

# **THE USE OF SCRIPTS AND STORYBOARDS IN CRISIS SITUATIONS**

## ***PLENARY REPORT SUMMARY***

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**Abstract:** To be prepared for a flooding crisis the city council of Prague prepared a crisis plan. In such a plan possible crisis events and corresponding actions of rescue workers have been described. The extensive text based crisis plan cannot be used to inform and train civilians in the crisis area and first responders. Storyboards and scripts offer a possible visualization of the crisis plan. In the paper the use of storyboards in case of a flooding crisis have been described. Some experiments have been performed and the results are presented

**Key words:** crisis plan, scripts, storyboards, data visualisation, artificial intelligence, experiments.

## **1. INTRODUCTION**

In 2002 there was an enormous flooding in the old city of Prague. The water of the river Vltava went beyond its borders and caused a lot of damage of buildings, infrastructure. A dozen of citizens were drown but many more were injured. A crisis management team evaluated the flooding crisis and concluded that the city was badly prepared for the flooding. Parallel with the renovation and reconstruction of the old city, the city council took some measurements to control the raising water in the river in a better way. A plan for building water reservoirs was designed and cascades in the river to buffer the water. The river bed was deepened and enlarged to enable faster drain of the water.

The crisis management team designed a flooding crisis plan with a detailed description of events to be expected during a crisis and possible action. First responders members of fire brigade, police and medical service play key roles during a flooding crisis. To be prepared for a flooding crisis training events are organized for first

responders at regular times on different places. For such training events special scenarios have been designed. But it proves that all the documents are difficult to read and understand by first responders.

During the flooding in 2002 many movies and pictures were taken. Eyewitness reports were written and recorded. Newspapers, radio and TV broadcasts reported about the flooding and present the flooding events on timely basis. This multimodal material has been included in the training material of first responders. Compared to written documents it proves that scripts, storyboards, gaming and MOOCs are highly appreciated by first responders. According to a well-known saying “a picture tells more than thousands of words”, it is not a big surprise that multimodal material is more informative than written documents. In this paper we will research a psychological grounding of this phenome. Next we will research how storyboards can be constructed from available multimodal recordings of a flooding disaster with and without use of augmented reality technology.

The outline of the paper is as follows. In the next section we will present a literature survey. Then we will present a model in section 3. This model has been tested in some experiments presented in section 4. In section 5 we come to a conclusion and end this paper with references.

## **2. RELATED WORK**

In [1] the AI researcher Robert Schank introduced the concept of behavioral scripts. Behavioral scripts are a sequence of expected behaviors for a given situation. Schank reported that humans are able to store many life events as a sequence of scripts in their memory. It proves that all people have common stories in their brain. Famous is the restaurant script. After entering a restaurant a customer may look for an empty table, order first some drinks, select food on the menu card. After finishing his meal the waiter asks for a dessert or some coffee. Before leaving the restaurant the customer pays his meal. The different roles and actors are well defined in the script. Schank developed a formal language to describe different scripts. Scripts are prototype behavior patterns. Details can easily be included by people. If a lot of contradictory information is perceived, humans are willing to give up

There is a lot of psychological research to validate the script theory. In their study Bower et al [2, 3] asked participants in their experiments to read different scenarios. Next the participants were asked to remember as much of each scenario. It proves that respondents reported events that were not part of the scenario but part of the underlying prototype script. Participants were also requested to indicate on a 7-point scale if some presented sentences were actually taken from the scenarios. It proves that respondents recognized some sentences as if they were from the scenario. In fact these sentences reported relevant issues from the scenario but were actually not from the scenario. Ultimately, Bower, Black, and Turner’s study suggested that scripts serve as a guide for a person’s recall and recognition for certain things that they already know.

Klein [4] studied the behavior of first responders. It proves that fireman had possible scripts of crisis scenarios in their memory. If they are confronted with the first features they select one of these scripts and stay to it until the moment they are confronted with so many conflicting features that they have to give up the chosen scripts and come up with a new script where all the features find their place. Fireman learned their scripts from past experience and training. It proves that they had problems finding a script if they were confronted with a disaster they have never seen before.

In one of his studies Rothkrantz [5, 6, 7] reported that fireman came up with possible scripts of fire in the underground or train incidents if they were confronted with wounded people and panicked people leaving the exit from the underground. These fireman were never confronted with the possible scenario of terroristic attack.

Rothkrantz [8, 9] showed that also human reasoning is quite different from reasoning using (probabilistic) expert systems. As Klein demonstrated human experts select from the beginning a possible script and stick to it until they are confronted with many conflicting events. In expert systems many possible scenarios are considered simultaneously. Every observed feature contributes with some weight to a possible script. Every moment the most probable script has been selected

### **3. PROBLEM DEFINITION**

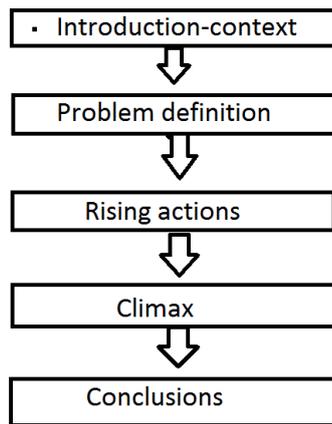
A crisis plan is usually an extensive written document. It proves that visualization of a crisis plan by storyboards is useful in application and training, exercises. The problem is how to design storyboards from multimedia recordings of past flooding events. In how far is a sequence of video frames a visualization of a prototype of a story.

### **4. MODEL**

In [10] Lefter et al. defined 25 topics of overt aggressive behavior in railway stations and trains. Eleven stand-up comedians were requested to play the aggressive scenes and all scenes were recorded by multimodal video recorders. The video footage was analyzed and it proves that all recorded scenes had a similar underlying model as displayed in figure 1. It always started with an introduction to the context, travelers in a train or in a station. Next the topic was introduced such as someone who uses the train without paying, pickpocket, embarrassment, inappropriate behavior of drunken traveler, loud speaking phone caller, beggar, hooligans. In all the recorded movies there was a rising action to a climax of overt aggressive behavior, followed by removal of the aggressor and returning back to the default situation.

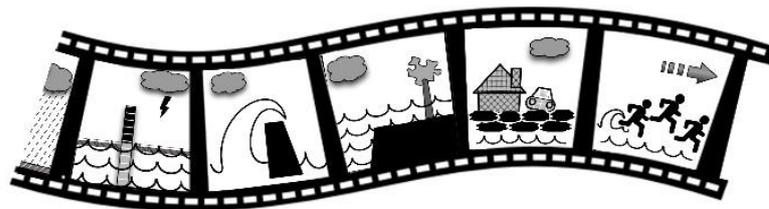
After the different scenes were recorded we made a storyboard of all the 25 different topics. An artist made drawings of characteristic scenes and the composing scenes of the storybook form a comic. The question was how the characteristic scenes

were selected. A final criteria was that the composed scenes have to tell a story. The selection by the artist was by intuition. Later we deleted and added scenes without changing the basics of every storybook. It proves that in 82% of the storybook of the artist remain unchanged. Given every drawing we were looking to a similar frame in the video recordings. It proves that the artist was inspired by the video recordings but was able to reduce characteristic scenes to the essentials. In fact the artist used also enhanced reality technology to generate characteristic scenes.



*Fig. 1. Model of a storyboard*

## 5. EXPERIMENTS



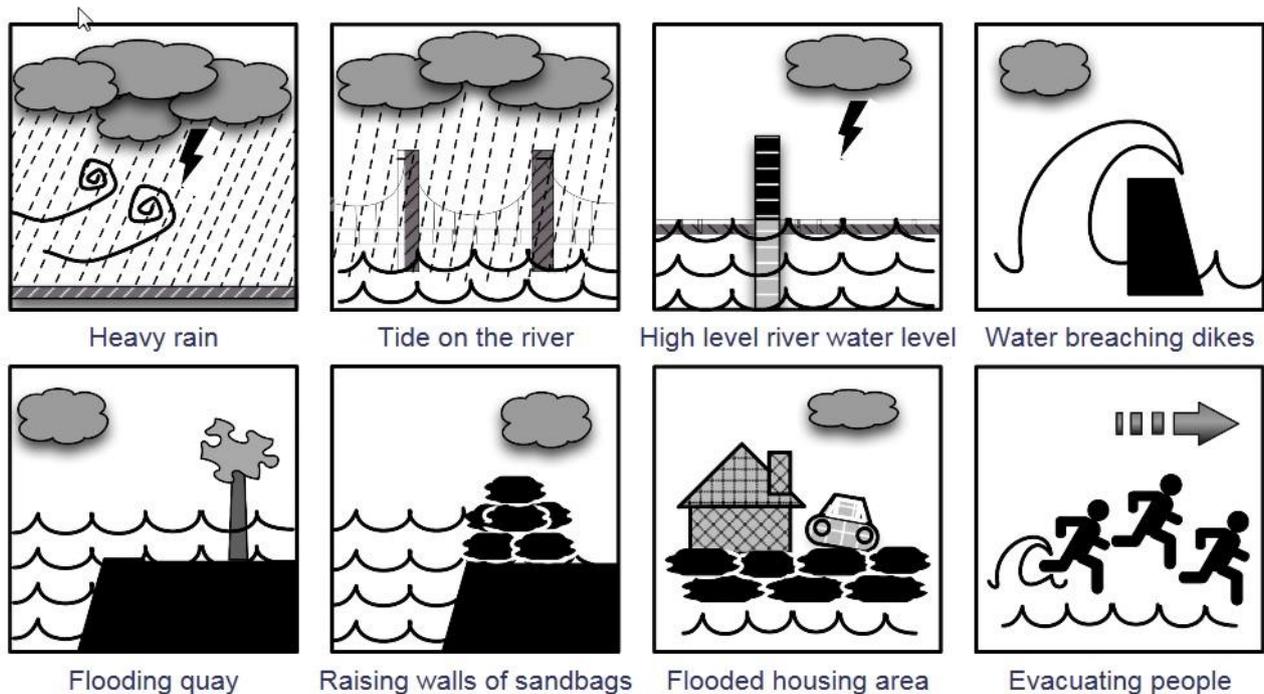
*Fig. 2. Storyboard of a movie of flooding.*

We performed some experiments to verify our hypothesis a defined in section 3. In this section we will describe the experiments and present the results

### 5.1. Stories related to storyboards

Our assumption is that some flooding events are stored as prototypes in the common memory of people. An artist made an artistic impression of the storyboards 5 flooding events such as the onset of a flooding, measurements to prevent flooding, successive flooding of the lower parts of Prague, mass evacuation, finger in the dike by soldier Schweik.

The participants in the experiments were 28 students Computer Science from Delft University of Technology. The storyboard as displayed in Figure 3 was displayed to them without text labels. Students were requested to fill in the text labels and a summarising story. It proves that 19 students were able to fill in the text labels correctly and summarised similar stories.



*Fig. 3. Storyboard of flooding.*

A possible flooding crisis can be described by a sequence of events. Maybe it starts with heavy rainfall, causing raising of the water level in the river, followed by breaching dikes, flooding quays, building walls of sandbags and evacuating people. These events can be visualized by pictures. These pictures tell a story. But not every sequence of pictures tells a meaningful, unique story. An interesting question is which flooding stories are in the mind of people and if these stories are similar?

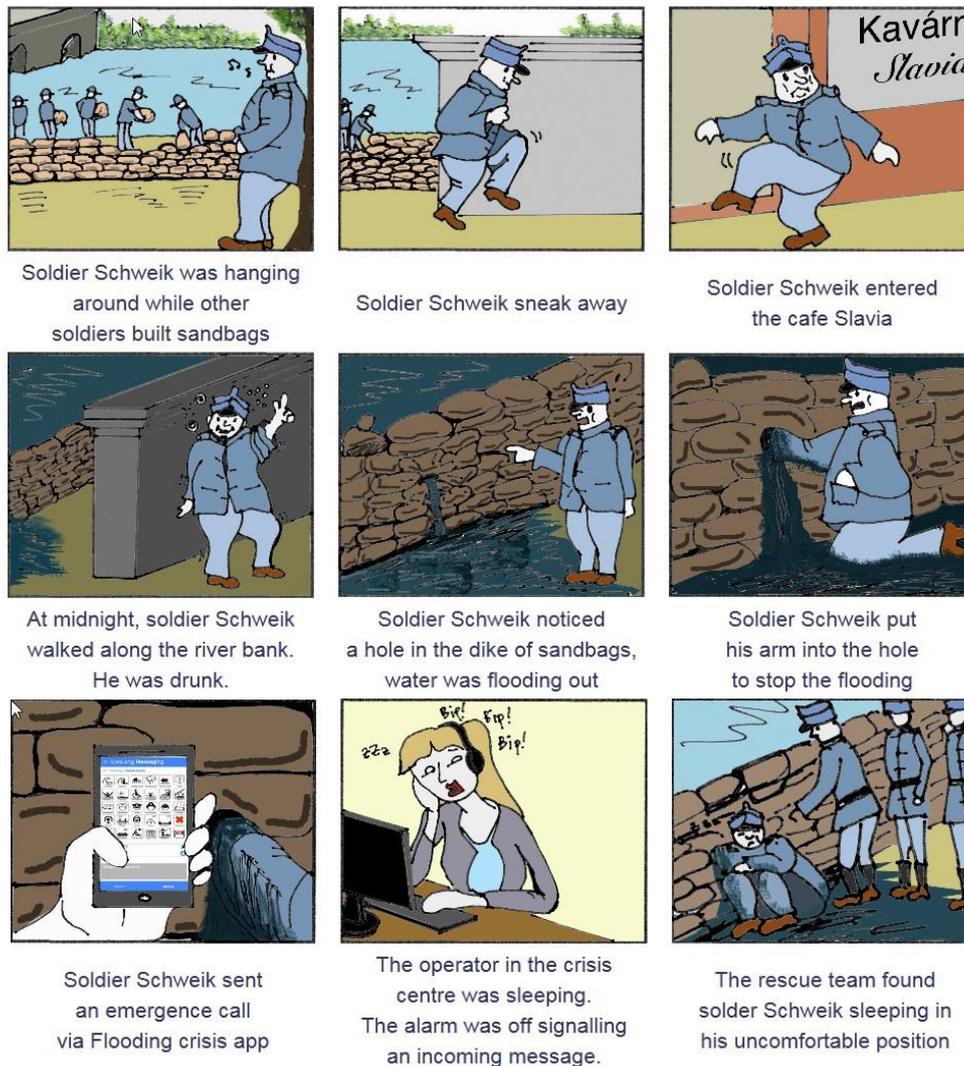


Fig. 4. Storyboard of soldier Schweik saving the city of Prague.

It is not necessary that, a storyboard is composed of pictures of realistic events. Augmented reality or even imaginary pictures can be used to accentuate the focus of the pictures and to enable the expected interpretation. Fantasy and imagination is also used in fairy tales and comics. Let's read the story (below) about how soldier Schweik saved Prague from flooding.

In a second experiment our 28 respondents were confronted with the storyboard as displayed in Figure but without text labels. Again the respondents were requested to generate appropriate text labels and 21 of them were able to do this. Some student never heard about the Dutch children story of the boy Hans Brinkers putting his finger in the dike and saved Holland.

## 5.2. Storyboards generated from movie frames

There are many movies, pictures, scripts available from the real life flooding disaster in 2002. In Figure 5 we display some examples. A sequence of random choice

of pictures will not tell a story. A special selection is needed and even some pictures processed with augmented reality technology.

In a third experiment our 28 students from DUT were confronted with a set of 25 pictures and were requested to generate a flooding script/storyboard composed of 10 of them. The generated storyboards were checked by 3 other students in a discussion. It proves that 22 relevant storyboards were generated, recognized by the other students.



*Fig. 5. Samples of pictures from the flooding disaster in 2002.*

## 6. CONCLUSION

In this paper we studied the generation and recognition of storyboards around a flooding disaster in Prague. It is assumed that humans use scripts to store information about real life events.

In a first experiment we tested if a storyboard of pictures of scenes from a flooding disaster were recognized by a panel of students.

In a second experiment we tested if a storyboard was recognized based on a well-known children story of Hans Brinkers putting his finger in a hole in the dike saving Holland from flooding. Respondents familiar with the children story recognized also the flooding storyboard.

Finally in a third experiment respondents were confronted with set of real life pictures of the flooding at Prague in 2002. The assignment was to generate a storyboard

from the pictures. It proves that most respondents were able to select appropriate pictures and put them in a logical order. Apparently most students had a flooding script in their mind and were able to generate a similar script using the pictures.

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