Technology Transfer in Computing Systems

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TETRACOM D3.8: An Innovative Diffused Monitoring of Moisture and Health in Building Structures

Andrea M. Cataldo, Luca Catarinucci, Giuseppe Egidio De Benedetto, Maria Leuzzi, Antonio Masciullo (University of Salento), Roberto Leopizzi, Cesario Martignano (EDIL GE.O.S. s.r.l.)

Moisture/water infiltration represents a serious issue for building infrastructures; in fact, it may lead to severe deterioration phenomena (e.g. premature corrosion of reinforcement bars), which, in turn, may result in catastrophic events. Hence, it is apparent the importance of early detection of moisture/water infiltration, so as to promptly intervene with the necessary maintenance. One of the possible technological solutions is to permanently embed moisture sensors inside the structures to be monitored. However, currently, most of the embeddable moisture-monitoring solutions resort to point/local-sensors; hence, reliable spatially resolved measurements are difficult to be achieved. An addition downside is that these sensors often work on batteries, thus requiring periodic and "destructive" maintenance (e.g. to replace batteries, it is necessary to remove the sensors from the walls) . Finally, the sophisticated electronics of these sensors may not last long inside construction materials.

Diffused monitoring of moisture content profile of building structures through maintenance-free, embedded sensing elements

Starting from these considerations, the subject of this technology transfer was an innovative solution, developed at the University of Salento, for obtaining a "diffused" measurement of the moisture content of building structures. This technology employs flexible sensing elements (SE's) to be used in conjunction with time domain reflectometry (TDR) measurement technique. This technology overcomes all the intrinsic limitations of traditional moisture content sensors. In fact, the SE's are passive (hence, maintenance free) and have a wire-like configuration (hence, instead of local measurements, they can provide the profile of the moisture content all along their length). Furthermore, the considered SE's have no sophisticated electronics on board, and they are protected from the environment thanks to a plastic jacket, thus also ensuring a lasting service life. Once the SE's are in the wall, the connection of the TDR instrument to the SE's is obtained by creating a `point of access to the SE', through a wall socket-like on the wall.

The company partner (and recipient) of this technology transfer was EDIL GE.O.S. s.r.l., a company whose primary activities are renovations of civil houses and historical buildings. This company had expressed the need for acquiring a smart technological solution for an effective monitoring of water infiltration in the houses on which they intervene. The know-how behind the use of this innovative technology was the subject of the present technology transfer, and the company partner was granted the opportunity to employ first-hand the new moisture-sensing technology.

Within this technology transfer, first, the University of Salento offered (theoretical and practical) training courses, regarding the aforementioned TDR-based system for monitoring water infiltration, to the staff of the company partner. Successively, the company partner was assisted by the University of Salento in the implementation of this new technology in old houses under renovation: because of the materials used at the time of construction and because of the geomorphology of the underground soil, these houses are subject to recurring phenomena of rising damp and, hence, were considered functional for implementing the technology transfer. It should be pointed out that the first step for an effective practical implementation of the embedded monitoring system was to analyze the planimetry of the building, so as to identify the strategic portions of the walls in which to install the SE's. The SE's used for the present practical implementation are flexible two-wire sensing elements.

Future exploitation of the technology

The implementation of this system is expected to give the company partner the opportunity to guarantee the customer a high-added value "warranty" on the renovation work: in fact, by installing this diffused moisture content measurement system, the company partner can provide regular monitoring and, if necessary, the prompt intervention, even before they become apparent to the eye.

Furthermore, in addition to moisture content measurements, the proposed technology may potentially be used to monitor the presence of structural defects of the structure in viaducts, bridges and a lot of other building infrastructures.