KOMEGA REQUIREMENTS No.3, Version 1
Basic Application Scenario - Editing S
*

Gerd Doeben-Henisch
gerd@doeben-henisch
in cooperation with the INM KOMeGA-Teams

August 12, 2020

Abstract

This text describes the basic requirements for the komega software project, which is part of a larger project in the domain of an applied cultural anthropology. This is version 1 of the basic requirements No.3 which continues No.1-v3 and No.2-v1.

1   Actor Story [AS] Overview

The actor story overview 1 shows all the different states which the actors can activate during the story. Additionally the general setting for the interactions between actors and the system interface [SI] is being shown. The system interface [SI] mediates the interactions between the actors and the simulator. Depending from the actual task there can be more than one window visible on the screen of the interface.

In this text the state called *editing a static state description S* shall be described.

2   Language-Sub-Sets $L_{0.i}$

In a discussion of Tarski (1936)[Tar36][1] and in No.1 of these requirements[2] I have developed the hypothesis that it could be of some help to develop the

---

[1] See Doeben-Henisch (2020) [DH20b]

[2] See Doeben-Henisch (2020)[DH20a].

ACTOR STORY: SHARED SIMULATION GAME DEVELOPMENT
AIDED BY HUMAN CENTERED AI

START
EDITING S
FEEDBACK S
EDITING X
FEEDBACK X
PASSIVE SIMULATION
INTERACTIVE SIMULATION
EVALUATION
ITERATE
STOP

GROUP OF ACTORS
· ONE PHYSICAL LOCATION
OR
· ONE ONLINE CONFERENCE

SYSTEM INTERFACE [SI]

DIFFERENT KINDS OF WINDOWS FOR EDITING, FEEDBACK, SIMULATION, AND EVALUATION
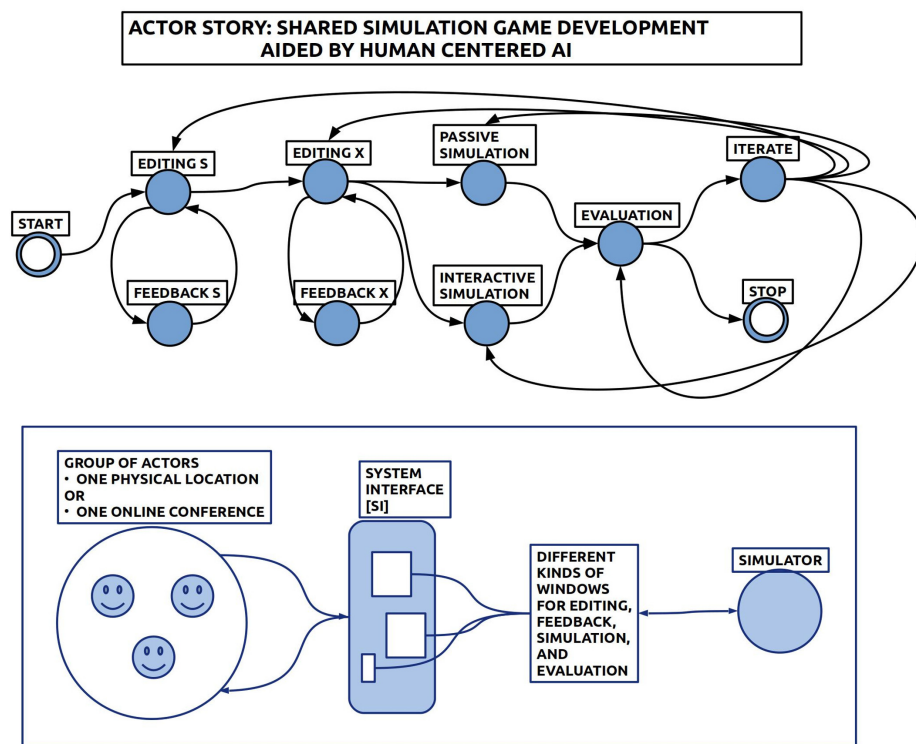
SIMULATOR

Figure 1: Actors and system interface (SI) for all states

simulator σ in close correlation with a defined hierarchy of sub-languages $L_{0.i}$ of a natural everyday language L_0. A sub-language $L_{0.i}$ represents the real part of the otherwise *hidden meaning function* π_α of some actor α and can therefore function as a kind of a *reference point* for the hidden human *intelligence* manifested partially in the symbolic communication.

Until now examples of such sub-sets $L_{0.i}$ are not known. This has many reasons. The main reason is perhaps the special application scenario which has been selected for this project. A longer and deeper discussion of this aspect should be later done elsewhere. For the actual task in this project to define such sub-sets $L_{0.i}$ we will take a very pragmatic attitude: (i) define *first rough criteria* for such sub-sets and then (ii) do a *series of empirical experiments* to interact with the reality of a practiced language. Furthermore it has to be assumed that the whole development process of a human centered AI will follow such a course. It is yet not known whether there will be a *fixed point in the future* where the AI has *learned so much* that the last learned sub-set $L_{0.n}$ is *identical* with the natural language L_0 itself.[3]

Pragmatic Criteria for first Sub-Sets: In a first guess the following sub-sets are assumed:

1. $L_{0.0.0} \subset L_{0.0}$: Only *concrete* statements.

2. $L_{0.0.1} \subset L_{0.0.0}$: Additionally *time expressions*.

3. $L_{0.0.2} \subset L_{0.0.1}$: Additionally *spatial orientation*.

4. $L_{0.0.3} \subset L_{0.0.2}$: Additionally *common expressions (variables)* with finite but dynamic lists of *possible instances (constants)*.

In the further development we will select the first guess of the hierarchy – here: $L_{0.0.0}$ – and run all states with this sub-language from editing S, editing X and testing the simulation with an evaluation. If we think we have understood this case well enough and if the simulator σ can handle it, then we will repeat te whole process with the next sub-set in the hierarchy, here then $L_{0.0.1}$, and so on for more and more sub-sets.

---

[3]Because a natural language L_0 is a system distributed in many individual meaning functions – eventually many hundred millions of speaker-hearers – the borders of a natural language are not clearly defined, they are principally *fuzzy* and therefore there can be not one clear fixed-point.

3   Language Sub-Set $L_{0.0.0}$

As explained in the hypothetical hierarchy for the sub-set $L_{0.0}$ the first element of this hierarchy is the sub-set $L_{0.0.0}$. The roughly stated criterion reads that only *concrete statements* shall belong to this sub-set. The context is the task of the expert-actors to write down a text D_S which can be understood as a description of a *static state* as part of the *real world* RW about which the expert-actors want to share their experience with regard to a *triggering problem* P.

3.1   Being 'True'

As general requirement for the expert-actors it is assumed that they do only make such statements about the *selected static state* S which can directly be decided as being the case in the state S or not. Thus if an actor A would state that *there is a table in this room* then every other actor of the group should be able to decide whether there is indeed a table in the room or not. If *yes* then this statement shall be classified as being *true*, otherwise it is not, it means it shall be classified as being *false*. If an actor cannot decide whether a statement is in some way *related* to the state S then the statement shall be classified as *undefined*.

3.2   The Meaning of an Expression of $L_{0.0.0}$

As assumed in this project there exists the general assumption that an actor can be characterized as an *automatic meaning device* AMD like:

$$\alpha_{perc} \quad : \quad RW \longmapsto IS \tag{1}$$
$$M_{nn} \cup E_{nn.L_0} \quad \subseteq \quad IS \tag{2}$$
$$\pi_\alpha \quad : \quad E_{nn.L_0} \longleftrightarrow M_{nn} \tag{3}$$
$$\alpha_{com} \quad : \quad IS \longmapsto E_{L_0} \tag{4}$$
$$\sigma_\alpha \quad : \quad RW \longmapsto L_{0.0} \tag{5}$$

This assumption applies that the meaning is only defined as an *internal function* π_α of the actor α and therefor it is not explicitly visible between different actors. The other main point is that the used *expressions* $E_{rw.L_{0.0.0}}$ as such do not – in the general case – give explicit hints to that kind of meaning, which is encoded by these expressions. If the general case would be the main case for the encoding of meaning then it would nearly be impossible to learn and use any such natural language. But, as reality demonstrates, the *encoding of meaning* into expressions follows some kind of internal structures and formal rules! The whole taxonomy of this encoding is until today not really completely

Figure 2: An empty chessboard

revealed[4], but the everyday language uses certain types and schema how the expressions are formally organized, that there is some *implicit meaning-form mapping* working, which all native speaker-hearers *know intuitively* because the meaning function is part of their inner knowledge.

3.3   Format of an Expression of $L_{0.0.0-2}$

Let us look to some examples:

Picture 2:   If we look to figure 2 then we would usually recognize explicitly at least two objects; (i) a *chessboard* and (ii) a *table*. We could say that there is 'something' which we classify as a 'chessboard' and 'something' which we classify as a 'table'. We know from our experience that there could be *many other somethings* which we either could classify as a 'chessboard' too or as a 'table'. Thus the expressions 'chessboard' and 'table' have not a single, concrete object as their meaning but they can be related to many different perceptions. This can be explained with the hypothesis by Biology and Neuroscience that the brain arranges all the different neural signals inside in complex clusters of neural correlates where one main node in the cluster manages many different sub-nodes which can represent different aspects of perceived signals which all together represent a 'chessboard' or a 'table'. And it seems that this strategy to represent *networks of arranged clusters with a main node* as an expression used

---

[4]Look to one of the most ambitious Grammar project of a natural language done in the last time, the *Grundzüge einer Deutschen Grammatik* (1980)[HFM80], which is highly impressive but at the same time sobering if one sees, how many important questions are not yet solved sufficiently.

Figure 3: Two players at the chessboard

Figure 4: Two players step 1

as a *common name* for many possible perceptual instances is quite common in natural languages.[5]

Identified objects have usually a non-empty set of *features* which are *associated* with them. The chessboard e.g. has some *shape* and is visually structured by regular *squares* of alternating *colors*; *brown* and *yellow*. In the the logic of the expression format it is common to connect expressions representing features with that expression, which is associated with these features like 'the square chessboard' or 'the brown field'.

Furthermore it is an overall implicit knowledge that all objects which are perceived from the environment are automatically arranged in a way which assumes a *three-dimensional space*. This yields automatically a lot of *spatial relations* only by the existence of objects, like 'the chessboard *is on* the table'.

Expressions like those which talk about objects with features or about spatial relations of objects are assumed to be *directly decidable* whether the matter of meaning is given in the real situation or not. Statements which can be decided in such a way are called *concrete statements*.

Picture 3 - 6: The following pictures 3, 4 , 5, 6 are showing a simple sequence of events. But step by step.

---

[5]In German we have also common expressions like 'Tisch' (table) and 'Schachbrett' (chessboard).

Figure 5: Two players step 2

Figure 6: Two players step 3

In the first picture 3 we have many more concrete objects and implicit spatial relations: white and black 'pawns', as these figures are named in the chess game; two players with individual shapes and colors. Thus we could make many statements related to this picture:'there is a white pawn', 'there is a black pawn', 'there are numbers', 'there are letters','the number 7 is left from a black pawn', 'the pawns are on the chessboard', 'the left player sits behind the white pawns', ...

If we compare picture 3 with picture 4 then we as humans can detect a *difference* between the two pictures. The 'right hand of the left player' has in picture 3 a different position as in the figure 3. And if we take the other pictures into account too then we can see that there is another position in picture 5 and even another position in figure 6. We know from everyday experience as well as from Biology and Neuroscience that human actors can detect *differences* in *sequences of events* because our brain is built in a way which automatically arranges sequences on a time line. More than this: because it is difficult – if not nearly impossible – to describe *continuous changes* with all their details the language has 'invented' another great mechanism: we have 'single words' to describe arbitrary complex changes/ movements like in these pictures: 'the left player *moves* the white pawn *two fields ahead*'. Here the implicit time dimension is associated additionally with implicit spatial features.

In this project it will clearly be distinguished between those statements which describe a *static state* and those which describe *changes*! A change will be reconstructed by two successive states. The difference of both states will give the

meaning of the change.

Summing up: These first examples shed some light on Objects with features (properties), on spatial relations, of possible timely relations, and of the nature of change. The last aspect points to the second task of constructing *rules of change*.

It will be the task of the next weeks to clarify these concepts further by more examples and by implementing these with real code.

References

[DH20a] Gerd Doeben-Henisch. Komega requirements no.1. basic application scenario. *eJournal uffmm.org, ISSN 2567-6458*, pages 1–7, 2020. https://www.uffmm.org/wp-content/uploads/2020/07/requirements-no1-v3-11Aug2020.pdf.

[DH20b] Gerd Doeben-Henisch. Reviewing tarski's semantic and model concept. 85 years later .... *eJournal uffmm.org, ISSN 2567-6458*, pages 1–11, 2020. https://www.uffmm.org/wp-content/uploads/2020/08/review-tarski-semantics-models-v1-printed.pdf.

[HFM80] Karl Erich Heidolph, Walter Flämig, and Wolfgang Motsch, editors. *Grundzüge einer Deutschen Grammatik*. Akademie Verlag, 1 edition, 1980. The book has been written by a team of 8 authors.

[Tar36] A. Tarski. Über den Begriff der logischen Folgerung. *Actes du Congrès de Philosophie Scientifique*, VII, ASI 394:1–11, 1936. The Congress took place 1935.