model temporal relationships automatically and consistently inherited by the associated Web service operations. This is important because task model relationships should be derived taking into account the user's perspective. Once the task model and Web services are connected, a first draft of an abstract UI description can be generated and then further edited by designers; when a satisfactory customization is reached, it can be refined into a concrete, platform-dependent one.

Designers can also include annotations associated with Web services, which provide (also partial) hints about the possibly related UIs. At the abstract UI level, the annotations can specify grouping definitions, input validation rules, mandatory/optional elements, data relations (conversions, units, enumerations), and languages. At the concrete UI level, the annotations can provide labels for input fields, content for help, error or warning messages, and indications for appearance rules (formats, design templates etc.).

When designing a specific multi-device application, the models created with device-independent languages should also take into account the features of the target interaction modality. Thus, for example, in the task model we can have tasks that depend on a certain modality (eg selecting a location in a graphical map or showing a video), and are neglected if they cannot be supported (eg in a platform having only the vocal modality).

For each target platform it is possible to focus just on relevant tasks and then derive the corresponding abstract description, which is in turn the input for deriving a more refined description in the specific concrete language available for each target platform. Since the concrete languages share a common core abstract vocabulary, this work is easier than working on a number of implementation modality-dependent languages. Our tool MARIAE is currently able to support the design and implementation of interactive service-based applications for various platforms: graphical desktop, graphical mobile, vocal, multimodal (vocal + graphical) and can be freely downloaded.

The tool has been developed in the ServFace project, whose goal was to create a model-driven service engineering methodology to build interactive service-based applications using UI annotations and service composition. The project began in 2008 and finished in 2010. The institutions involved were ISTI-CNR, SAP AG (Consortium Leader), Technische Universität Dresden, University of Manchester, W4.

Links:
ConcurTaskTrees Environment:
http://giove.isti.cnr.it/tools/CTTE/home
MARIAE Tool: http://giove.isti.cnr.it/tools/MARIAE/home
HIIS Laboratory: http://giove.isti.cnr.it/
ServFace EU Project: http://www.servface.eu/

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Training Crisis Managers in Strategic Decision-Making

by Amedeo Cesta, Gabriella Cortellessa, Riccardo De Benedictis, and Keith Strickland

The goal of PANDORA is to apply state-of-the-art ICT technologies to build a learning environment for strategic crisis managers. We are currently refining a first version where training sessions are animated by reproducing realistic crisis events and fostering creative decision-making. Central to PANDORA is an original use of the timeline-based planning strategies used to diversify crisis scenarios by creating alternative training paths and to model trainees behavioral patterns for personalized training.

Crisis management in emergency situations helps significantly to avoid major losses and may prevent emergencies from becoming disasters. The success of crisis management depends heavily on the effectiveness of high-level strategic choices and the reasoning abilities of decision makers.

Three different levels of decision makers exist in current approaches to crisis management:
- operational level or bronze commanders, directly operating on crisis scenarios, whose actions and results are monitored and communicated to higher levels
- tactical level or silver commanders, responsible for translating high-level strategic decisions into actions and related resources allocations
- strategic level or gold commanders, who identify key issues and decide strategies to resolve the crisis.

The PANDORA project aims at creating an advanced training environment for crisis decision makers who operate in highly stressful situations. They must react effectively and coordinate interventions with different authorities to limit the dangerous effects of crises and to enable quick recoveries. Contrary to almost all the state-of-the-art training systems, aimed at the operational or tactical level, PANDORA targets decision-making at the strategic level, which presents interesting open challenges.

There are two main approaches to training: (a) tabletop exercises (group discussions guided by a simulated disaster); (b) real world simulation exercises (field-tests replicating emergency situations). Tabletop exercises are low cost and easy to organise, but they cannot recreate the real atmosphere, in terms of stress and pressure. On the other hand, real world simulations can be very effective but are extremely expensive and difficult to organize.

PANDORA aims at replicating the benefits of both training approaches by developing a system capable of guaranteeing the realism of the real world simulation and the practicality of tabletop exercises. A user-centered approach is followed and we have worked in close collaboration with the UK Emergency Planning College, which has identified the main requirements, and is influencing the design and implementation decisions.

Figure 1 summarizes the main concept of PANDORA. A group of trainees, from different agencies (eg, Civil Defence, Health, Fire Service, Police, Transportation) access the training system. If some authorities are not present, they are simulated through Non Player Characters. Each trainee feeds personal data to the PANDORA kernel, which gathers this information to build a user model (Behavioral Module). On the basis of this model, the system synthesizes personalized training paths (Behavioral Planner). The output of this process is passed to a second module (Crisis Planner), which uses both the Behavioral Module indications and knowledge of the chosen scenario to plan sequences of stimuli appropriate for the group (information shared among all trainees)

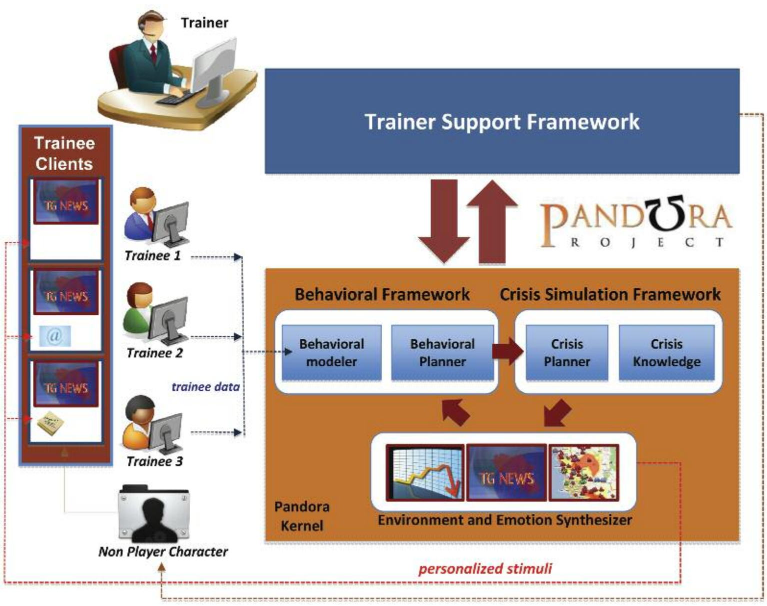

Figure 1: The PANDORA system architecture.

and the individual trainees (information tailored to induce the “right level of stress”).

The plan is then passed to the Environment and Emotion Synthesizer, responsible for an effective rendering of the various stimuli. A separate module (Trainer Support Framework) allows trainers to control the training session and dynamically adjust the stimuli based on their experience.

PANDORA uses timeline-based planning technology which allows for rich domain modelling and uses both temporal and resource constraints. A timeline can be seen as a stepwise constant function of time. Specifically it is an ordered sequence of values holding on subsequent temporal intervals. This approach has been used both in the Behavioural and the Crisis Framework.

In the first case some psycho-physiological trainee features, shown to influence human behaviour under crisis, are modelled and updated during training as timelines. On the basis of this model, the Behavioural Planner synthesizes goals for the Crisis Planner. The Crisis Planner creates training storyboards, sets of “events” communicated to the trainees (eg, a news video from the crisis setting, a phone call or e-mail from an operational or tactical manager). Additionally, the Planner “reacts” to trainees’ strategic decisions, triggering subequent events to continue the session.

The overall system empowers the trainer with a new means for training people. Indeed the suggested crisis stimuli and the behavioural analysis are presented to the trainer to influence at any moment the training session, in perfect line with a mixed-initiative style.

Links:
http://www.pandoraproject.eu/
http://epcollege.com/
http://pst.istc.cnr.it/

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Security and Resilience in Cognitive Radio Networks

by Vangelis Angelakis, Ioannis Askoxylakis, Scott Fowler, David Gundlegård, Apostolos Traganitis and Di Yuan

After more than a decade of research, system security and resilience is now the major technological barrier for the Cognitive Radio (CR) to be adopted by the telecommunication industry. New ideas are required to make CR networks secure and robust against attacks taking advantage the inherent characteristics of the CR functionality. This work explores key points that urgently need to be addressed.

Cognitive radio (CR) is a term with many possible meanings in the telecommunications literature of the past decade. Most commonly, a cognitive radio device is based on a software-defined radio (SDR), and has an adjustable front-end, which allows it to tune on different frequencies, power levels and modulation schemes. The SDR infrastructure has a programming interface that enables these configuration options. These, in conjunction with the context of operation (radio interference and noise, traffic demand, mobility levels, element status, location, etc) are made available to a decision-making entity, which selects the best configuration by solving an optimization problem with respect to some objective function. Further input is contained in a system knowledge base that codes the contexts encountered and maps them to specific radio configurations that can be used. This mapping can be done through a reasoning engine which is essentially a set of logical inferring rules (policies) and “reasons” (i.e. searches) for a proposed set of actions that will manipulate the current state of the knowledge base in an