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A plot tree structure to represent surface flow connectivity in rural catchments: definition and application for mining critical source areas and temporal conditions

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Agricultural landscapes are structured by a mosaic of farmers'fields whose boundaries and land use change over time, and by linear elements such as hedgerows, ditches and roads, which are more or less connected to each other. Such man-made features are now well known to have an effect on catchment hydrology, erosion and water quality. In such agricultural landscapes, it is crucial to have an adequate functional representation of the flow pathways and define relevant indicators of surface flow connectivity over the catchment towards the stream, as a necessary step for improving landscape design and water protection.
A new conceptual object oriented approach has been proposed by building the drainage network on the identification of the inlets and outlets for surface water flow on each farmers' field and surrounding landscape elements (Aurousseau et al., 2009 ; Gascuel-Odoux et al., 2011), then on delineating a set of elementary plot outlet trees labelled by attributes which feed the stream. This drainage network is therefore represented as a global plot outlet tree which conceptualizes the connectivity of the surface flow patterns over the catchment.
This approach has been applied to different catchment areas, integrated in modelling (Gascuel-Odoux et al., 2009) and decision support tools. It provides a functional display of data for decision support which can highlight the plots of potential risk regarding the surface runoff, areas which are often shortly extended over catchments (suspended sediment application). Integrated in modelling and mining tools, it allows to catch typologies of the most spatial pattern involved in water quality degradation (herbicides transport model) (Trepos et al., 2012) and test their permanency in time regarding the variations of climate conditions and agricultural practices (Salmon-Monviola et al., 2011). This set of works joins skills in hydrology, agronomy and computer sciences.

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