Historical data bases and the context sensitive handling of data: towards the development of historical data base management software

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Historical Data Bases and the Context Sensitive Handling of Data. Towards the Development of Historical Data Base Management Software

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Abstract: Does the usage of computer related methods consists in the application of standard tools only or is the development of more specific techniques necessary? The following paper argues, that there are indeed fields of application, where the peculiarities of historical data are sufficiently intricate, so that we do not only have to develop new software tools, but have to engage upon the design of new concepts and algorithmic solutions. Such problems, fairly frequent in all areas where historical data are imprecise or »fuzzy« can best be described in cases, where the standard assumption of traditional data base models - that the content of a »filed« can be interpreted without knowing the value of another - is invalitated.

0. Introduction

Within the concept of the >Historical Workstation the development of appropiate data base management software remains one of the most important aims. Historical data base management software should be able to handle the peculiarities of historical source material and meet the specific demands of administering such material by means of a data base.

Historical data bases must provide for administering data which for the most part contain a lot of >irregularities< (to mention but a few: the fields and entries of the data base often differ in length considerably, fields contain two or more entries of the same logical rank, the data base has to administer a large number of attributes, but entities often occur with attributes missing etc) Furthermore, historical data require special software solutions for a whole set of peculiarities, which usually do not occur in

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other data bases (e.g. dates in different schemes of calendar notation, varying currencies, variant spelling of names etc).

In addition to these characteristics at the technical level of representing historical source material on a computer, some aspects distinguish historical data bases from ordinary ones in a more fundamental way. These can be termed >context sensitivity<, >fuzziness< and >multidimensionality< of information contained in the sources and therefore to be handled by the software of a historical data base system. In our paper we concentrate on the concept of >context sensitivity<. We should emphasize that our considerations are not speculative, but are supposed to be a practical guideline for the implementation of context sensitive handling of data whithin the data base manangement software of »Κλειω«.

1. Interpreting Data in their Context

Working on historical sources, analyzing them carefully and interpreting them appropriately is one of the basic issues in historical research. All we can learn about the past depends on the sources available and in the end the foundations of every study in history are constituted by them and the way they have been used.

Quite often the sources needed for a historical research project are of different origins, natures or qualities, in many cases they are incomplete and above all they cannot be relied on without further consideration. Starting a historical research project therefore nearly always means sounding out the sources and checking their quality and reliability. The process of examining the sources has several aspects, e.g. the authenticity of the sources, their distance to the events or facts they deal with, the correspondence of the information contained in the source with other sources or reliable information at our disposal and so on. Furthermore it involves checking carefully what information is contained about »aggregated facts«, i.e. facts, which are reflected by the source not directly (explicitly), but indirectly (implicitly). Many specialized historical sciences (like chronology, diplomatics, heraldry, numismatics, prosoprograhy etc) can be consulted to obtain the historical expert knowledge needed for understanding the sources.

Exploring the sources is only the first step in historical research, but nevertheless a fundamental one. (A historical study has, of course, to go further, i.e. to evaluate the information found in the sources and use it for historical explanations and interpretations.) Its main aim is to understand the source appropriately and to extract all relevant information. The way to do this is to formulate questions, to examine the source carefully and above all to apply additional knowledge to the source. All we know from other sources, information we received from colleagues and experts wor-

king on similar problems, assumptions and hypotheses we built up during the work, the knowledge we already obtained from the source - all these components are interrelated in this process in a rather complex way affecting, influencing and modifying each other.

Usually every single information item in the source is carefully examined and often aspects have to be taken into account which are important not for the source as a whole but only for a small part of it or even for a single item. For instance there may be a statement in the source which has obviously been »corrected« by a »later hand« and therefore should be handled separately from other items of this kind. In other words every single information item can be interpreted correctly only by regarding facts and interrelations constituting as a whole the context of this item.

Looking at the context more closely, we can distinguish the following aspects: First the context of a single statement in a source is the text preceding and following this statement i.e. its physical surroundings, which, of course, are defineable in different ways. Another contextual aspect consists of the interrelations between the statement(text) and the world surrounding it, a world which perhaps no longer exists, but which is known to us. In this respect the origin of the source, the event it deals with or our knowledge about this event, intentions and actions connected with the source, the surviving of the source and so on are concerned. Finally our own interests in regard to the source and the role it is supposed to play in our research must be taken into account as well and can be considered as an interrelation of the source to the existing world. While the first aspect mentioned can be called the contextual microstructure of an item, the other aspects form its contextual macrostructure.

The relation of context and source is not a static, but a highly dynamic one. The additional knowledge applied to the source may not only be extended by the source, but in many cases it must be modified or completely revised. For example assumptions which seemed to be sure may turn out to be wrong and have to be revised, so that parts of the source which were interpreted under these assumptions have to be evaluated once more - a situation, which is far from being unusual, but on the contrary more an everyday problem in historical research.

Regarding contextual aspects of a source does not only mean having additional information at hand and using it for interpreting the source, but that the information to be handled is of a certain quality or nature. Information in historical research is often vague and fuzzy, i.e. it cannot be reduced to »wrong« or »false« or expressed in exact quantities and sizes. This kind of information is often contained in the historical source material itself, but the amount of fuzzy information will grow considerably applying additional knowledge to the source and trying to evaluate every single information item within all its contextal interrelations. In many

cases it may be impossible to specify the interrelations clearly and unambiguously. For instance assumptions may be only »probable«, quantities and sizes are not given in a precise form, the meaning of terms used is changing and so on. Nevertheless this kind of information is important for understanding the sources adequately and plays an important role in historical research.

For the computer to support a historian sufficiently, it must support him in his research in all the respects mentioned above. The computer should not only allow him to administer a huge amount of data, but must also provide all the tools needed for an appropriate understanding of it. In particular it must be possible to integrate additional information and knowledge into the administration of the data expressing thereby assumptions and working hypotheses, expert knowledge and contextual aspects to be taken into account. A complex and flexible handling of information like this needed in scientific research, can be called »context sensitive« handling of data.

What it means to handle data context sensitively may be illustrated by an example. Assume that we are doing some work on the Russian Revolution of 1917 and are working on a collection of sources, consisting of reports and telegrams from local police authorities to the Ministry of the Interior in Petrograd. This collection is of interest to us in several respects, but right now we are interested in reports about demonstrations or other kinds of collective expressions of will, and try to find out how many people took part in these demonstrations and what they were demonstrating for, because - maybe - we want to know something about mass mobilization during the revolution and the motives and aims behind it. Assume furthermore that the sources are available in a format that allows us to find and access all reports and telegrams dealing with demonstrations or comparable manifestations of will.

In principle it would not take longer than a few seconds to find out what we are interested in, but there still exists a problem: From other sources we know that our collection of reports cannot be relied on without further consideration. The local authorities did not send their telegrams and reports to the ministry of the interior in Petrograd, but to the provincial administrations, which collected them and passed them on to the central government. Assume that we know for sure that some provincial administrations modified the reports for political reasons, say in order to give the impression that there are no unrest and trouble in the province but that everything is under control. It would of course be very important for us to take into consideration this additional knowledge when working on the sources and to »correct« the falsifications performed in the documents, e.g. to increase the number of participants of demonstrations, which has been intentionally decreased by the provincial administrations.

What has to be done to achieve our aims can be divided into two steps. First, whenever reports on demonstrations are concerned, the computer has to check whether the city or town it refers to belongs to one of those provinces where according to our knowledge the reports have been falsified by the provincial administration. Secondly the number of participants of demonstrations in such reports has to be modified. While the first task is rather simple to carry out, the second seems more complicated, at least in those cases where there are no exact data at hand about the falsifications performed. Assume for the moment, for the sake of simplicity, that within a certain period of time the numbers of participants in demonstrations have been exactly divided by two so that we simply have to double them in order to form a more realistic picture of the demonstrations in these provinces. Storing this knowledge on the computer and relating it to our collection of documents it should from now on be integrated into any work on the source. So if we ask our data base for all demonstrations with more than 1000 participants the computer should also lead us to reports about demonstrations with 600 or 800 (but not 400) participants taking place within a certain period of time and referring to towns and cities of all the provinces where the reports have been falsified.

In practice, however, our knowledge about the falsification of the documents is probably far more vague and ambiguous. As long as it is completely confused and its consequences for the understanding of the sources can by no means be defined it remains, of course, ineffective for our work as it would be when working on these sources in a printed edition. But in cases, where such consequences can be described and defined, but cannot be expressed in precise and exact terms, they nevertheless should be representable in order to integrate them into our further work. For example if there is only the »probability« that the documents have been falsified, and - maybe - this probability depends on the time the reports were passed on to the central government by the provincial administrations and on the cities and towns they came from, a request for all demonstrations with more than 1000 participants should also lead us to those documents containing a number of participants lesser than 1000 but having a certain degree of probability (defined by us) that these documents have been falsified by the provincial authorities.

If sometime our information about the falsification of the documents turns out to be insufficient - be it completely wrong or misleading, be it that falsifications and manipulations of the reports took place in other provinces too - it must be possible to modify our knowledge about the sources and thereby to bring the interpretation of the documents quickly into line with our actual information.

2. The Components of a Contextsensitive Data Base and their Interaction

Data base management software which meets the demands of historical research in the way we described above has to support two fundamental aims: It must be able to administer very large amounts of data (historical data bases often contain hundreds of MB !) in an efficient way and it has to integrate additional knowledge (i.e. information which is not contained in the data itself) into the administration of the data. Historical data base management software must therefore be located somewhere between ordinary data base management software, providing excellent solutions for efficient administration of large amounts of data, aiming however at simple data structures and principally trivial applications, and fields of work which usually are classed as Artificial Intelligence, such as the representation of knowledge. In practical applications like expert systems, however, the methods and techniques of Artificial Intelligence are applied to restricted amounts of data while many of the efforts invested in techniques of efficient problem solving are only of limited importance for historical data base management software. In particular the integration of historical expert knowledge (for instance prosoprographical data bases or »encyclopedias« for chronological, geographical or other background knowledge) into the administration of the data has to find its own way to manage the amounts of this kind of knowledge (often containing many thousand records) and to support its speedy integration into the administration of the data, which, of course, should be as quick and efficient as possible.

To provide for context sensitive handling of data the following components should be available in historical data base management software:

- a data base management system (DBMS) storing and administering the sources in a factual data base;
- historical expert knowledge, which either exists in the form of machine-readable »encyclopedias« i.e. data bases or which can be represented in one way or the other on the computer;
- a way to define micro- and macrocontextual relations for single items and statements of the source;
- a kind of explanation module which allows the interaction of the components to be made transparent to the user, which may be particularly useful in more complicated applications.

Some people might consider it useless or superflous to distinguish between these components raising the following objection: Why don't we modify and »correct« our data to have it in a well prepared form and avoid all the trouble with background knowledge and its integration into data base management? We have good reason to believe that this would be wrong. First,

modifying the data means modifying the source so that the documents we are working on by means of the computer will no longer resemble the original source (and - by the way - will therefore be of no use for any other historian who might be interested in our documents). One may argue that in order to preserve a maximal faithfulness to the sources we can store our data twice: in the way it appears in the source and in a way that modifies the original form of information according to our historical background knowledge (converting for example a date given in the style of the French revolutionary calendar to a normalized calendar date or evaluating a given amount of currency by a value we defined). But there still remains an unsolved problem: the data must be converted or »doubled« when it is prepared for the computer i.e in a very early state of research, when a lot of information required for an adequate understanding of the source is simply not available. Moreover, what might be of importance for the interpretation may change during the work on the source, so that modifications of the data must be performed continuously, giving rise to problems of updating which simply cannot be controlled. So it seems to be good practice to distinguish between the data and the background knowledge needed for its interpretation and to have these as two components in a historical data base, administered independently of each other and linked together at that moment when additional information is required.

While the distinction between data and background knowledge should be obvious - a historian would scarcely write additional remarks into the printed edition of the source, but more likely on papers or record cards he uses in combination with the source - the differentiation between historical expert knowledge and contextual relations may not be reasonable at first sight. Both components provide a way to apply additional knowledge to the source, so why is an analytical distinction made between them? The reason is that on one hand the evaluation of contextual aspects and relations does not always require historical expert knowledge, while on the other hand the integration of historical expert knowledge into the management of a data base may not be enough alone to meet the specific demands of a context sensitive data handling.

Historical expert knowledge puts information at our disposal about how to convert calendar dates, to compare different currencies, to decide whether a town belongs to a certain bishopric or not and so on. To include such knowledge into the management of data without doubt constitutes an important step supporting a historian in research, but it does not necessarily mean achieving a context sensitive data handling. For this it must be possible to handle every single item of the data base specifically and to evaluate it taking into account all relevant additional information including specialist information. As long as historical background knowledge can be related only to structural aspects of the source material (i.e. to the attri-

butes of the data base), we are still far from our aims, because the same definitions about integrating additional knowledge are used whenever an instantiation of this attribute is processed: in other words expert knowledge is not related to single items according to their specific contextual requirements, but only to classes or groups of items as a whole. In contrast we aim at integrating expert knowledge in a context sensitive way as well. This means that e.g. an amount of currency is evaluated according to the temporal and spatial context in which it occurs; the way a currency like »florin« would be valued in a region A at a time tl would therefore vary from that in the region A at a time t2 or that in a region B at a time tl. To integrate expert knowledge context sensitively requires a) that in a situation like this be defined which contextual aspects (temporal, spatial or other) of the item should be taken into account and where the context defining information can be found in the data base and b) that the expert knowledge residing on the computer be represented in a form suitable for operations like requests with additional aspects.

3. Requirements for Context Sensitive Data Handling

In principle the microcontext of an information item consists of all other items preceding or following the statement in question. In terms of data base technology: Every field of a data base can potentially serve as a context defining field for any other field of the data base. Even if there does not exist an explicitly defined contextual relation between two fields A and B, field B may nevertheless be important for field A, if it is required to evaluate a field C, which is a context defining field of A. In other words, whenever a field of the data base is processed all the other fields must be accessible in order to find the information needed for the evaluation of its context. Therefore one of the basic requirements for context sensitive data handling consists of a data model allowing access to every field in the data base coming from any field.

While, in principle, the microcontext of a field is constituted by all the other fields in the data base, not all relations are relevant at a given moment. The decision on what may be of importance for the context of a field is, of course, up to the researcher and contextual relations may change depending on what is known about the source. Therefore they cannot be irreversibly stored in the data base. On the contrary, historical data base management software must provide a tool for defining contextual aspects and modifying them, whenever it seems necessary, creating thereby a kind of additional network consisting of data base fields as nodes and contextual relations as links.

Moreover the data model has to fulfil another important condition. Microcontextual relations of an item do not only exist in regard to its immediate vicinity i.e other fields which belong to the same unit of information (e.g. a document), but they can also refer to »remote« items or documents, which follow or precede the unit of information to which the item belongs. For example if for some reason the date of origin is missing in a document it may be useful to compute it from the dates of origin of the documents preceding and following it respectively in order to have temporal information at hand for further operations. The data model must therefore provide for conserving the order and sequence of information as it appears in the source and for reconstructing it whenever it is necessary for the context of a field.

Evaluating the contextual aspects of a field obviously implies the context sensitive interpretation of all fields constituting the context of the field in question. In other words, context defining information has to be treated context sensitively as well, which means that the process of interpreting data context sensitively is deeply recursive. The recursion is limited by the fact that data base fields containing temporal information can be considered to be their own temporal context; the same obviously applies to fields with spatial information which can be referred to as their own spatial context. As a condition this can be expressed as follows: The data model has to be of such a kind that context defining information can be treated recursively.

Provisions have to be made for those cases, in which the evaluation of a field A at a certain moment needs the value of A itself. This case is far from being inadmissible i.e. it cannot be considered an error situation, as it may seem at the first sight. Consider the following example in which the evaluation of the temporal aspect of a field depends on the evaluation of the spatial aspect, which itself presupposes the evaluation of the temporal aspect. Trying to convert a calendar date which is given in the style of a diocesan calendar spatial information is needed in order to find out which diocesan calendar is to be applied. Evaluating the field containing the related spatial information it turns out to be necessary to have temporal information in order to decide whether the village or town mentioned in this field belongs to bishopric A or bishopric B, both using varying calendars. At this moment the evaluation of the contextual aspects seems to be blocked because the evaluation of one aspect presupposes the evaluation of a second one which itself depends on the evaluation of the first.

A solution in a situation like this consists of the following: After the calendar date has been converted according to some default rules it will be possible to evaluate the spatial context i.e. to determine whether the town or village belongs to bishopric A or bishopric B; afterwards the temporal aspect will be recomputed on the basis of the diocesan calendar determined.

This way of solving the problem seems to be successful as long as the conversion of the one aspect according to some default rules leads to unambiguous results in the evaluation of the complementary aspect. In our example this means that as long as the spatial information can be obtained on the basis of the year alone, there will be no problem handling such a situation, because the spatial information is never concerned when the calendar date is recomputed on the basis of the local calendar. If this is not the case, however, things become more complicated. If it cannot be determined clearly to which bishopric the village or town belongs, because it happened to have been handed over from bishopric A to bishopric B at nearly the same time when the event dealt with in our document took place, there might be no way out of our problem: after recomputing the date it may be necessary to correct our spatial information which in turn requires us to recompute the date and so on. In the end a situation like this can only be coped with by means of approximate reasoning or probability calculus (i.e when additional information is available) stressing thereby what we mentioned above: Handling data context sensitively often means encountering information, which is not exact and precise, but vague and fuzzy. Though we do not concentrate on this point we should emphasize once more that historical data base management requires a wide range of possibilities and tools to handle such information and to use it for administration of the data.

The integration of historical expert knowledge into the evaluation of contextual aspects obviously implies that this knowledge can be administered consistently along with the data base and that it is represented on the computer in a way suitable for the demands of context sensitive data handling. If e.g. for reasons of comparability all amounts of currency in our data should be transformed into numeric expressions the tables of expert knowledge should differentiate according to temporal and spatial aspects. This means that the tables are not only searched for a currency like »florin«, but also for correspondence in regard to a certain time and a certain geographical region. A »florin« which appears in documents related to bishopric A in the 15th century should be treated differently from a »florin« occurring in documents of bishopric B in the 16th century. To provide for integration of background knowledge like this, i.e. to provide for differentiation according to additional aspects, the knowledge about currencies should be administered in the form of a context sensitive data base as well. This obviously applies to all kinds of historical expert knowledge integrated into context sensitive data base management.

Provisions have to be made for those cases where there is no context defined for a data base field or where correspondences for a defined context cannot be found in the expert knowledge. It must be possible therefore to specify a standard context, which is assigned to all fields lacking their

own context definition. Furthermore there should be standard values within the expert knowledge which are referred to whenever the contextual (temporal/spatial) aspects of a field do not correspond with the contextual aspects defined in the expert knowledge.

Finally historical data base management software must be able to handle a situation, in which the information needed for the context sensitive interpretation of a field is not explicitly, but implicitly contained in the context defining fields. If there is for example no information about the date of a certain event, but information does exist about the date of birth of a person A and his age at the time this event took place, the temporal aspect of the event can be >reconstructed< from the information available about person A. In cases like this additional knowledge is required about how to deduce the information needed from the information contained in the context defining fields. In our example the temporal aspect of the event could be defined by the two data base fields containing the date of birth of person A and his age at the time in question combined with a rule for how to calculate the date. Thus, historical data base management software must provide as an integral part a kind of knowledge-based rule system storing knowledge of how to derive information contained by implication in context defining fields.

4. Context sensitivity and Κλειω

Κλειω fulfills some of the essential prerequisites required to implement context sensitive data handling. In particular the underlying data model following the concept of a semantic network meets many of the specific demands mentioned above. For example it supports the preservation of the sequence of information and it provides for overall access to other data fields needed for the evaluation of contextual aspects. Moreover Κλειω also maintains a clear distinction between the data and the administration of background knowledge.

Hitherto in Κλειω background knowledge can be integrated into data base management only with regard to structural aspects i.e. attributes of the data base. Our nearest aim therefore consists of modifying and extending the tools implemented already for the integration of background knowledge in order to make them suitable for context sensitive data handling. While a first prototyp should be available in autumn 1990, a »context sensitive« version of Κλειω is supposed to be released in summer 1991.

How the features of context sensitivity are supposed to be integrated into Κλειω can be illustrated best by an example. Assume that the following data have to be handled (given here in a format required by Κλειω):

document $...../ 1.2.1794/...../ Aachen/ ...../376 lb / .....
document $...../ 13.4.1805/...../ Ansbach/...../458 lb / .....
document $...../ 3.6.1810/...../ Aschaffenburg/...../201 lb /.....

The information unit »document« - apart from other entries - consists of three fields which are relevant to our example: these fields are called »date«, »place« and »salt-delivered«. The last contains different amounts of weight given all in pounds, but refering - as we know - to local scales of weight. To compare them correctly they obviously have to be valued differently according to their local meaning.
Assume furthermore that our knowledge about local weights can be resumed as follows:

Aachen		1 lb	=	0.46704 kg
	since 1816:	1 lb	=	0.46771 kg (according to prussian weights)
Ansbach		1 lb	=	0.50999 kg
	since 1819:	1 lb	=	0.56000 kg (according to bavarian weights)
Aschaffenburg		1 lb	=	0.50529 kg
	since 1821:	1 lb	=	0.56000 kg (according to bavarian weights)

In order to integrate this knowledge into data administration the following definitions have to be made:

1. Context defining information needed for processsing the amounts of weight can be found in the fields »date« (containing the temporal aspect) and the field »place« (containing the name of a town i.e the spatial aspect) respectively.

In Κλειω this will be possible in combination with the »terminus directive«, used to relate logical objects to data base attributes (which are called »elementary information« in Κλειω). In future a »terminus directive« may be followed by a »context definition directive« determining how to obtain the temporal, spatial or other information needed for the context of this attribute. The context defining fields are referred to by describing the way of how to find them »navigating« through the data base. This may be done in absolute terms or relative to the field in question.

Κλειω provides several tools supporting the manipulation of numeric data; among them are tools to handle expressions consisting of a number and a »qualificator«. How to process the field in detail is determined by means of a logical object specifying the »data type« of this field and constituting its »logical surroundings«. This logical object which can be named »eval-pound« is supposed to be defined later (see 3.); for now we only

have to relate this object to the data base attribute »salt-delivered« by means of a »terminus directives

TERMINUS NOMEN=SALT-DELIVERED; MODUS=NUMERUS; NUMERUS=EVAL-POUND;

A valid »context defining directive« following the »terminus directive« and determining the context defining fields for »salt-delivered« would be:

```
kontext    iter   =   ":date";
           modus  =   tempora;

           iter   =   ":place";
           modus  =   situs;
```

In our example the definition of how to find a context defining field is very simple, because the context defining fields belong to the same information unit. It should be emphasized, however, that far more complex definitions are possible in Κλειω in order to find »remote« information items.

The kind of information contained in the context defining fields is specified by the »modus parameter« accepting the values of »tempora«, »situs« and others; in addition every contextual link established can be given a user-defined name in order to distinguish between fields containing the same kind of information.

2. Different context situations have to be described according to our knowledge about local weights. For the sake of simplicity we restrict ourself to a context definition for »Ansbach« and fix two context situations depending on spatial and temporal information.

The definition of a context situation is considered to be a kind of logical object which in Κλειω is defined by means of the »item instructions For this end a new class of logical objects, the so-called »context objects«, is introduced into KXEICO.

```
item      nomen  =  ansbachl;        usus  =  kontext;
situs     signa  =  "Ansbach";
témpora   signa  =  "1.1.1819 ante";
exitus    nomen  =  ansbachl;

item      nomen  =  ansbach2;       usus  =  kontext;
situs     signa  =  "Ansbach";
témpora   signa  =  "1.1.1819 post";
exitus    nomen  =  ansbach2;
```

It should be obvious that context definitions can be far more complex. They are supposed to contain three classes of directives (témpora, situs and ceteri), which are to be specified by several parameters. The context conditions determined are checked in the order they appear in the logical object. Of course, it will be possible, to specify alternative conditions.

3. Finally we have to define the »logical surroundings« of the data base attribute »salt-delivered« including thereby the context situations we just defined. This logical object is created by means of the »item instruction« mentioned already.

To handle numeric expressions consisting of a number and a »qualificator« KXeico provides the »lingua directive« allowing to assign a numeric equivalent to the »qualificator« and making these expressions for example comparable on the basis of kilogram.
A valid definition of the logical object »eval-pound« would be:

```
item     nomen    =  eval-pound;  usu s  =  numerus;
lingua   nomen    =  "lb";
         numerus  =  0.50999;
         kontext  =  ansbachl;
         numerus  =  0.56000;
         kontext  =  ansbach2;
         numerus  =  0.5;
exitus   nomen    =  eval-pound;
```

The logic underlying this definition may be described as follows: Whenever a value is assigned to a parameter this assignment may be followed by a »context parameter« determining a certain context situation for the assignment. The last assignment to the parameter »numerus« not followed by a context parameter is considered to be a standard value to fall back upon if no defined context situation is suitable at a given moment.