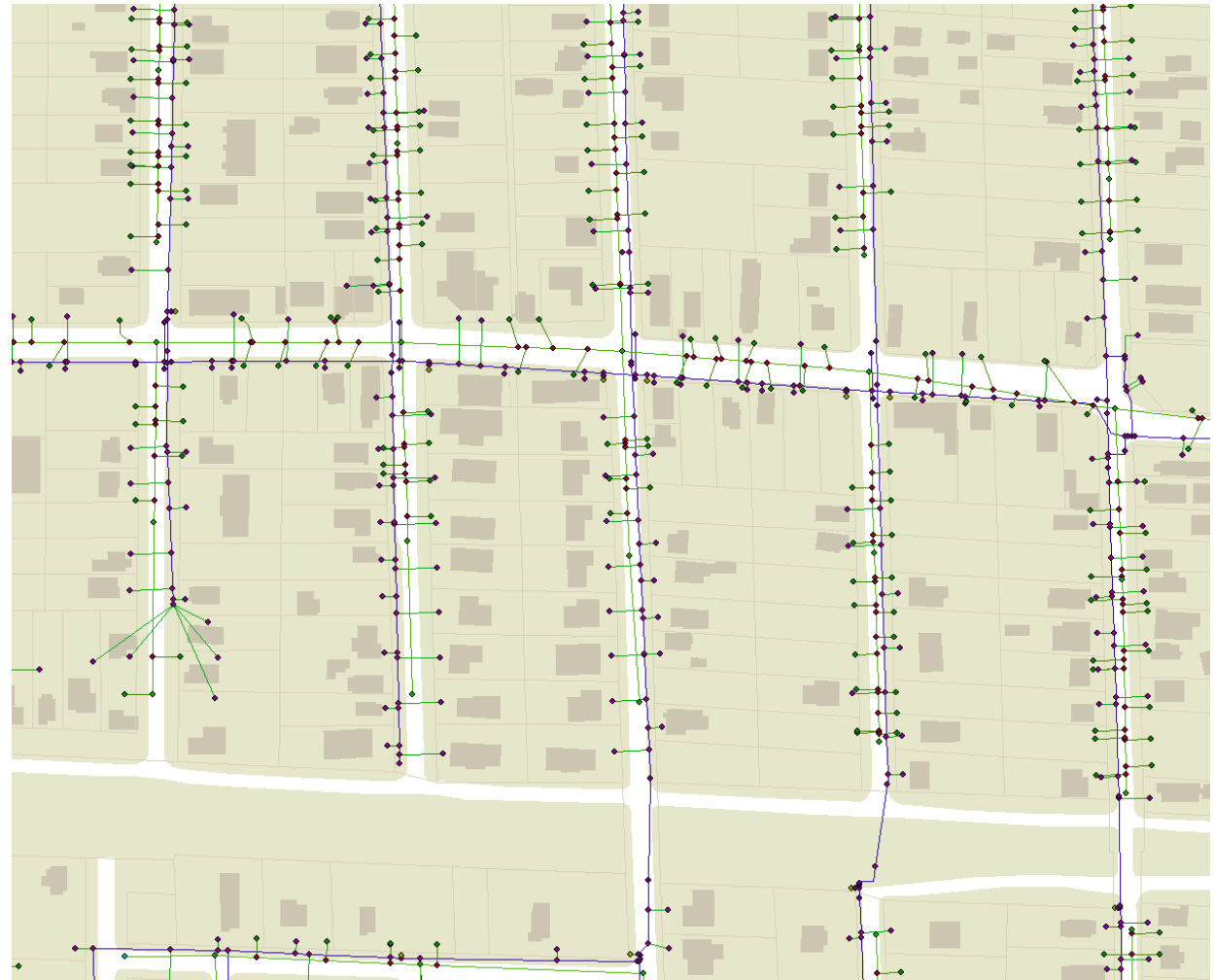
PRE-PROCESSING STAGE

Pipeline distribution network geometry and detection of the water leakage

- ArcView GIS cartography of the whole subsurface municipal infrastructures in the WGS84 coordinate system through [5.-8.] m depth and 5.m basic bandwidth .
- Pipeline material property
- Pipeline geometry properties: top of the pipe geographic coordinates (x,y,z) and pipe diameter.
- Tracking the pipeline distribution network with the higher resolution and moisture detection in the influence region of the pipes.

TARGET DETECTION ELEMENTS

- Pipe diameter
- Pipe material property
- Pipe depth
- Network structures
- Manhole
- Service connection
- Tap
- Discharge point
- Clean Outs
- Catch Basin
- Gravity main
- Pressurized main



CASE: VOKA LJUBLJANA

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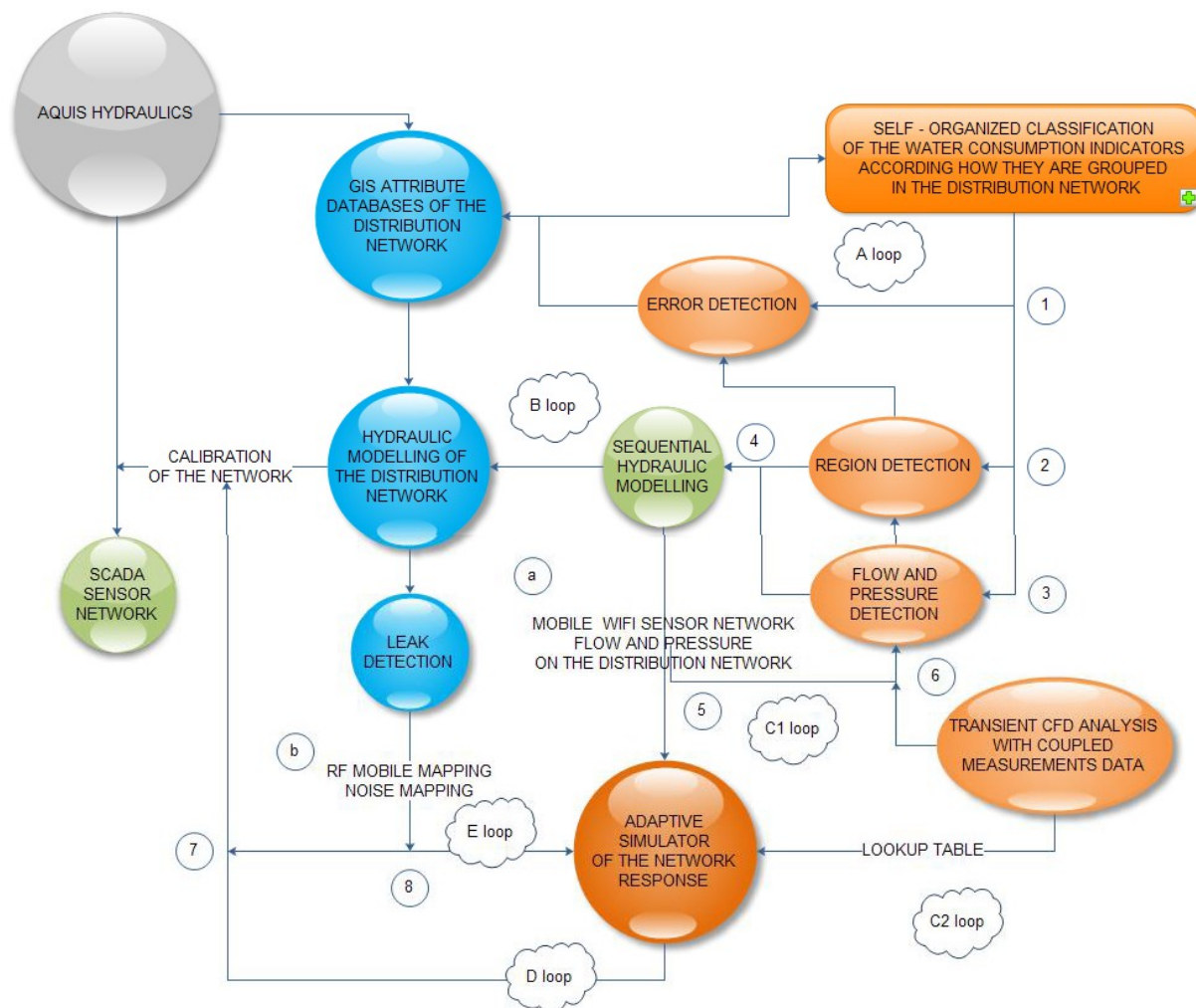
PROCESSING STAGE

Localization of the pipeline leakage

MULTI STAGES LEAKAGE DETECTION ALGORITHM

Algorithm flow-chart demonstrate full version of the detection procedures.

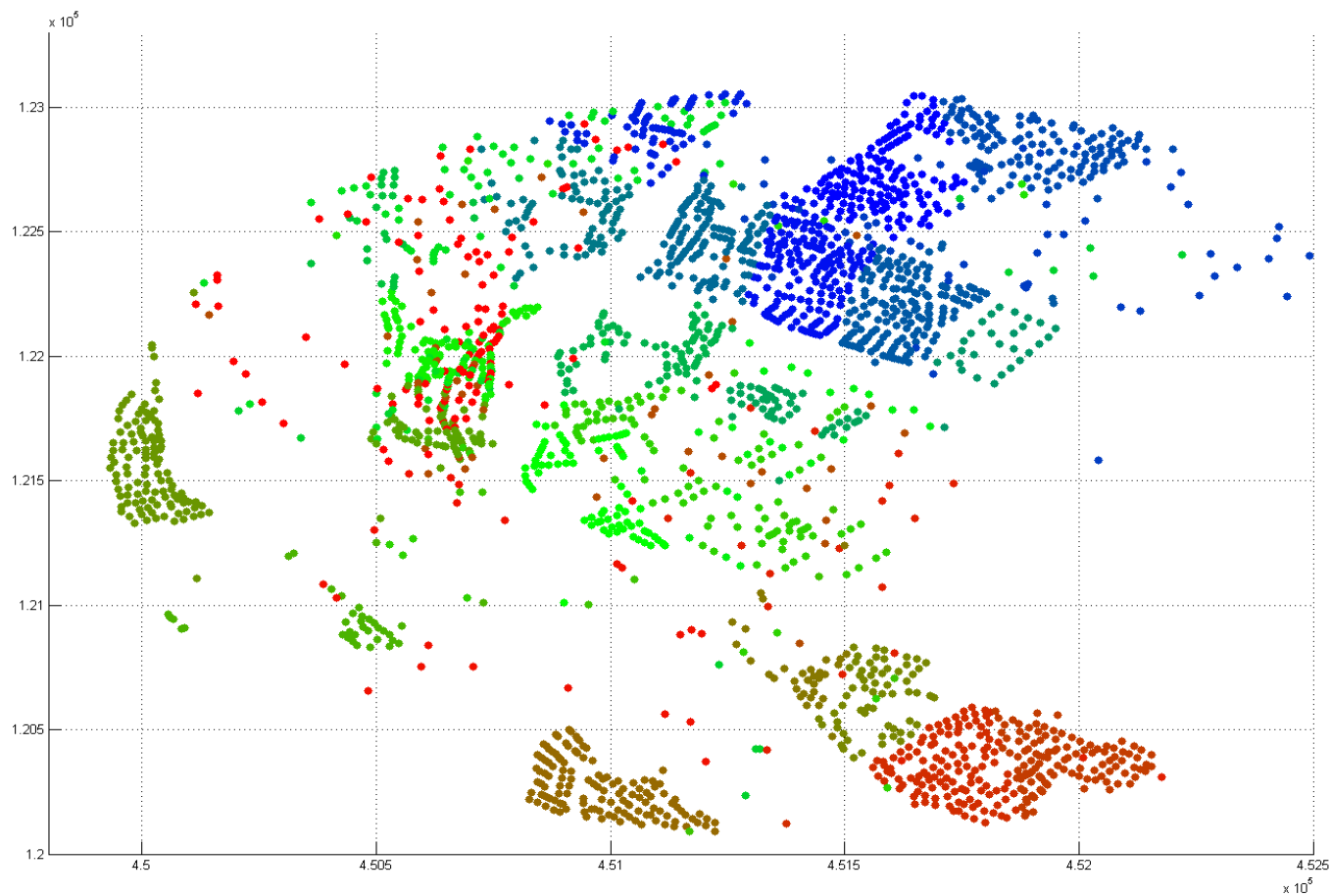
Typically the range of the diagnostics and/or level of detection localization should be customized.



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CASE: MO Kranj Planina – Eltec Petrol Slovenia

Water supply leakage clustering
with self-organized neural network



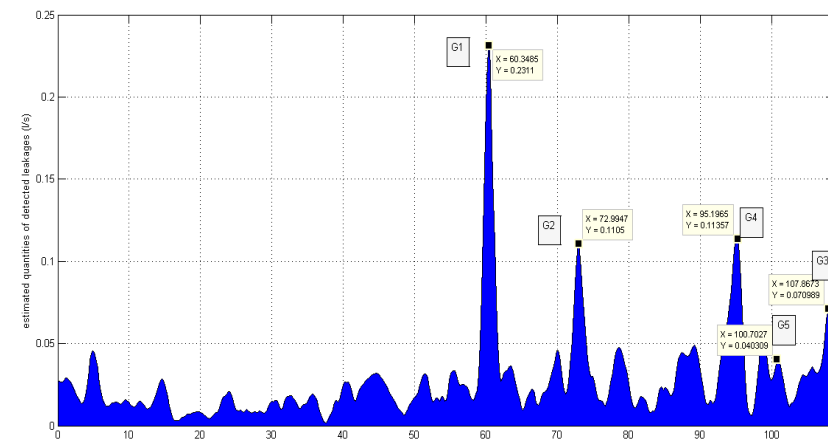
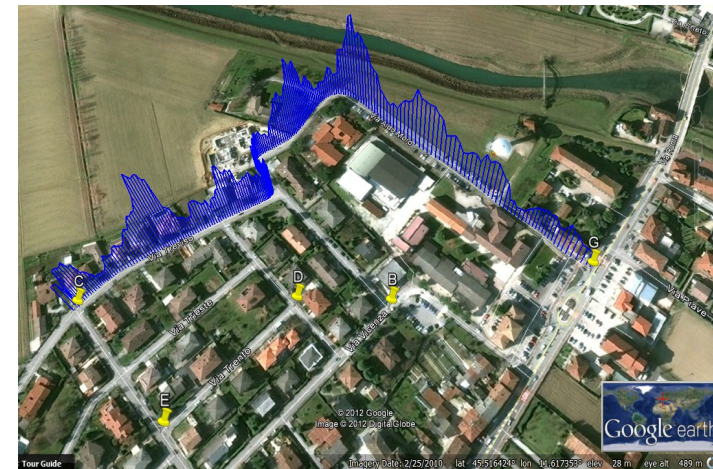
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CASE: MUNICIPALITY OF VICENZA, ITALY

The results of the localization water leakage analysis are graphical present as the attribute layer of the GIS cartography with location on the pipeline distribution network and quantities which are results from look-up table calibration curves analysis.



DETECTED QUANTITIES OF LEAKAGES



RF MOBILE MAPPING

CONFIGURATION OF MOBILE FMCW RADAR ACQUISITION SYSTEM

FMCW ACQUISITION SYSTEM

RF SIGNAL GENERATOR 6.6GHz
RF SIGNAL ANALYZER
SOLID-STATE 48 CHANNEL MULTIPLEXER

ANTENNA ARRAY:

16 UWB VIVALDI RECEIVER ANTENNA ARRAY 800MHz-3GHz
8 bi-Conical RECEIVER ANTENNA ARRAY 100MHz-1.2GHz
8 DIPOL ANTENNAS 10kHz-2000MHz

RT GPS SYSTEM WITH GYRO
4 NEAR IR CAMERAS AND 2 HIGH-SPEED IR CAMERA
LASER DISTANCE BEAM

WI-FI SENSOR NETWORK

ULTRA-SOUND FLOWMETERS
PIPE PRESSURE METERS

