Review of Cathy Stein Greenblat's book 'Designing Games and Simulations. An Illustrated Handbook', (1988)

A Review from the Point of View of the DAAI Paradigm
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Abstract

This text discusses ideas about the relationship between the DAAI paradigm and the concept of simulation games as described in the book of Greenblat (1988) [Gre88].

1 Simulation Games

The Expertise of Greenblat has been built up during 16 years of intensive work in research and teaching around the topic of *simulation games*.

The Main Scope of her book is the explanation of all the important factors which are part of the *process* of *designing* a simulation game. This is relying on science, but as well on art. Then, having a game developed, the other big topic is the *evaluation* of the simulation game by playing and analyzing the game process afterwards.

In the following Greenblat defines some basic concepts which she is using in her book.

Simulations: The point of reference for simulations is some *real environment* (or part of it, some real process or a system), which will be *translated* into a *model* with minimal *dynamics representing* those central *features* which are *understood as being important* for the real system.(cf. p.14)

Games: In a *game* in the general sense the process depends mainly on the decisions of the players, but can be modified by different circumstances like *roles* the players should agree with, *goals* which should become achieved, special *activities* which can be performed, *constraints* which represent limits to activities, or some *payoffs – positive or negatives –* as results of actions.(cf.p.14)

Gaming Simulation (or Simulation Games): What turns a normal game into a simulation is according to Greenblat the fact that the game becomes related to the real world.(cf. p.14f)

Role Playing: For the participants a *role* is specified and the *general outline of a situation*. From this point onwards the process is mostly open. There are no fixed rules for actions and no clearly defined payoffs.(cf. p.15f)

Gaming Simulation vs. Computer Simulation: Greenblat distinguishes between gaming simulations and computer simulations, but the arguments for this distinctions are not very sharp. Mainly it seems that she gives the *computer simulation* the advantage for more precise computations and a bigger quantity of data which can be handled. The *gaming simulation* shall have the advantage that the experience of the human players is deeper and allows a more intensive learning, and the decisions are more realistically. (cf. p.18f)

Educational Perspective: Greenblat gives some arguments, why the method of simulation games is advantageous for the realm of education. The main points are (cf. p.16ff):

1. Improving the *motivation* of students for the subject.
2. Better *development* of certain *skills*.
3. Enabling the *change of attitudes*.
4. Enabling a better *Self-evaluation*.
5. Offering more *active* participation, *more repetitions* on demand, *not only verbally*.

2 Critical Comment

From the point of the DAAI paradigm the terminology of Greenblat is a bit problematic. Here are the arguments:

In the light of the conceptual structure a *game*, a *simulation game* and a *computer simulation* is not really different. As mentioned above we have in all cases the following elements $\langle ENV, A, R, RL, PAY \rangle$:

1. We have *players* (or 'actors') [A]
2. We have an *environment* [ENV] for the players
3. We have *rules*[R] which define the kind of activities, which the players can realize as well *defined effects* of the actions with regard to the environment
4. We have some *roles* [RL] characterizing the main properties of an player
5. We have some *payoffs* [PAY] associated with the environment and the actions

The differences of the three concepts *game*, *simulation game* and *computer simulation* is understood within the DAAI paradigm as follows:

1. In a (simulation) game where *no computer is involved* the experience for the human players is direct, and allows a maximum of personal experience being an active part of a model. But on account of the limits of human bodies and the real character of the model the complexity of the game is severely limited.
2. In a simulation game which is *completely done as a computer model*, where even the players are modeled as virtual objects in the computer, there is no direct experience for human players. But on account of the computing power of modern computers it is possible to simulate an incredible amount of possible scenarios with their possible outcomes, scenarios which without a computer never would be possible to check.
3. In a *hybrid human-computer simulation game* the human players can overtake the roles of the virtual actors and can interact with the computer simulation *as if* they are *acting in a real world* scenario. The incorporation of real human players in a virtual game scenario limits on the one hand the amount of possible scenarios to be explored, but on the other hand the experience for the human user can vastly be extended by scenarios which by different reasons would not be possible in the real world.
4. The *most simple case* of a *hybrid human-computer* simulation game is such that the computer simulates only the *model* of the game by computing the *effects* of the actions of the human players.

Summary of Definitions: From the point of the DAAI paradigm we prefer therefor the following terminology: The term *role game* will be used as it is used by Greenblat. The terms *game*, *game simulation/ simulation game* and *computer simulation* will be used as discussed above. A *simulation game* is basically a game and will only be distinguished by different *modes*: (i) *no virtual* part, (ii) having a *virtual model*, (iii) being *completely virtual*.

Greenblat excludes the kind of computer simulation as characterized by option (iii) explicitly. (cf. p.19) It seems further that she excludes even the kind of computer simulation as characterized by option (ii).

3 Developing a (Simulation) Game

After discussing the case, that there exists already a game, which can be used as a basic template for the problem at hand, Greenblat starts the analysis of how to develop a new game.

For this development she distinguishes 5 stages (cf. p.27):

1. setting objectives and parameters.
2. model development.
3. decisions about representations.
4. construction of the gaming simulation.
5. preparation for use by others

4 Game Development and DAAI

There seems to be some analogy between the game development and the DAAI analysis. The following text is a kind of a *free interpretation* of the development concept of Greenblat and the DAAI paradigm.

1. Setting *objectives* and *parameters*[1] can be understood as the construction of a *vision statement* D_V as answer to the preceding *problem statement* D_P. The problem statement tells the experts what kind of a problem triggers the stakeholder to look for a new solution, and in the vision statement there are some first ideas of how the new solution should look like. Thus the vision statement can be understood as the *objective*. Because the vision as such is usually quite general there is some need for more specifications, which can be put into the format of *parameters* or, as done in the DAAI paradigm, in the format of the following statements:

   (a) A certain *environment* ENV is assumed.
   (b) Different *tasks* T are identified which have to be solved, associated with certain *goals* G.
   (c) A minimal set of intended *actors (players)* A is assumed with some minimal *roles* RL.
   (d) Some *non-functional requirements* $NFRs$ are given to characterize overall properties of the whole process.
   (e) Some properties of the *project context* PC are specified (which kinds of resources can/ should be used, are available, ...).

2. The *model development*[2] within the DAAI paradigm is realized by the following elements:

[1] cf. chapter 5, pp.35-39
[2] cf. chapter 6, pp.40-51

(a) An *actor story* AS will be constructed describing all the intended processes required structured as a *graph* with states and transitions. A *state* is a collection of *facts* describing a static scenario. A state can be associated with a *model of space* as well as a *model of time*. A *transition* is a collection of *changes* which can transform a given state S into a follow up state S'. The actor story describes by this a complete *model* with its *dynamics*.

(b) If the model shall include *actors* A with *behavior functions* ϕ then one can construct for each actor an *actor model* AM which can contain arbitrary complex inner states to enable every kind of dynamics which one wants to attach to an actor.

(c) The combination of an actor story and an actor model allows complete models with dynamics which can simulate *arbitrary complex models* for investigations without the direct interactions with human persons.

(d) To *evaluate such complete models* one can replace the virtual actors during a simulation with real human persons. This replacement would turn a complete virtual simulation game into an *ordinary* simulation game with real players.

(e) Depending from the degree of replacing the virtual actors by real players one can define *hybrid games* where some players are real players and some are virtual actors.

3. The decisions about *representations*[3] within the DAAI paradigm will be interpreted as decisions about the *real interface* of the model to the users. While the user can be realized either by real human persons or by virtual actors, for the representation *only the real human user is of importance*. Within the DAAI paradigm this kind of preparation is called the design of the *system interface* SI, which *interacts* with the real player. To find an *optimal solution* for such an interface one has to know sufficiently well how the *cognitive processes* of a real player are functioning with regard to the tasks in the model. Therefore one has to analyze the *user interface* UI too which is associated with the supporting cognitive functions. While this analysis will yield a complete specification of the *system interface* SI this system interface will not be implemented within the DAAI paradigm. Only minimal *mock-ups* will be constructed that it is possible to run *usability tests*.[4]

4. *Construction of the gaming simulation*[5]: While the DAAI paradigm as such does not include the implementation of the analyzed structures the considerations of Greenblat to the following implementation of a game have not to be part of the DAAI paradigm. Nevertheless – as mentioned above – the *usability tests* of the system interface have to be done sufficiently well and for this so-called *mock-ups* will be constructed.

5. The *Preparation for use by others* is interpreted here as that *documentation* which is necessary that others can understand what is intended by the developers and how this should be used.

[3] cf. chapter 7, pp.52-61

[4] One has to keep in mind that the concept of the system interface has to be considered as extending to *all* elements which can be *perceived* by a real player or which can be *influenced* by a real player!

[5] cf. chapters 8-9, pp.62-156

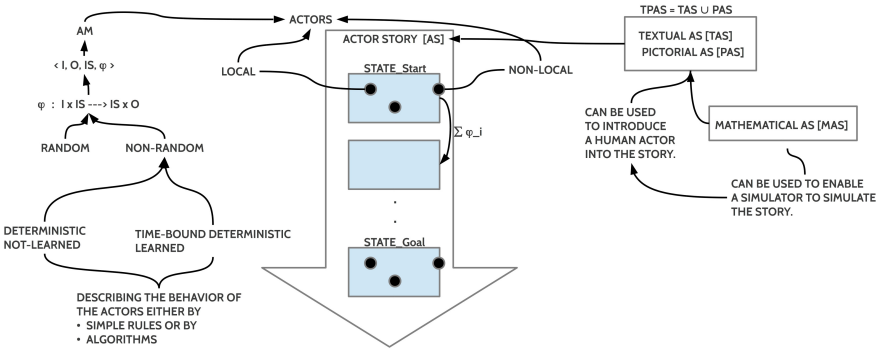

Figure 1: Introducing Actors in the Story

5 Actors and Instructions

In chapter 8 describes Greenblat, how to *introduce* the intended *players into the game* before the game starts. Until now this was an explicit part of then DAAI paradigm only in the context of the *usability tests*. It seems that this perspective of *introducing the actors* has to be made more explicit (cf. the figure 1).

Because in the DAAI paradigm one has to construct an *actor story [AS]* in any case, distinguished as textual AS [TAS], as pictorial AS [PAS] as well as as mathematical AS [MAS], one can use the TAS and the PAS to instruct an intended actor A with the aid of these stories what has to be expected in the story.

The MAS is usually only needed for an *simulator [SIM]* to simulate the story. Ideally the simulator will use the MAS – eventually combined with the PAS – to *show* a simulation of the story.

The *actors [A]* are distinguished into those actors which are *local* to a state and those which are *not local* to a state. Non-local actors can be laws of nature or actors which are somehow local, but belonging to the *context*, the *environment* of a state. Every actor has by definition a behavior function which is either *random* or *non-random*. In the last case one can distinguish *deterministic* systems which can not learn, or those systems which can learn and behave *time-bound deterministic*. This means that a truly learning system can follow rules during some time period, but can change these rules again by some reasons during other time phases. Thus the *behavior of an actor* can either be described by some simple rules or by an algorithm.

References

[Gre88] Cathy Stein Greenblat. *DESIGNING GAMES and SIMULATIONS. An Illustrated Handbook*. Sage Publications, 1988.