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Interconnecting sensors and people to improve the knowledge and sustainable management in rural and alpine environment: the CIRCE project

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Environmental sensor monitoring is continuously developing, both in terms of quantity (i.e. measurement sites), and quality (i.e. technological innovation). Environmental monitoring is carried out by either public or private entities for their own specific purposes, such as scientific research, civil protection, support to industrial and agricultural activities, services for citizens, security, education, and information. However, the acquired dataset could be cross-appealing, hence, being interesting for purposes that diverted from their main intended use.
The CIRCE project (Cooperative Internet-of-Data Rural-alpine Community Environment) aimed to gather, manage, use and distribute data obtained from sensors and from people, in a multipurpose approach. The CIRCE project was selected within a call for tender launched by Piedmont Region (in collaboration with CSI Piemonte) in order to improve the digital ecosystem represented by YUCCA, an open source platform oriented to the acquisition, sharing and reuse of data resulting both from real-time and on-demand applications. The partnership of the CIRCE project was made by scientific research bodies (IMAMOTER-CNR, IRPI-CNR, DIST) together with SMEs involved in environmental monitoring and ICT sectors (namely: 3a srl, EnviCons srl, Impresa Verde Cuneo srl, and NetValue srl).
Within the project a shared network of agro-meteo-hydrological sensors has been created. Then a platform and its interface for collection, management and distribution of data has been developed.
The CIRCE network is currently constituted by a total amount of 171 sensors remotely connected and originally belonging to different networks. They are settled-up in order to monitor and investigate agro-meteo-hydrological processes in different rural and mountain areas of Piedmont Region (NW-Italy), including some very sensitive locations, but difficult to access. Each sensor network differs from each other, in terms of purpose of monitoring, monitored parameters, instrumentation, system architecture, data acquisition and communication processes. In addition to real-time data, the CIRCE database includes many historical datasets, which were uniformed to the adopted database architecture. Such datasets were collected before the implementation of the project both from the connected sensors, and from sensors no longer active.
In order to attempt to reduce the gap between the research community and end users, specific APP for smartphones and tablets were created. Such tools facilitate the access and the enrichment of the CIRCE database both for the hydrological section (APP IDRO) than for the agro-meteorological section (APP AGRO). Non-specialists may participate in enrichment of the sensor punctual data with sending qualitative and quantitative information about the observed processes (e.g. watercourse levels, erosion processes, presence of pathogens, damage pictures, etc.). The territorial investigation and the data acquisition also involved groups of citizens (namely farmers, technician and volunteers), that were engaged in creating and testing the informatics tools, according with the “Living Lab” approach.
Finally, the CIRCE platform was interfaced with the YUCCA platform, allowing an open access to the CIRCE dataset and its integration in the SmartDataNet system of the Regione Piemonte public administration.
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