

8.3 Language and Software, or: Fritzl's Quest

Dafydd Gibbon

8.3.1 Fritzl and the problem-solving problem

A linguist surveying the challenging peaks and valleys of the computational cognitive science landscape was awed by the forceful arguments and brilliant solutions offered by various teams of guides to the problem of traversing this impressive terrain. The AI team turned up with its helicopters, the software engineers offered their snowcats, the philosophers brought along a variety of skis designed for a dizzy slalom 'alpine' or a circuitous debate 'de fond'. And the local travel agent (Frame Problems, Inc.) had a special offer of three styles of planning: the checklist plus rules of thumb (risking accidents), the exhaustive step-by-step chart (with the risk of never finishing) and the list of things that don't have to be taken along (with the risk of never starting).

However, being a sociable sort of person and accustomed to linguistic study in the field, the linguist sought out Fritzl, a speaker of an unintelligible local dialect but reputed in the village to be a real expert on the area, and patiently learned enough of the lingo to persuade Fritzl to communicate his enthusiasm for life in this area, explain the interesting features of the terrain, and finally to cross the area together, ending up at Fritzl's favourite hostelry on the other side.

Why is it, the linguist wondered on his return, that so many people ignore the advantages of looking at language closely? Reminiscing, he picks up one of the travel brochures he had perused before the trip¹ and recalls the comments of many of his friends and colleagues about *Zuhandensein* and *Vorhandensein*, which he had not found in the local dialect, and *autopoiesis*, which seemed a big word for explaining how Fritzl and the villagers had survived through the centuries. And he noticed that indeed the language dimension was emphasized in the brochure, but had somehow tended to be overlooked: there were sections on language, truth and the world, on language, listening and commitment, even on listening in a background, on meaning, commitment and speech acts, on formalization as special language use, on breakdown, language and existence, on levels of representation, on understanding language, on artificial intelligence and language understanding, on understanding as pattern recognition, on what it means to understand, and indeed on management and conversation and on tools for conversation!

Surely this would have been enough to allow the specialists to get on with Fritzl? Particularly since one of the authors came to fame with a simulated

¹ [Winograd and Flores, 1986]

natural language understanding robot (called Shrewd Lou) and both, as well as others they criticize, are in the business of designing and selling helpful tools for the purpose.

Obviously Fritzl has special knowledge, indeed down-to-earth, flesh and blood skills, which are of great interest, and if we can find special technical languages in which to represent them, and strategies for simulating them, for instance in a silicon environment, then we are in the same business². The linguist, too, will need to exercise his own knowledge in order to describe such a special language, since some of Fritzl's skills are verbal: insofar as he can transmit his own skills to the next generation, he has such a technical language already, and the linguist will need to describe it and translate dialogues in this language into a more comprehensible dialect.

Now, who is Fritzl? Although he may be a court of last appeal, he is no abstract 'homunculus', and certainly not a 'deus ex machina'. Nor is he a personification of the trip designer's 'alter ego' when he sits at his desk and works out examples to illustrate his theoretical predictions.

Fritzl is the fellow who can actually perform the tasks required on an intuitively intentional basis, who can talk about them in a rational, analytic, functional manner to those who listen carefully, and who could, if motivated, be trained to design devices which satisfy or extend part of his own bodily requirements or skills, such as energy storage (his rucksack), protection (his woollen underwear), aids to perception (his hand raised against the glare) and locomotion (his skis and ropes), and high-level symbolic representation systems (his charts and maps). He could, if given the chance, tell experts how to make even better tools for him. However, he would get extremely insulting if anyone suggested that such a device could replace him, or the linguist, for that matter, as a guide to the physical and linguistic intricacies of village life in that area.

This assumes, of course, that Fritzl's consultants had learned his dialect, or taught him theirs. Usually, however, an interpreter is required. So it falls to the linguist to outline strategies for understanding Fritzl and either do the interpreting himself or train others to do so. Naturally, there are other experts with somewhat different specializations who could also do the job: the logician, who would instantly translate Fritzl's words into an unambiguous, completely explicit set of axioms, or the ordinary language philosopher, who would discover the conditions under which Fritzl's statements were at least felicitous, if not actually true, or the sociologist, who would observe Fritzl's everyday verbal and nonverbal activities at his work in detail, uncovering pairwise patterns, or the psychologist, who would either offer Fritzl higher and higher rewards for ever more complicated patterns of behaviour, or make him press buttons on seeing pictures of the mountains, thus revealing his internalized mental map.

But what would the linguist actually do? He would try to account for similarities and differences in the languages used by the participants in the above scenario, explain why Fritzl or the linguist himself and his Consultants have difficulty in understanding each other at different levels of comprehension, and

² Cf. [Fluck, 1976, Weingarten and Fiehler, 1986].

try to provide a link between the methods of the linguist's colleagues in other disciplines and the details of the forms, meanings and functions of language. And the linguist would not succeed, for the same reason that others would not succeed: his own technical language would be different again, and of course everyone *knows* his language anyway, so who needs a linguist? However, Fritzl had not yet reached this level of self-questioning.

8.3.2 Cognition and computation: the linguistic stance

Regardless of these minor hurdles, the following report on the principles underlying Fritzl's verbal expertise is intended to be generalizable to anyone speaking in any dialect on any topic under the sun. It represents a *linguistic stance* on questions of cognition and the representation and construction of reality; the *intentional*, *functional*, and *physical stances*³ appropriate to functional models of computational modelling and, in particular, artificial intelligence, are seen in terms of a *pragmatic* stance, the *semantic and syntactic* stances, and a physical stance towards our models and constructs. The basic ideas underlying this approach may be outlined in terms of the following points.

Cognition and causality: Fritzl's cognitive processes are causally explainable by his biological makeup, and are specific to it⁴. Abstract and concrete computational models of Fritzl are selective, with a shifting selection line, and never fully simulate human intentional properties such as intelligence, but are, rather, conjectural tool-like extensions of his own bodily requirements and skills.

Cognition and representation: Fritzl's cognitive processes, and hence his techniques for constructing realities, including the new one with the linguist in it, are knowable only via their representations in his external symbol systems, which are causally linked to his cognitive processes, i.e., his dialect.

Underlying representations: Fritzl's most fundamental external representation system is his everyday verbalization in speech. Fritzl can write a quite acceptable variety of German, as the linguist soon discovered, but systems such as standard languages or writing are more like highly specialized and context-specific technical languages. To suggest the existence of mental representations inside Fritzl seems somewhat superfluous, though external representations of his hypothetical mental states are a scientific necessity for the self-respecting modern linguist.

Reality and representation: Fritzl's representations of the world and of himself appear to be located (in terms of their main vocabulary fields) on a scale of intention, meaning, form, and physical substance. This closes into a cycle when the linguist observes Fritzl talking. Introspection seems to lead him make utterances which we give representations in terms of the vocabulary field of intentions (we know these, because we have them too). These can be structured in terms

³ [Dennett, 1987]

⁴ Cf. [Searle, 1980].

of vocabulary fields covering the meanings and the forms of utterances, and in terms of expressions describing their physical form. An observer could alternatively traverse the cycle in the other direction: she may analyse Fritzl's organs and behaviours, say, in terms of a physicalistic language, extract from this the formal patterns discovered thereby, interpret these in terms of perceived reality in general, and put these into the context of intentions which we attribute to Fritzl. For Fritzl, the frame problem turned out to be a problem of linguistic focussing – foregrounding and backgrounding information – and of stereotypic versus experienced views, of the explication of information so far left implicit, and of coping with vagueness.

Representation and explication: Fritzl's initially indistinct utterances, while perfectly adequate in context, may be replaced in the course of time (under the pressure of the linguist's incomprehension) by more explicit formulations which, while not being exact paraphrases, are intended to say much the same thing but more clearly. And Fritzl's own understanding of the subject matter itself is thereby enhanced. This process may continue cyclically, as in scientific endeavour, becoming eventually so complicated that additional storage media (writing, computers) and access techniques (page numbering, computer programs) may be needed for representing things, and the re-translation into Fritzl's village dialect will have become all but impossible. But external representations are no more than external representations, whether as evanescent movements of the lips, the fingers, or the air, as traces on stone or paper, or as lithographic or electrical patterns on silicon chips. This is not to say that the intellectual equivalent of an optical illusion – the lithoid homunculus – may not be engendered by the qualitative leap in brain support achieved with the aid of the magnification effects of the computer in space and in time.

Language, cognition and commitment: Fritzl's dialectal representations permit not only the reconstruction of the notion of his individual mind and its external symbolic representations, but also a reconstruction of Fritzl as part of a larger conventionally organized, aggregate society which is larger than and differently structured from the individual, though not in any sense an organism in the sense that Fritzl is an organism. Innate tropisms (like the ant building its anthill, Fritzl's balancing movements), learned stereotypic skills (like Fritzl's mountaineering in general, or his friendly greetings, or his pronunciation), creative action (like Fritzl's recognizing an unexpected trap and avoiding it, or explaining how to do so to the linguist) define the mutual strategies of the village society for survival or self-destruction. Some are verbal, some are directly physical strategies.

Language and variety: Fritzl adapts his language to different social contexts as a skill, holistically and without necessarily consciously knowing he does, in a fashion which the linguist can describe parametrically. He mumbles indistinct curses when trying to repair his rucksack, raises his voice when exchanging stories with the other village folk, speaks slowly and with a different vocabulary when explaining things to his visitor.

The important point for this report is, essentially, the last: the parametrization of the variety in Fritzl's speech. His teacher at school apparently tried to convince him, fortunately without success, that his pronunciation was awful, his syntax wrong, his vocabulary miserable and his expression crude. His own common sense told him that he was entirely right to speak as he did in the village, that his pronunciation was perfect, his syntax fine, his vocabulary relevant and his expression appropriate – in short, that he was accepted by the community – and that the teacher's pronunciation was awful, his syntax wrong, his vocabulary ridiculous and his expression quite screwed up. Not only that, Fritzl realized that if he wanted to be a teacher he would have to make some compromises. Moreover, he also realized that if he wanted to play any number of other roles in the community he would have to adapt his language in the same number of ways, without any prescriptive moralizing about whether his language was thereby “better” or “worse”⁵.

Actually, some time later, Fritzl wrote to the linguist in puzzlement about all the changes due to the tourists in the village, and that he had somehow come to the conclusion that it was all due to the fact that nobody could understand his dialect. Not only that. He confided that since the specialists had all but succeeded in duplicating him, he had decided to become a software engineer and perhaps construct a new reality for himself in so doing. Moreover, he had already found in the process that whatever language he learned, the same applied: Fortran, Lisp, C, even Prolog. And, though he was hesitant to admit this, he had finally decided to become a linguist. A computational linguist, naturally.

8.3.3 Software as language

The term ‘programming language’, Fritzl decided, is not a misnomer; a programming language shares most common features with more familiar written colloquial idioms except ambiguity on the semantic side and pronounceability on the physical side. This is sometimes doubted, but the similarities and differences are not fortuitous, as Fritzl discovered.

The forms of a programming language are quite similar to those of other versions of written language. Its smallest units resemble orthographic words, and have their internal spelling which often overlaps strongly that of some natural language. It has a syntax, determining the combinatoric properties and ordering of words. It has a morphology (prefixes and suffixes, etc.), for instance in the form of type indices on variables, or in variable names, which express a kind of co-reference much in the same way that pronouns agreeing in person, number and gender do. It has a textual syntax, stating how to combine sentences into coherent texts.

Not only that, a programming language has a semantics, not just in the formal logical sense of a set-theoretically defined virtual ontology, or in the usual programmer's sense of the runtime values of identifiers, but in a common or garden linguistic sense of having meaning in the contexts in which it is used.

⁵ Cf. [Gumperz, 1982].

The expression “FRITZL” really means Fritzl, and “SALARY FRITZL” really means Fritzl's salary, unless the programmer is playing with the language, testing, or otherwise combining signs in a syntactically correct but meaningless fashion (as we can in other forms of written language, too).

But what Fritzl found when he turned to linguistics was that the distinctions do not stop at syntax and semantics as in computer science. They continue to pragmatics, as in general semiotics. *If syntax expresses relations between signs in a language, and semantics relations between signs and the world, pragmatics expresses relations between signs and their users*, in traditional semiotics⁶. For Fritzl, with his interest in software engineering, this apparently taboo area came to exercise a considerable fascination, and thus it constitutes the main thrust of the rest of this report.

8.3.4 Systems as texts

Looking back on his third-year software development project, Fritzl recalled what an immense amount of paper he and his team had generated, most of it remaining unread in detail, and was thankful for the sophisticated interactive system he was using to generate his memoirs. More intensely than screens and blinking cursors, he found, the idea of paper still conjured up the notion of pen, writing, and all their associations. And he recalled the different sorts of text (at that time called “hard copy”) which they had produced. There were descriptions of various tasks, some informal and some as reports, program listings, test runs, program specifications, inventories, technical documents, and a user manual. And of course there had been all that endless discussion about the right design philosophy, the right implementation strategies, the tiresome bugs, and what the user needed to know. And how Mariandl, a translator he was friendly with at the time, had been appalled by the bad grammar and punctuation of the prompts! Some of these texts Fritzl had kept.

Was there a principle behind all this variation? What was the unifying force behind all these written traces of communicative processes? If there was system behind it all, perhaps one could conceive of the system as a theory – but surely not as the private and ultimately incommunicable theory of an individual programmer or team, as suggested by Naur⁷. Isn't it the conventional property of a serious theory to be explicit, shared by a scientific community and, with a certain finite amount of effort, to be comprehensible? In fact, there appeared to be no theory, but a roughly coherent set of texts around a major theme: perhaps this is closer to Naur's idea.

The core was the program itself, which had a precise syntactic specification. Beyond the local line-by-line details, which made some kind of easily recognizable formal sense, the program as a whole made not the slightest sense, of course. It might just as well have been an ancient and sacred, as yet undeciphered scroll. But given the handbooks, things started to fall into place: whole chunks of the

⁶ For example [Morris, 1946].

⁷ See [Naur, 1985b].

program text were given informal but highly intelligible rules of interpretation, relating them to the world outside. And these interpretations could often be followed, with a little more effort, down to the more local details of the code. So Fritzl found syntactically correct sentences in the program, and remembered that they had actually meant something to somebody a long time ago.

So the different sorts of text varied quite systematically in terms of several parameters: by *form* or syntax (small technical vocabulary and grammar against larger, more picturesque informal descriptive vocabulary), by *meaning* or semantics (more precise, specific, highly delimited, specialized versus more vague, general, informally characterized, widely applicable), and by *function* or pragmatics (instructions to the programmer, the program as a ‘template’ for the computer to traverse mechanically again and again without variation, the handbook as a set of explanations and instructions for the user). And also by *medium* (written, not spoken, confidential versus published), by *genesis* (explicitly designed versus gradually acquired) and along other dimensions.

What a pity, thought Fritzl, that they had not recorded the oral discussion at that time, as Goguen would have recommended; the special features of spoken language had a particularly intensive effect on finding solutions: how often had he simply described a problem to someone else, hearing only “Really?!” or “Sounds okay to me”, for the answer to occur to him just like that. The different kinds of dialogue had been subject to quite different conventions⁸.

8.3.5 The pragmatics of utterances

So, Fritzl reasoned further, if software development is largely text production, what roles do these texts and their parts play in the individual acts of text or utterance creation, speech acts, and in the constitution of discourses with whole sequences of such acts? What kinds of speech acts are performed

... by the developer, in producing the software,

... by the user, in using the software,

and who takes the responsibility for these texts or speech acts – promises, threats, explanations, summaries, predictions – in the contexts in which they are used?

To gain an idea of what is involved, Fritzl reviewed some approaches to describing the functions of language. The central approach was speech act theory, with some historical background in other theories, and with some contextualization in terms of higher-level speech activity such as dialogue.

The traditional parametrization of speech acts (acts of writing being more restricted) was based on constitutive factors of communication, such as speech producer and receiver, channel or contact, message, context, and the code used. The “functional” approach started with three functions defined on a quadruple of constitutive factors <Sign, Speaker, Addressee, Context>⁹, explicating the

⁸ Cf. [Coulthard, 1987].

⁹ See [Bühler, 1934].

old notion that language is a tool, organon. The three main kinds of function are:

EXPRESSION (speaker, utterance), with values such as emotion, conviction, opinion, belief;
 APPEAL (addressee, utterance), with values such as persuasion, insult, fright, impressiveness, rejection;
 REPRESENTATION (context, utterance), essentially with referential values: object reference and truth values.

Jakobson¹⁰ extended the factors with somewhat different terminology to include <Speaker, Hearer, Contact, Context, Code, Message>, and defined three more functions (using the term “message” rather than “utterance”):

METALINGUAL (code, message), with values involving marking, commenting on and evaluation of the code itself;
 PHATIC (code, contact), with the function of creating, sustaining, closing channels of communication, securing uptake, marking and correcting errors, with both physical and social dimensions¹¹;
 POETIC (message, message), with the idea that some functions of language are aesthetic in a formal sense, with intrinsic and conventional patterning – perhaps “art for art’s sake”.

These views of the functions of language beyond the individual were greatly refined by contributions from the philosophy and the sociology of language. And it is interesting to see how the contributions of speech act theory within the philosophy of language¹² look somewhat different from the perspectives of different disciplines such as linguistics or philosophy.

From the philosophical perspective, speech act theory may be seen as an attempt to generalize over the semantics of speech acts (as the statement of *truth conditions*) and the pragmatics of speech acts, in particular those which do not, strictly speaking, have truth values (such as baptisms, commands and promises), but have other ethical values in terms of commitment and responsibility. However, their *felicity conditions* are quite similar to truth conditions when looked at in all relevant details.

From the linguistic perspective, speech act theory links up with other levels of representation of language: with the choice of words, details of the choice of sentence structure, the use of speech melody and typography to give contour to the utterance, and with the use of language of different styles, sociolects and dialects under the conditions of different relations of social cooperation, competition, and domination.

A classical, rather detailed exposition of the nature of speech acts is given by Searle. Searle starts from the basic premise of a *Principle of Expressibility*¹³,

¹⁰ See [Jakobson, 1962].

¹¹ [Malinowski, 1924]

¹² Cf. [Austin, 1962, Searle, 1969] and many other studies.

¹³ [Searle, 1969, p. 20]

which includes what speakers mean, but excludes “certain kinds of effects” on hearers – poetic, emotional, inducing beliefs, etc., contrary to Naur’s view:

“A main claim of the Theory Building View of programming is that an essential part of any program, the theory of it, is something that could not conceivably be expressed, but is inextricably bound to human beings.”¹⁴

The Principle of Expressibility claims:

...for any meaning X and any speaker S , whenever S means (intends to convey, wishes to communicate in an utterance, etc.) X then it is possible that there is some expression E such that E is an exact expression of or formulation of X ...

This connects to the notion of speech act, i.e., the utterance as having a role in a speech situation, by virtue of what may be termed the “Literal Utterance Principle” (not Searle’s term), the point being that some speech acts (e.g., “Yes, of course”) are quite inexplicit, and rightly so, in everyday speech:

...for every possible speech act there is a possible sentence or set of sentences the literal utterance of which in a particular context would constitute a performance of that speech act.

The importance of the Principle of Expressibility cannot be overemphasized: it underlies the whole of the work of the linguist, but it also underlies the basic strategy of scientific explication in every scientific discipline. Starting from a less well-understood notion, clearer delimitations from other notions and sharper characterizations of the notion itself are developed in terms of technical languages, and ultimately formal languages, including computer programs.

For Searle, the general form of a speech act is $F(p)$, where p ranges over propositions and F ranges over “illocutionary force indicating devices” such as word order, stress, intonation contour, punctuation, the mood of the verb (imperative, indicative, interrogative, subjunctive, etc.), and explicit “performative verbs” such as *apologize*, *warn*, *claim*, *request*.

Speech acts are defined in terms of *constitutive rules* (as opposed to regulatory rules, which channel pre-defined action), which are based on necessary and sufficient *conditions* for the successful and non-defective performance of a speech act. These, in turn, build on *institutional* (conventional, social) as opposed to brute (or physical) facts. Typical institutional facts include observations about speakers and hearers in their discourse roles, rather than in their identities as biological persons. The performance conditions are illustrated by the speech act of *promising* (think of booking an airline ticket as a computational promise by someone – by whom?):

¹⁴ [Naur, 1985b, p. 258]

“Given that a speaker S utters a sentence T in the presence of a hearer H, then, in the literal utterance of T, S sincerely and non-defectively promises that p to H if and only if the following conditions 1-9 obtain.”¹⁵

Normal context condition (not Searle's term)

1. Normal input and output conditions obtain (such as knowledge of the language, health, non-play-acting, ...).

Propositional content conditions

2. S expresses the proposition that p in the utterance of T.
3. In expressing that p, S predicates a future act A of S.

Preparatory conditions

4. H would prefer S's doing A to his not doing A, and S believes H would prefer his doing A to his not doing A.
5. It is not obvious to both S and H that S will do A in the normal course of events.

Sincerity condition

6. S intends to do A.

Essential condition

7. S intends that the utterance of T will place him under an obligation to do A.

Uptake condition (not Searle's term)

8. S intends (i-1) to produce in H the knowledge (K) that the utterance of T is to count as placing S under an obligation to do A. S intends to produce K by means of the recognition of i-1, and he intends i-1 to be recognized in virtue of (by means of) H's knowledge of the meaning of T.

Utterance condition (not Searle's term)

9. Semantical rules of the dialect spoken by S and H are such that T is correctly and sincerely uttered if and only if conditions 1-8 obtain.

If discussion of the *commitment* dimension of communication (which Fritzl intuitively understood when he agreed to act as companion through mountainous terrain) is to be concrete, coherent, and convincing, then it requires a detailed explication in terms such as those provided by speech act theory.

¹⁵ [Searle, 1969, p. 57]

8.3.6 The pragmatics of dialogue

But the individual utterance is not the be-all and end-all: there are more general *discourse conditions* such as *conventions for cooperation*¹⁶, different discourse roles, different *turn-taking* conventions for conducting meetings, for discussion at the desk, for phone calls, for informal chats in the cafeteria with other colleagues¹⁷.

While Searle concentrated on constitutive rules for speech acts, the *maxims* of Grice might be conceived as *regulatory* rules for the relevance of utterances in the whole discourse context¹⁸, together constituting the *Cooperative Principle* of conversation which is intended to enable the hearer to recognize the intention of the speaker¹⁹:

Maxims of quantity

1. Make your contribution as informative as is required.
2. Do not make your contribution more informative than is required.

Maxims of quality

1. Do not say what you believe to be false.
2. Do not say that for which you lack adequate evidence.

Maxim of relation

1. Be relevant.

Maxims of manner

1. Avoid obscurity of expression.
2. Avoid ambiguity.
3. Be brief.
4. Be orderly.

The maxims may be related indirectly to Searle's conditions of performance; the sincerity condition is clearly reflected in the first maxim of quality, for example. Informally expressed as these maxims are, their appropriateness should not be underestimated. Each represents an important question in the philosophy of language; for instance, the maxims of manner can be taken to refer mainly to classical problems in semantics: to vagueness or fuzziness, ambiguity, redundancy or tautology, and to the compositionality of meaning. Intelligent application of these maxims enables Fritzl to draw interesting conclusions such as the following:

¹⁶ See [Grice, 1975].

¹⁷ Cf. [Sacks et al., 1974, Gibbon, 1985].

¹⁸ See [Sperber and Wilson, 1986].

¹⁹ See [Grice, 1975].

Vagueness is not just “noise” but an essential property of non-technical use of language. Why? Imagine a language game with two people who disagree on some topic, say, on whether Fritzl really knew what he was talking about. Even their definitions of terms are different. Also imagine that they are rather excited, and don't feel like getting on to some higher level of universal “meaning atoms” to which they can reduce their disparate definitions (as true empiricists, they might even refuse to do this on principle). How could they conceivably communicate anything without vagueness? But, through the explication process, they can approximate more and more closely to precision.

Cooperation – like commitment, or responsibility – is not a property of an individual speech actor: “cooperation with”, “commitment to”, “responsibility for” imply roles in a social aggregate. Just to give an example: imagine Fritzl in his role as chairman of a project negotiation meeting. Simultaneously he may at any given moment participate in the following communicative role structure²⁰:

CONTROL: chairman (versus working party member, etc.),
 STRATEGY: floorholder (versus audience versus eavesdropper),
 TACTICS: addressor (versus addressee versus listener),
 PRIORITY: initiator (versus responder, e.g., questioner versus answerer),
 CHANNEL: sender (versus receiver),
 PROCESS: producer (versus perceiver).

Any of these roles can help to determine when Fritzl gets to speak or relinquishes his turn to someone else, and Fritzl may indeed choose to project structures of this kind on to his software communication strategies as constraints to guide or frustrate the user.

Interaction in communication is governed by a number of dynamic factors, apart from the underlying role structures. One such factor pertains to situation-specific turn-taking principles²¹. How does one know that someone has finished speaking, or wants to speak? The cues (such as tone of voice, ends of sentences, lowering of eyes and hands) and role conditions, differ from situation to situation: meetings, interviews, informal conversations and other kinds of interaction differ in these respects. How does this apply to the interactive principles involved in human-computer-interaction? Fritzl found no easy answer to this question.

Another factor is the typical sequencing of speech acts which is characteristic of specific language varieties. A common case is the speech act *adjacency pair*, such as <Question, Answer>, <Claim, Refutation>, <Request, Response>, which may be generalized to a pair <Initiation, Reaction>. But this is not the whole story. What happens when the language tool slips, as it were, and Fritzl doesn't succeed in making the point he wanted to make? This *breakdown* situation, where the tool becomes simply an oddly shaped object, forces the routine, stereotypic running of dialogue into the consciousness of the participants.

²⁰ See [Gibbon, 1985, p. 407].

²¹ Cf. [Sacks et al., 1974].

But there are higher level discourse strategies for coping with this kind of problem, too. These may often be explicated by analysing an existing stage in a dialogue structure in terms of a further pair, involving transitions of various kinds, either to the reaction, or to the next structure, confirming the successful execution of part of the dialogue or its unsuccessful execution, plus a corrective suggestion. A simple case:

A: Where's the mouse?
 B: In the corner.
 A: Thanks.

The third item is often used to initiate an “uptake loop” of arbitrary length (i.e., until patience runs out), designed to clarify the response:

A: Where's the mouse?
 B: In the corner.
 A: Which corner?
 B: That one.
 A: Thanks.

Reactions, too, may be analysed as being prefixed by a transition element:

A: Where's the mouse?
 B: Sorry?
 A: Where's the mouse?
 B: Oh, in the corner.
 A: Which corner?
 B: Pardon me?
 A: ??*!@!!

The so-called “empty words” used in such structures are actually far from empty²²: they bear a high burden of information about the state of the conversation in terms of the fulfilment of speech act conditions. Moreover, it can be quite dangerous, literally, to assume from one's own conventions that all languages, indeed all varieties of one's own language, share them. The conventions for marking these initiations, reactions, transitions, terminations vary from language to language, and group to group, and indeed situation to situation, though the basic uptake loop structure is constant. And uptake-oriented forms – realizations of Jakobson's *phatic* function of language – figure in effect, though at a crude level, in interaction with software systems, too.

Applications of principles related to those discussed here have been made by Goguen, Linde and others²³: much communicative interaction is stereotyped, and can be easily modelled. The difficulties arise when in real-time office situations, in industrial plants, in aeroplanes and elsewhere the stereotypes based on role and convention are interrupted by noise or unusual events, and real creative

²² Cf. [Schriffrin, 1987].

²³ Cf. [Goguen et al., 1983].

communication based on partial or background information plus immediately perceived changes of situation is called for. The intricacies of language which allow language users, both speakers and writers, to signal this kind of prioritizing of information – the light and shade of the verbal landscape – are varied and complex and somehow, presumably, require to be taken into account in reconstructions of such realities in the form of computational tools.

8.3.7 Fritzl and commitment

Why is language so often overlooked as a source not only of problems but of stimuli for solutions to problems? The main reason is, perhaps, that we are so practised in its use that its “readiness-to-hand” as a fluently used tool makes it all but unnoticeable. And when it breaks down, thereby laying bare the necessity for following repair strategies, these too, as a rule, are present as higher-level, fluently used tools. Further, when the breakdown is so thorough that the necessity for conscious reflection on the conditions of language use is laid bare, these conditions turn out to be so complex, and the cues for indicating them so varied, that we immediately shy away from them and create our own abstract, simplified pictures of language, preferentially the kind of language that we think (that we think. . .) that we use ourselves.

It should now come as no surprise to learn that linguists have found out that the way we *actually* use language when it is “ready to hand” as a fluently used tool differs from the way in which we *think* we use it, i.e., a mode in which language is contemplated as an object. We tend to think we speak (and act) according to well-defined norms which we have been trained to think are “good”. And in a homogeneous society there may well be no such discrepancy. But society even in Fritzl's village is inhomogeneous in terms of the roles of its members, and at a moment's notice it may become more so, owing to an influx of inquisitive linguists and other tourists. And our prescriptive ideas about how we speak are not descriptions of the reality of skilful, fluent language use.

Writing, too, only makes sense when interpreted in a given context, like Fritzl's software project, where the program only made sense when interpreted with the aid of the handbooks or its developers, and otherwise was simply a pattern imposed on silicon or on the magnetic coating of a disk, a template to be traversed with the aid of minimal amounts of electrical energy, again and again, ever in the same way (‘modulo’ breakdowns), in response to switches in keyboards, in mouse keys, or in other sensors, and producing light patterns to be interpreted much as other writing is interpreted. Where is the commitment, the responsibility, in such traces? No more in the computer than in the pen Fritzl used to sign his first cheque, but either in the designer of the pen, or Fritzl himself, who both share the responsibility, often in legally defined ways. Breakdown for technical reasons? Never. Though our less privileged successors in the next millenium will no doubt have archaeologists who will be puzzled by millions of tiny silicon replicas of Mosaic tablets, each with hundreds of thousands of simple commandments linked with hundreds of thousands of ANDs and ORs and NOTs.

So, having gone through all of this in order to understand what had suddenly descended on his village, way back then, Fritzl realized that he was right after all: his dialect was just fine. And his command of other languages, and of styles of speech and writing also became, in due course, finely attuned to the contexts in which they were used. The specialists had simply been writing, writing, writing in order to use the advantages of a special kind of storage medium with suitable access techniques in order to support selected aspects of their bodily requirements and functions, including those of their brains.

Thus, Fritzl concluded his report, in the beginning was the word. And, not unexpectedly, in the end, too.