CART’EAUX WATERS MAP’ AUTOMATIC MAPPING PROCEDURE FOR WASTEWATER NETWORKS USING MACHINE LEARNING AND DATA MINING

In France, municipalities must establish a detailed description of wastewater collection and transport systems. If general maps and characteristics of the wastewater networks should – a priori – be available, the information remains quite fragmented (different formats and databases, held by many stakeholders).

The Cart’Eaux project aims at developing a methodology to gather various types of data to produce a regular and complete mapping of urban sewage systems. This includes the use of remote sensing, deep learning, data mining, text analysis. Several statistically possible networks are generated including an uncertainty associated to each piece of information, that will be taken into account in the final hydraulic modelling.

In the following, results are expressed in terms of precision and recall.

**Manhole cover localization: deep learning** (Commandré et al. 2017b, Pasquet et al. 2016)

**Data:**
- 2 RGB images 5 cm/pixel “Prades” and “Gigan”
- Training dataset: 500 manhole covers in Prades (>= augmentation data up to 18401 “manhole” and 418915 “other”)
- Validation dataset: 150 manhole covers in Gigan

**Results:** The mapped network from all actual nodes is validated against the real network using 1/ positional errors (Heipke et al., 1997):
- Precision (correctness) = 90%
- Recall (completeness) = 93%

**Data mining and Text analysis to retrieve meaningful information** (Chahinian et al. 2016)

Step 1: the web is scoured for informative documents which are saved in text format
Step 2: information extraction
- spatial (Unitex software)
- temporal (Heideltimer software)
- thematic (lexicon of buried network terms)
Step 3: linkage

**References:**
Commandré, J-J., Regis, D., Pilat, J., Chauvigné, M. Delenne, C. and Chahinian, N. 2017. Mapped cover localization on aerial images with a deep learning approach. 6th International Conference on Geospatial Resources Management (GRM-6), pages 221–228; Orsay, France.


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