

## PREFACE

### **EMPATHY: Second International Workshop on Empowering People in Dealing with Internet of Things Ecosystems**

Nowadays, we live in an epoch where technology is evolving at an extremely fast pace, giving rise to unprecedented challenges, risks and opportunities. The proliferation of low-cost technologies integrating sensors and actuators, the advancement in wireless connectivity, the progress in artificial intelligence, which has been used to obtain automation in several fields, as well as the rise of the Internet of Things (IoT) paradigm have all contributed to create a scenario where the digital and physical realms meld together, and users can interact with a plethora of ubiquitous, always-connected smart objects.

The end user experience, however, may not always be satisfactory: IoT ecosystems may not be transparent enough for users to understand their behaviour, or they may fail to keep up with users' dynamic, ever-evolving needs. The role of End User Development (EUD), which concerns methods, techniques, and tools allowing users of software systems, who are acting as non-professional software developers, to create, modify, or extend their applications is therefore fundamental to help users themselves control and understand the automation available in their context of use.

A specific challenge for EUD in the IoT context regards the need to establish how to automatically react to events that can be generated through dynamic combinations of a variety of sensors, objects, services, devices, and people. While solutions based on the visual creation of trigger-action rules are receiving increasing interest, such approaches can nevertheless prove difficult for non-programmer users when elaborate rules must be expressed, for example combining multiple triggers and actions to define the behaviour of complex smart environments. In addition, trigger-action rules could raise some ambiguity in their interpretation due to potential discrepancies in end users' mental models, which is especially relevant in domains where incorrect behaviours can cause safety issues.

The EMPATHY project, funded by the Italian MIUR, aims at exploring solutions to personalize IoT environments and provide users with control of the automation in their everyday life.

Following the success of the first edition, which was held at AVI 2020, the second EMPATHY workshop, held in conjunction with INTERACT 2021, aimed at further investigating such topics, opening the discussion to all interested researchers and practitioners.

Twelve papers were originally submitted to the workshop. Ten of them, published in these proceedings, were presented, either in presence or online, and led to a fruitful discussion which involved the authors and other attendees as well.

Several topics were addressed.

De Russis, Monge Roffarello and Borsarelli investigated the role of conversational assistants in facilitating the composition of rules to control a domestic IoT ecosystem. Menon and Hedin suggested that animistic narratives could represent a new approach to design "living" IoT ecosystems. Rizvi presented IoTgo, a toolkit to support the creation of IoT smart things on the part of non-programmers. Mattioli, Manca, Paternò and Santoro claimed that

Augmented Reality (AR) could be used to facilitate the customization of smart home environments and proposed two techniques for recognising objects. Cena, Gena, Mattutino, Mioli, Moreno and Venero envisaged how different types of personalized recommendations could be used to support configuration choices in smart environments. Morra, Cosentino, Gelsomini, Matera and Mores introduced COBO, a phygital toolkit to design smart objects which specifically targets young adults with intellectual disability. Breve, Cimino and Deufemia focused on possible security and privacy threats connected with user-defined event-condition-action (ECA) rules and discussed a classification model based on neural networks for the identification of such issues. Andrao, Treccani and Zancanaro proposed a language of primitives that therapists can use to personalize the exercises in a tabletop tangible device meant for children on the autism spectrum. Breve, Greco, Desolda, Matera and Deufemia studied how Task Automation Systems (TASs), i.e., tools aimed at supporting the definition of trigger-action rules, can be extended to manage security and privacy-related aspects. Desolda, Greco, Zancanaro and Costabile started from the idea that users may have difficulties in distinguishing between trigger states and trigger events, and examined how Event-State-Condition-Action (ESCA) rules could be implemented in a TAS,

We are planning to have new editions of the international EMPATHY workshop in the near future, so as to foster the exploration of novel solutions, perspectives and challenges.

The workshop organizers

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