AGILE

Automatic Generation of Instructions in Languages of Eastern Europe

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Title ***Lexical-morphological specifications and resources for the initial demonstrator***

Authors Hana Skoumalová
Jiří Hana
Danail Dochev
Nevena Gromova
Serge Sharoff

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Abstract:

This document contains results of seven partial tasks: LSPEC1 (specification of a lexical entry), MORP1-Bu, MORP1-Cz and MORP1-Ru (description of morphological resources for Bulgarian, Czech and Russian, respectively), and LEXN1-Bu, LEXN1-Cz and LEXN1-Ru (description of lexical entries used in the first stage of the AGILE project). In the part describing the (ideal) lexical entry (LSPEC1), the theoretical basis for handling the free word order and the consequences for the lexicon are sketched. In the next section, a stock-taking of available morphological resources for the three languages is done and in the next section the current state of the lexicons of the single languages is described.

More information on AGILE is available on the project web page and from the project coordinators:

URL:	http://www.itri.brighton.ac.uk/projects/agile
email:	agile-coord@itri.bton.ac.uk
telephone:	+44-1273-642900
fax:	+44-1273-642908

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1. Introduction

The AGILE project involving three Slavonic languages (Bulgarian, Czech and Russian) is to develop a suite of software tools to assist technical writers in the production of software manuals. It is a continuation of DRAFTER project developed for English and French. As the three new languages are typologically different from the previous ones, the research can bring interesting results.

Work Package 4 is devoted to building lexical and morphological resources as a component part of the Initial Demonstrator, and to specifying the requirements on lexical and morphological resources for the final prototype in the three languages for the chosen domain. However, typological differences between the original languages and those addressed in the present project (concerning, for example, morphology and the freeer word order) will necessitate substantial modifications in the form and the contents of lexical entries.

This task has three main objectives. First, it delivers a full specification of the kinds of information to be included in a lexical entry, of the form of such an entry and its linkage to the upper model. Second, it aims to specify morphological components for Bulgarian, Czech and Russian, either by defining new modules or by defining an interface between an existing morphological module and the format required by the sentence generator. Third, it defines lexicons for Bulgarian, Czech and Russian covering the chosen domain of the Initial Demonstrator.

2. LSPEC1—Description of a lexical entry

Every entry contains information from different levels of sentence description. It describes the morphological properties of the word, syntactic information, which is for example valence frame of a verb (and possibly also of an adjective or noun), information about the case required by a preposition, type of a pronoun, or numeral, etc.

One of the main differences between English and Slavonic languages is the free word order in the latter ones. It was decided to exploit the Praguian theory for handling the topic-focus articulation: it is based on the so called “systemic ordering”, which describes the order of the main verb, participants and adverbials in an unmarked sentence for a particular language (see [Sgall et al (1986)]). In sentences with non-empty topic, the surface word order can differ from the systemic ordering. For every language, a set of rules can be found that describe the change of word order in the surface structure (see [Hajičová et al. (1995)]).

To make use of the theory we have to be able to do the mapping between participants in the underlying structure and subject, objects and complements in the surface structure. This sort of information must be contained in the lexicon—see the section 0 for more detailed description. Thus, the lexical entry in the AGILE project will differ from lexical entries of DRAFTER, although in the first stage only few changes were made.

1.1 Linkage to upper model

In the first stage of the project the LOOM knowledge representation language was used, in which the linkage to upper model was defined. Every concept is connected with the lexicon either by specifying the lexical item directly, or by listing of desired features of the lexical

entry assigned to the concept. We can see examples of the linkage on the following examples:

```
(penman::annotate-concept PROPERTY-ASCRIPTION
:lex-items
    (BE))
(penman::annotate-concept PROCESS
:lex-features
    (NOMINALIZATION))
```

In the first example, the copula 'be' is assigned to concept of PROPERTY-ASCRIPTION, in the second example it is required that the concept PROCESS is expressed by means of nominalization. The variable `:lex-item` points to a lemma in the lexicon, while the variable `:lex-features` points to a list of features characterizing every lemma. The two methods of linking the lexicon with the upper model can be combined, as we can see in the next example:

```
(penman::annotate-concept LIKING
:lex-features
    (LIKE)
:lex-items
    (LIKE-VERB))
```

In the second stage of the work, LOOM was replaced by CLOS, in which this linkage module is missing. It is necessary to develop this module for every language involved in the project. In the experiments that have been done up to now, the lexical items to be used were listed in every SPL:

```
(EXAMPLE
    :NAME   D0-TEXT1-CZ-4
    :GENERATEDFORM   "Příkazy jsou snadný."
    :TARGETFORM   "Příkazy jsou snadné."
    :LOGICALFORM
    (S / PROPERTY-ASCRIPTION
          :LEX BE
          :DOMAIN (D1 / OBJECT :LEX PRIKAZ :NUMBER PLURAL)
    :RANGE (R1 / SCALABLE-QUALITY :LEX SNADNY))
    :SET-NAME   D0-TEXT1
)
```

In this example, it was necessary to say explicitly that PROPERTY-ASCRIPTION is realized by the lexical item BE.

3. MORP1—Available morphological resources

As Slavonic languages are inflectionally very rich, it was decided to use external morphology. This means that KPML calls an external function and sends it a lemma or word stem and the desired form as parameters. The function returns a string—the surface realization of the morphological form.

3.1 Bulgarian

3.1.1 Description of morphological resources available for Bulgarian

Several systems for morphological processing have been developed in Bulgaria for the last fifteen years. Most of them were research oriented. The systems listed below are the most suitable for practical use in generation because of their relative completeness and practical orientation.

The system "MORPHO-ASSISTANT" [Simov et al. (1990)], developed in Linguistic Modeling Laboratory-BAS, performs morphological analysis and synthesis. Extensive morphological knowledge is represented as feature structures in Prolog. The system works under DOS. Its dictionary contains 60000 base forms.

The system "TWOL" [Paskaleva (1997)], also developed in the Linguistic Modeling Laboratory-BAS, is based on a finite-state model (Kimmo&Xerox model) for morphological analysis and generation. It is implemented in the programming language C. The system works under DOS and UNIX. Its dictionary contains 30000 base forms.

The system BULMORPH [Totkov et al. (1988), Totkov G., Krushkov Hr., (1996)], developed in the University of Plovdiv, is a morphological processor for Bulgarian which performs morphological analysis and synthesis. Robust analysis for unknown words is available. The system is implemented using Pascal/DELPHI and works under DOS, WINDOWS' 95/NT. A Dynamic Link Library (DLL) for WINDOWS' 95/NT is maintained. The dictionary contains 67500 base forms. The processor is distributed by ELDA (European Language Recourses Distribution Agency).

3.1.2 Resources chosen for AGILE

The System BULMORPH (University of Plovdiv) is the most appropriate for the project, because Dynamic Link Library (DLL) for WINDOWS' 95/NT allows an easy interface between different Windows applications. The system generates more than 1,400,000 word forms using the dictionary of the base forms. The size of both system and dictionary is up to 320 KB.

BULMORPH supports 187 different inflectional types classified in lexical categories as follows: 75 for the nouns, 14 for the adjectives, 41 for the pronouns, 11 for the numerals and 42 for the verbs. Every Bulgarian inflecting word can be classified as a member of one of these types. Specific types for proper nouns are added.

3.1.3 State of interfacing to KPML

An interface between BULMORPH and KPML allowing the use of external for KPML DLL has been experimented by Bateman and Krushkov. The experiments were made by use of Harlequin Lisp. The next step is to specify the input for different functions, supported by DLL.

3.1.4 Morphological description of each lexical category appearing in target texts

The morphological features of each lexical category were determined on the basis of the corpus analysis (WP3). Some lexical categories (e.g. pronouns) and morphological features are missing due to the fact that they do not occur in the Initial Demonstrator texts.

Verbs

Basic form

Aspect (imperfective, perfective)

Tense (present, simple past, future)

Number (singular, plural)

Person (1p. sg, 2p. sg, 3p. sg, 1p. pl, 2p. pl, 3p. pl)

Voice (active, passive)

Mood (Indicative, Imperative)

Nouns

Gender (masculine, feminine, neuter)

Number (singular, plural)

Article (for masculine - full and short form)

Adjectives

Gender (masculine, feminine, neuter)

Number (singular, plural)

Article (for masculine - full and short form)

Numerative

Type (ordinal)

Gender (masculine, feminine, neuter)

Number (singular, plural)

3.2 Czech

3.2.1 Available resources

For Czech there is a huge morphological lexicon available. It contains ca 200,000 entries from which more than 70 million forms can be generated. The generation includes also the most common regular derivations—it still has to be decided whether we will exploit this capability. This lexicon has been used in several industrial applications, e.g. ASPI—a full-text searching system for lawyers (running under DOS and Windows), in a two-level morphology system developed at Xerox (running under Solaris and Linux), now it is used for tagging the Czech National Corpus (running under Solaris, Linux and Windows).

3.2.2 Short overview of Czech morphology

Czech is a language with rather rich inflection. The grammatical categories are given in **Error! Unknown switch argument.** and their distribution among the single POSs in **Error! Unknown switch argument.**.

gender	masculine animate
	masculine inanimate
	feminine
	neuter
number	singular
	plural
	(dual)
case	nominative
	genitive
	dative
	accusative
	vocative
	locative
	instrumental
person	1st
	2nd
	3rd
tense	past
	present
	future
gradation	positive
	comparative
	superlative
negation	affirmative
	negative

Table 1: Czech grammatical categories

In traditional grammar books, only three genders are listed: masculine, feminine and neuter, and the animateness is another feature occurring only at masculine. In practical applications, however, it is more convenient to work with four genders.

As for the dual number, there are only some vestiges of it in the declension of nouns, but the only case where we have to mark the number as dual because of the adjective-noun agreement is the feminine instrumental: for example the word *oko* 'eye' has regular plural forms *oka* (with different meaning) and dual forms *oči*. Though the gender of this word is neuter, the dual forms have the agreement with feminine forms of adjectives and thus they can be understood as feminine plural forms. The only exception is the Instrumental, where the adjective has a special, dual form (see Table 2).

	Neuter plural	Feminine plural	Feminine dual
Nominative	*velká oka*	*velké oči*	
Genitive	*velkých ok*	*velkých očí*	
Dative	*velkým okům*	*velkým očím*	
Accusative	*velká oka*	*velké oči*	
Vocative	*velká oka*	*velké oči*	
Locative	*velkých okách*	*velkých očích*	
Instrumental	*velkými oky*		*velkýma očima*

Table 2: Plural and dual forms of the word *oko*

The tense of the indicative is present or future, the tense of participles is present or past. We mark even the indicative of perfective verbs as present, though the meaning is future.

The future tense is reserved for verbs of motion that have both present tense and simple future (e.g. *jdu—půjdu* 'I go—I will go', *nesu—ponesu* 'I carry—I will carry'), and for the verb *být* 'to be'.

Error! Unknown switch argument. shows that one word can have many grammatical forms. An adjective, for example, has 342 grammatical forms, but many of them are of course homonymous (e.g. the form *jarní* has 27 meanings).

	Gender	Number	Case	Person	Tense	Degree	Negation
Noun	x	x	x				(x)
Adjective	x	x	x			x	x
Pronoun	x	x	x	(x)			(x)
Numeral	x	(x)	x				
Finite verb		x		x	x		x
Participle	x	x	(x)		(x)		x
Adverb						x	x

Table 3: Distribution of grammatical categories

1.1.3 State of interfacing to KPML

Nothing has been done up to now. It has not been decided yet whether we will (at least partly) re-use an existing software or whether we will create a new interface to the lexicon. The two-level morphology system cannot be used, as it only runs in Unix. Most probably we will use **flex** and **C** procedures that are used for tagging the corpus and will develop a new interface to KPML.

1.3 Russian

1.3.1 The structure of morphological index

The morphological information in AGILE conforms to the elaborate classification system for Russian morphology developed by Zaliznjak [Zaliznjak(1977)]. The index consists of a specifying string, a numerical class of declension or conjugation, an alternation mark, an accentuation index and additional features. A specifying string is an abbreviation which denotes the part of speech of the lexical item, nouns have information on their gender (м, ж, с), verbs on their aspect (св, нсв, св-нсв). In addition intransitive verbs have the нп mark. The declension class varies from 0 to 8 for nouns, 1-6 for adjectives and pronouns, 1-17 for verbs. Alternation in the stem is denoted by * or **. An accentuation index is a Latin character from *a* to *f* (the most of words in the register of the Initial Demonstrator have an accent in their stem which is in a static position for all forms of the word; this is denoted by the accentuation index *a*). Additional features mark the most frequent deviations from the standard declension schemes.

The complete treatment of this index is provided in [Zaliznjak (1977)]. A further extension here over the above is the inclusion of lists of stems; this provides data for selection between different types of stems in the case of stem alternation, for example, in the case of verbs, infinitival and personal stems are listed in the lexical item, in order to conform with the requirements of the external morphological module.

1.1.2 Application programmer interface to the morphological generator

The implementation of the morphological generator is based on a library of classes which describe grammatical features of Russian words. This preexisting system is based on quite different principles than the generation grammar [Sharoff (1995)]. In the course of the project it has been ported to the Common Lisp Object System (CLOS) Common LISP. Non-Latin characters are being represented here by the standard Windows encoding Win-CP1251 and by Unicode in the application of the Harlequin Common LISP.

1.1.2.1 Morphological classes and initialization of their instances

The basic class of the morphological generator is `rusword`, described below:

```
(defclass rusword ()
   ((stemlist :type list :initarg :stemlist  :accessor stemlist)
```

with the list of stems,

```
   (morph-info :type list :initarg :morph-info  :accessor morph-
   info)
```

with the morphological index,

```
    (morph :accessor morph :initform (gentemp "morph"))
```

with a symbol which carries interpreted morphological features. The rest of slots is for current values:

```
   (stem :type string :initarg :stem :accessor stem)
   (flex :type string :initarg :flex :accessor flex)
   (wordform :type string :accessor wordform)))
```

Classes which are derived from the `rusword` include the class of declinable words and the class of verbs (including participial forms):

```
(defclass declinword (rusword)
  ((gender :initarg :gender :initform '(#\м) :accessor gender)
   (rnumber :initarg :rnumber :initform '(sing) :accessor
   rnumber)
   (rcase  :initarg :rcase :initform '(nom) :accessor rcase)
   (form  :initarg :form :initform 'simple :accessor form)))
```

Its subclasses are classes of noun, pronoun and adjective (they have no additional slots).

Slots of the class of verbs define its characteristics:

```
(defclass verb (rusword)
 ((person :initarg :person :initform 1 :accessor person)
  (rnumber :initarg :rnumber :initform '(sing) :accessor rnumber)
  (tense :initarg :tense :initform 'present :accessor tense)
  (aspect :initarg :aspect :initform 'нсв :accessor aspect)
  (form :initarg :form :initform 'infinite :accessor form)
  (gender :initarg :gender :initform '(#\м) :accessor gender)
  (reflexive :initarg :reflexive :accessor reflexive)
  (adj :type adjective :initarg :adj :accessor adj)))
```

The last slot of verbs holds an adjective corresponding to a participial form of this verb.

A special function is designed for initialization of instances of the above-mentioned classes. It analyzes the content of the string with a morphological index and creates an instance of a corresponding class:

```
(defun make-word (stemlist morph-string)
  (case (car morph-string)
    ((м мо ж жо с со жо-мо) (make-noun stemlist morph-string))
    ((мест) (make-pronoun stemlist morph-string))
```

```
    ((п п-мс пм пж пс) (make-adjective stemlist morph-string))
    ((св нсв св-нсв) (make-verb stemlist morph-string))
    (otherwise (make-indeclinword stemlist morph-string))))
```

1.1.1.2 Generation methods

The most important generic function for generation of word forms is `generate-form`, which is specialized for declinable words and verbs. In the former case it receives keyword parameters for case, number and gender:

```
(defmethod generate-form ((r declinword) &key (rcase (rcase r))
   (rnumber (rnumber r)) (gender (gender r)))
```

Keyword parameter supplied to `generate-form`, which is specialized for verbs, include person, number, tense, reflexivity and form (the latter belongs to the list of `'(finite infinite imperative active-participle passive-participle adv-participle passive)`; adv-participle means deeprichastie - adverbial participle; passive means a special short form of a passive past participle, which used in building passive forms); for participial forms case and gender may be specified:

```
(defmethod generate-form ((r verb) &key (person (person r))
   (rnumber (rnumber r)) (form (form r)) (tense (tense r))
   (reflexive (reflexive r)) (rcase '(nom)) (gender '(#\м)))
```

Several methods of the above-mentioned morphological classes provide specialized access which is relevant to generation of forms, they are called by `generate-form`, though they maybe irrelevant for external applications; in particular:

`selectstem` — helps in selection of a stem from the list of possible stems according to morphological features;

`setflex` — calculates a flex which conforms to current morphological features;

`generate` — generates a word form which conforms to current morphological features;

`generate-paradigm ((r noun))` — iterates a call to generate for number and case through the noun paradigm

`generate-paradigm ((r adjective))` — iterates a call to generate for cases sequentially of masculine, feminine genders in singular number, then for cases of plural number

1.1.3 Examples of calls to the morphological generator

1.1.3.1 Declension

```
(setq komanda (make-word '("команд")  '(ж 1 а)))
(generate-form komanda :rcase '(acc) :rnumber '(sing))
=> "команду"
(generate-paradigm komanda)
"команда"
"команды"
"команде"
"команду"
"командой"
"команде"
"команды"
```

```
"команд"
"командам"
"команды"
"командами"
"командах"

(setq knopka (make-word '("кнопк" "кнопок")  '(ж 3 * a)))
(generate-form knopka :rcase '(acc) :rnumber '(sing))
=> "кнопку"
(generate-form knopka :rcase '(gen) :rnumber '(plur))
=> "кнопок"

(setq kombinatsija (make-word '("комбинаци")  '(ж 7 a)))
(generate-form kombinatsija :rcase '(acc) :rnumber '(sing))
=> "комбинацию"

(setq nazhatie (make-word '("нажати")  '(с 7 a)))
(generate-form nazhatie :rcase '(inst) :rnumber '(sing))
=> "нажатием"

(setq imja (make-word '("им" "имен")  '(с 8 a)))
(generate-form imja :rcase '(acc) :rnumber '(sing))
=> "имя"
(generate-form imja :rcase '(inst) :rnumber '(sing))
=> "именем"

(setq oblastj (make-word '("област")  '(ж 8 a)))
(generate-form oblastj :rcase '(inst) :rnumber '(sing))
=> "областью"

(setq menju (make-word '("меню")  '(с 0 a)))
(generate-form menju :rcase '(prepos) :rnumber '(sing))
=> "меню"

(setq granichny (make-word '("граничн")  '(п 1 a)))
(generate-form granichny :rcase '(acc) :rnumber '(sing) :gender
   '(#\ж))
=> "граничную"

(setq krivaja (make-word '("крив")  '(пж 1 b)))
(generate-form krivaja :rcase '(gen) :rnumber '(sing))
=> "кривой"

(setq odin (make-word '("одн" "один")  '(п-мс 3 * b)))
(generate-form odin :rcase '(inst) :rnumber '(sing) :gender
   '(#\м))
=> "одним"
(generate-form odin :rcase '(nom) :rnumber '(sing) :gender
   '(#\м))
=> "один"
```

1.1.1.2 Conjugation

```
(setq vybratj (make-word '("выбра" "выбер")  '(св 6 a)))
(generate-form vybratj :form 'adv-participle :tense 'past)
=> "выбрав"
(generate-form vybratj  :form 'imperative :rnumber '(plur))
=> "выберите"

(setq nazhatj (make-word '("нажа" "нажм")  '(св 14 b -м-)))
```

```
(generate-form nazhatj :form 'imperative :rnumber '(plur))
=> "нажмите"

(setq zapustitj (make-word '("запусти" "запущ")  '(св 4 a)))
(generate-form zapustitj :form 'imperative :rnumber '(plur))
=> "запустите"
(generate-form zapustitj :form 'passive-participle :tense 'past
   :rcase '(gen) :rnumber '(sing) :gender '(#\ж))
=> "запущенной"
(generate-form zapustitj :form 'passive-participle :tense 'past
   :rcase '(gen) :rnumber '(sing) :gender '(#\ж) :reflexive t)
=> "запустившейся"

(setq narisovatj (make-word '("нарисова" "нарису")  '(св 2 a)))
(generate-form narisovatj :form 'infinite)
=> "нарисовать"
(generate-form narisovatj :form 'passive-participle :tense 'past
   :rcase '(gen) :rnumber '(sing) :gender '(#\м))
=> "нарисованного"
(generate-form narisovatj :form 'active-participle :tense 'past
   :rcase '(gen) :rnumber '(sing) :gender '(#\м))
=> "нарисовавшего"

(setq pojavljatsja (make-word '("появля")  '(нсв 1 b -ся)))
(generate-form pojavljatsja :form 'active-participle :tense
   'present :rcase '(inst) :rnumber '(sing) :gender '(#\ж))
=> "появляющейся"
(generate-form pojavljatsja :form 'finite :tense 'present :person
   3 :rnumber '(plur))
=> "появляются"
```

1.1.4 Interface of the morphological generator to KPML

Interfacing KPML to an external morphological generator has been used, in particular, within the TechDoc multilingual generation system for instructional texts [Rösner & Stede (1994)]. There are several extensive computational treatments of German morphology and so, in TechDoc, the Penman generator was modified, so that an external component—the German morphological component Morphix [Finkler & Neumann (1988)]—intervened between Penman's internal code for producing morphological forms and the construction of the constituent tree containing the final generated strings. In the present model of the Russian morphological interface the full use of the object-oriented approach has been adopted.

During grammar traversal, certain choices result in the specification of morphological properties, for example, in the Russian grammar when a direct complement is inserted, it is supplied with the realization statement: (inflectify directcomplement accusative). Then, when morphology is not being handled by a multilingual grammatical description in the form of a system network, then the KPML method:

```
REALIZE-INFLECTIFY (chosen-word inflection-feature-list lg)
```

is called. This has been specialized for Russian so that the features selected from the grammar are analyzed and mapped appropriately for calls to the external lexical form generation procedures described above. The lexical item for the chosen is retrieved by the KPML function:

```
(SETQ word-from-lexicon (fetch-lexicon-info Chosen-Word
   'instance)))
```

Morphological properties and the list of stems are retrieved from the lexical item, and if they are present an object carrying morphological information is created by a call to the morphological generator function make-word:

```
(when (and property-list stem)
        (setq morph-object (make-word stem property-list))
```

Later on this method provides mapping of grammatical features, which have been selected by the grammar, into morphological properties handled by the morphological generator. This is done by appending the existing list of morphological features with the keywords followed by a corresponding morphological feature, for example:

```
(if (member 'imperative Grammatical-Feature-List)
   (SETQ morph-feature-list (append '(:form imperative)
     morph-feature-list)))
(if (intersection '(plural-form plural) Grammatical-Feature-List)
   (SETQ morph-feature-list (append '(:rnumber (plur))
     morph-feature-list)))
```

Then the morphological object together with the morphological features list are supplied as parameters to the generic function generate-form, which is specialized by the morphological object:

```
(SETQ spelling (apply 'generate-form (cons morph-object morph-
   feature-list)))
```

If fonts for displaying Cyrillic characters in KPML has not been provided, the string in Cyrillic characters which is output by morphological generator is converted to a stringof their standard Latin equivalents by calling:

```
(if (not *cyrillic-display-loaded*)
   (SETQ spelling (transliterate spelling))))
...
(defconstant *cyrillic-characters* (coerce
   "абвгдежзийклмнопрстуфхцчшщъыьэюя" 'list))
(defconstant *latin-characters* '("a" "b" "v" "g" "d" "e" "zh"
   "z" "i" "j" "k" "l" "m" "n" "o" "p" "r" "s" "t" "u" "f" "kh"
   "ts" "ch" "sh" "sch" "~" "y" "j" "e" "ju" "ja"))
(defconstant *transliteration-pairs* (pairlis *cyrillic-
   characters* *Latin-characters*))
(defun transliterate (cyr-string)
  (apply 'concatenate (append '(string) (mapcar #'(lambda (x) (or
   (cdr (assoc x *transliteration-pairs*)) (string x))) (coerce
   cyr-string 'list)))))
```

4. LEXN1—Definition of the initial lexicon

4.1 Bulgarian

4.1.1 Description of available resources for Bulgarian language

Several Bulgarian computer lexicons have been developed in Bulgaria for the last years. Most of them were research oriented and realized not as a stand-alone machine-readable lexicons, but as parts of systems for morphological processing. The systems listed below are the most suitable for practical use in generation.

The system "MORPHO-ASSISTANT" [Simov et al. (1990)] performs morphological analysis and synthesis. The morphological knowledge is represented as feature structures in Prolog. The embedded dictionary contains 60000 base forms. The system works under DOS.

The system "TWOL" [Paskaleva (1997)] is based on a finite-state model for morphological analysis and generation. It is implemented in the programming language C. The system dictionary contains 30000 base forms. TWOL works under DOS and UNIX. Both systems were developed in Linguistic Modeling Laboratory - BAS.

The system BULMORPH [Totkov et al. (1988), Totkov G., Krushkov Hr.,(1996)] developed at the University of Plovdiv is a morphological processor for Bulgarian which performs morphological analysis and synthesis. Robust analysis for unknown words is available. The system is implemented using Pascal/DELPHI. It works under DOS, WINDOWS' 95/NT. A Dynamic Link Library (DLL) for WINDOWS' 95/NT is maintained. The dictionary contains 67500 base forms. The processor is distributed by ELDA (European Language Recourses Distribution Agency).

4.1.2 Lexical resources chosen for Bulgarian: Morphological Dictionary.

The dictionary embedded in the BULMORPH [Totkov G., Krushkov Hr.,(1996)] is intended to be used in next stage of the project. It has the following basic characteristics: format: ASCII; 67500 entries divided into 231 inflectional types (proper nouns incl.), morphosyntactic information for each entry, and a morphological processor BULMORPH (MS DOS and WINDOWS) for morphological analysis and generation. Each entry consists of: Base form; Pattern; Inflectional type number.

The dictionary is being distributed by ELDA (European Language Recourses Distribution Agency).

4.1.3 Description of the lexical items appearing in the target texts

The Bulgarian lexicon for the Initial demonstrator phase is a small internal-type lexicon with respect to KPML.

The lexicon contains all the Bulgarian word forms for the Initial Demonstrator. They were added to the English CADCAM terms. The lexical entries for verbs are imperative forms. Some nouns have definite and nondefinite forms so there are separate lexical entries for them marked with a special tag.

A typical lexical item in the Bulgarian lexicon includes the following slots: name, spelling, features, properties, sample-sentence, for example:

```
(LEXICAL-ITEM
   :NAME   IZBIRAM
   :SPELLING   "izberete"
   :SAMPLE-SENTENCE   "izberete Pline"
   :FEATURES   (DO-VERB EFFECTIVE-VERB DISPOSAL-VERB)
   :EDITOR   "DOCHEV")
```

4.1.3.1 Name

This slot contains an identifier of a lexical item. This value is referred by SPL `:lex` keywords and lexify statements in the grammar.

4.1.3.2 Spelling

Currently the necessary wordform for the output is taken from this slot. It will not be used in the Bulgarian grammar, if an external morphological module is loaded.

4.1.3.3 Features

This slot contains features, which are used by the Bulgarian grammar. For the purposes of the Initial Demonstrator all the lexical features of the Bulgarian entries were copied from the appropriate English lexemes. It has a very restricted set of values. Basically, for nouns it is filled with features `(NOUN COMMON-NOUN)`, for verbs — `(VERB DO-VERB EFFECTIVE-VERB DISPOSAL-VERB)`.

4.1.3.4 Properties

For the purposes of the Initial Demonstrator this slot is used only to express the plural form of the nouns. It is activated by the English grammar systems for irregular plural forms of the nouns.

```
(LEXICAL-ITEM
    :NAME   LINIA
    :SPELLING   "linia"
    :FEATURES   (PLURALFORM IRR NONE-OF-THATCOMP-TYPIC NONSUBSTITUTE
                        COUNTABLE NOT-NOMINALIZATION COMMON-NOUN NOUN)
    :PROPERTIES   ((PLURALFORM "linii"))
    :EDITOR   "DOCHEV")
```

4.1.3.5 Sample-sentence

This slot contains a context in which this item occurs in Bulgarian sentences.

4.2 Czech

4.2.1 Available resources

As it was mentioned above, for the topic-focus articulation we need the information on underlying structure of a sentence. For this purpose we will exploit a small lexicon containing the syntactic description of all word classes. It is being developed as a test bed for theoretical research, mainly on verb valency. It is implemented in DATR and contains 4,810 entries:

nouns	2469
adjectives	401
pronouns	40
numerals	1035
verbs	345
adverbs	401
prepositions	73
conjunctions	39
interjections	3

particles 4

The Czech lexicon uses the following attributes and values:

base form	of the word, possibly with an index
gloss	a short description of the meaning or an example of usage of the word
morphological information	all possible forms of the word and other morphological information
syntactic information	the category, the frame, information about passivization, and other information necessary for the analysis/generation

The syntactic part of the lexical structure is very diverse, as different parts of speech bring to a sentence different pieces of syntactic information. The only syntactic attribute that all the parts of speech posses is the syntactic category (`<syn cat>`).

In the following sections we will describe the syntactic properties of all the categories.

1.1.1.1 Verbs

We will explain the structure on an example. The word *bát se* (to be afraid) with the frame *bát se čeho/že/aby* (to be afraid of/that) is encoded in the lexicon in the following way:

```
Bát_1:
     <gloss> == bojí se strašidel;
                ... že nepřijdou;
                ... aby nepřišli
     <mor> == BÁT
     <syn> == RSE_F[2clzcla]@.
```

The base form serves as a node in the DATR hierarchy. The gloss, as it is unique for every word, must be inserted for every word separately. The `mor` and `syn` information, however, can be inherited from a supernode—in this case the morphological information is inherited from a node `BÁT` (we will only use the information on aspect) and the syntactic information from the node `RSE_F[2clzcla]@`. As an output of the DATR theory we get this result:

```
Bát_1:
    <gloss> = bojí se strašidel;
          ... že nepřijdou;
          ... aby nepřišli
    <mor aspect> = imperf
    <syn cat> = V
    <syn type> = main
    <syn refl> = se
    <syn subj surf> = NPnom
    <syn subj deep> = Actor
    <syn subj oblig> = oblig_deletable
    <syn 1_obj surf> = NPgen , CLže , Claby
    <syn 1_obj deep> = Patient
    <syn 1_obj oblig> = optional
    <syn pass> = no.
```

The syntactic part informs that the category of the word is V (verb), its type is ‘main verb’, the verb is intrinsic reflexive (i.e. it requires the reflexive particle *se*), and cannot occur in the

passive voice.[1] Further, it describes the valency frame of the verb: The frame has two members—Actor and Patient in the underlying structure, which play roles of the subject and an object in the surface structure. Their surface forms are a noun phrase in Nominative for the subject, and a noun phrase in Genitive or a clause connected by the conjunction *že* (that) or a clause connected by the conjunction *aby* (so that) for the object. Actor is obligatory in the deep structure but deletable on the surface, while Patient is optional.

1.1.1.2 Nouns

The syntactic category of a noun is **N**, it can also be reflexive and it can have a frame. Beside the five verbal inner participants and an obligatory free modification, noun can have **Partitive**, **Appurtenance** and **Identity** participant. All these members of the frame play roles of attributes in the sentence:

- *Janův příjezd domů* Jan's arrival home
- *svoboda projevu* freedom of expression
- *právo shromažďovat se/na svobodu projevu* right to gather/for freedom of expression

1.1.1.3 Adjectives

The syntactic category of adjectives is **A**, and they belong to several types. In the lexicon, the type is an attribute in the syntactic structure (syn type) with the following values:

plain The 'real' adjectives describing properties of other objects.

vact Verbal active adjectives—or long active participles, like *dělající* (doing), *píšící* (writing), etc.

vpass Verbal passive adjectives—or long passive participles, like *dělaný* (being done), *psaný* (written), etc.

aposs Possesive adjectives derived from nouns: *otcův* (father's), *matčin* (mother's).

The plain and verbal active adjectives can be reflexive and they can have a frame. Their frames are very similar to those of verbs; they only do not contain **Subject**. The verbal passive adjectives cannot be reflexive, but they can have a frame. The frames of both the active and passive verbal adjectives can be derived from the corresponding verb frame—the frame of the active adjective from the active frame, and the frame of passive adjective from the passive frame by deleting the subject.

1.1.1.4 Pronouns

Pronouns do not have a syntactic category of their own; they are either nouns or adjectives. They have, however, syntactic type which differentiate them from these two categories.

1.1.1.5 Numerals

Numerals have the syntactic category **Num**, but only some of words traditionally categorized as numerals bear this category. The others are nouns or adjectives or adverbs. Like pronouns, they have syntactic type.

---

[1] For the verbs that can be passivized, we only list the types of passive construction, as these constructions can be derived after an algorithm described in [Skoumalová (1998)].

1.1.1.6 Adverbs

The syntactic category of adverbs is **Ad**. The adverbs can have syntactic type which determines the type of a deictic adverb (i.e. adverbial pronouns) like *kde* (where), *tam* (there), etc. Beside the type they also have an attribute called `syn sem`. This attribute determines the semantics of the adverb, which is necessary for analysis/generation of adverbials (free modifications).

1.1.1.7 Prepositions

Prepositions have the syntactic category **Prep** and two more syntactic attributes: `syn case` determines the case of following noun phrase and `syn sem` determines the semantics of the whole prepositional phrase. This semantic information is again used for generation of free modifications.

1.1.1.8 Conjunctions

Conjunctions have the syntactic category **Conj** and their syntactic type is **subord**, **coord** or **coord+aux**. The last value occurs at the conjunctions *aby* and *kdyby*, which are in fact contracted forms of a conjunction and the auxiliary verb *být* (to be) in conditional.

1.1.1.9 Particles and Interjections

These two classes have only the syntactic category **Part** and **Interj**, respectively, and they do not have any other attributes.

1.1.2 Current state of the Czech lexicon

In the first stage of the project we were using the original DRAFTER lexicons, in which we made only minor changes: we translated the base forms to Czech, we added the morphology where necessary, but in the `features` list we only changed the morphological forms. Example of several entries:

```
(LEXICAL-ITEM
    :NAME   SPUSTIT
    :SPELLING   "spustit"
    :FEATURES (DO-VERB EFFECTIVE-VERB DISPOSAL-VERB IRR
          UNITARYSPELLING INFLECTABLE
          VERB PASTPARTCIPLEFORM
          FIRSTSINGULARFORM SECONDSINGULARFORM THIRDSINGULARFORM
          FIRSTPLURALFORM SECONDPLURALFORM THIRDPLURALFORM)
    :PROPERTIES   ((PASTPARTICIPLEFORM "spustil")
                   (FIRSTSINGULARFORM "spustím")
                   (SECONDSINGULARFORM "spustíš")
                   (THIRDSINGULARFORM "spustí")
                   (FIRSTPLURALFORM "spustíme")
                   (SECONDPLURALFORM "spustíte")
                   (PLURALFORM "spustí")))
```

```
(LEXICAL-ITEM
    :NAME   snadny
    :SPELLING   "snadný"
    :FEATURES (ADJECTIVE DEGREE-ADJ IRR
               COMPARATIVEFORM SUPERLATIVEFORM)
    :PROPERTIES ((COMPARATIVEFORM "snazší")
               (SUPERLATIVEFORM "nejsnazší"))
)

(LEXICAL-ITEM
    :NAME   BOD
    :SPELLING   "bod"
    :FEATURES   (OUTCLASSIFY-PROPERNOUN NOUN COMMON-NOUN COUNTABLES
          IRR PLURALFORM)
    :PROPERTIES ((PLURALFORM "body")))
```

1.3 Russian

1.3.1 The structure of a lexical item

The complete specification of information to be included in the lexical entry in the Russian lexicon is relatively limited in the Initial Demonstrator. Now it includes basic classification features which are used by the Russian grammar, as well as morphological information which conforms to the elaborate classification system for Russian morphology developed by Zaliznjak [Zaliznjak (1977)]. The structure of morphological information is described in [Sharoff (1998)].

A typical lexical item in the Russian lexicon includes the following slots: name, spelling, fetures, properties, sample-sentence and comments, for example:

```
(LEXICAL-ITEM
   :NAME   IMYA
   :FEATURES   (NOUN COMMON-NOUN)
   :SAMPLE-SENTENCE   "imya fajla (risunka)"
   :PROPERTIES   (("им" "имен")  (с 8 а))
   :COMMENTS   "the file (drawing) name"
)
```

1.1.1.1 Name

This slot contains an identifier of a lexical item. This value is referred by SPL `:lex` keywords and lexify statements in the grammar. Two special names are: `&-LINKER` (for a comma) and `ELLIPSISZERO` (for items without lexical realization, such as *a/the* articles of English in the Russian grammar).

1.1.1.2 Spelling

This slot is not currently used in the Russian grammar, if an external morphological module is loaded.

1.1.1.3 Features

This slot contains features, which are used by the Russian grammar. For the purposes of the Initial Demonstrator it has a very restricted set of values. Basically, for nouns it is filled with features `(NOUN COMMON-NOUN)`, for verbs — `(VERB DO-VERB EFFECTIVE-VERB DISPOSAL-VERB)`.

1.1.1.4 Properties

For the purposes of the Initial Demonstrator this slot contains a string with morphological information: the list of stems and the morphological index of a lexical item. The list of stems provides data for selection between different types of stems in the case of stem alternation, for example, in the case of verbs, infinitival and personal stems are listed in the lexical item, in order to conform with the requirements of the external morphological module.The morphological index consists of a specifying string, a numerical class of declension or conjugation, an alternation mark, an accentuation index and additional features. This structure is described in greater detail in [Sharoff (1998)].

1.1.1.5 Sample-sentence

This slot contains a context in which this item occurs in Russian sentences.

1.1.1.6 Comment

This slot contains an English sentence which corresponds to the Russian sentence shown in the sample-sentence slot.

5. Conclusion

For every language involved in the project, there are suitable resources that can be used for the morphological analysis. In the next stage of the project it is necessary to create the interface between the existing resources and KPML (for Bulgarian and Czech) and to refine the lexical features of single entries.

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Appendix A: Content of the Bulgarian lexicon

```
(LEXICAL-ITEM
    :NAME   CENTRIRANE-NONDET
    :SPELLING   "centrirane"
    :FEATURES (OUTCLASSIFY-PROPERNOUN NOUN COMMON-NOUN COUNTABLES)
    :EDITOR   "DOCHEV")

(LEXICAL-ITEM
    :NAME   CHERTANE
    :SPELLING   "chertane"
    :FEATURES   (OUTCLASSIFY-PROPERNOUN NOUN COMMON-NOUN COUNTABLES)
    :EDITOR   "DOCHEV")

(LEXICAL-ITEM
    :NAME   CHETVARTI
    :SPELLING   "chetvartata"
    :FEATURES   (ARABICPROP ORDINAL)
    :PROPERTIES   ((ARABICPROP 4))
    :EDITOR   " KAMENKA")

(LEXICAL-ITEM
    :NAME   CHISLO
    :SPELLING   "chislo"
    :FEATURES (OUTCLASSIFY-PROPERNOUN NOUN COMMON-NOUN COUNTABLEES)
    :EDITOR   "DOCHEV")

 (LEXICAL-ITEM
    :NAME   DEVETI
    :SPELLING   "devetata"
    :FEATURES   (ARABICPROP ORDINAL)
    :PROPERTIES   ((ARABICPROP 1))
    :EDITOR   " KAMENKA")

(LEXICAL-ITEM
    :NAME   DOLNO
    :SPELLING   "dolno"
    :SAMPLE-SENTENCE   "dolno podravniavane"
    :FEATURES   (NOT-PREDICATEONLY NONE-OF-SIZE-PROVENANCE-MATERIAL-
       COLOUR-AGE INTRINSIC DEGREE-ADJ MORE-MOST NOT-CASEPREPOSITIONS
       ADJECTIVE)
```

```
    :EDITOR   "NEVENA")

 (LEXICAL-ITEM
    :NAME   FUNKTSIONALEN
    :SPELLING   "funktsionalnija"
    :SAMPLE-SENTENCE   "funktsionalen red"
    :FEATURES   (NOT-PREDICATEONLY NONE-OF-SIZE-PROVENANCE-MATERIAL-
       COLOUR-AGE INTRINSIC DEGREE-ADJ MORE-MOST NOT-CASEPREPOSITIONS
                        ADJECTIVE)
    :EDITOR   "DOCHEV")

(LEXICAL-ITEM
    :NAME   GORNO
    :SPELLING   "gorno"
    :SAMPLE-SENTENCE   "gorno podravniavane"
    :FEATURES   (NOT-PREDICATEONLY NONE-OF-SIZE-PROVENANCE-MATERIAL-
       COLOUR-AGE INTRINSIC DEGREE-ADJ MORE-MOST NOT-CASEPREPOSITIONS
                        ADJECTIVE)
    :EDITOR   " NEVENA ")

(LEXICAL-ITEM
    :NAME   I
    :SPELLING   "i"
    :SAMPLE-SENTENCE   "Izberete A I izberete B"
    :FEATURES   (SENTENCECONJUNCTION ADDITIVE CONJUNCT NOT-
                         PUNCTUATION NOT-SUBORDINATOR LINKER)
    :EDITOR   "NEVENA")

(LEXICAL-ITEM
    :NAME   ILI
    :SPELLING   "ili"
    :SAMPLE-SENTENCE   "Bjalo ili cherno?"
    :FEATURES   (SENTENCECONJUNCTION ADDITIVE CONJUNCT NOT-
                        PUNCTUATION NOT-SUBORDINATOR LINKER)
    :EDITOR   "NEVENA")

(LEXICAL-ITEM
    :NAME   i-LINKER
    :SPELLING   "i"
    :SAMPLE-SENTENCE   " Vavedete s i mashtab "
    :FEATURES   (PUNCTUATION SENTENCECONJUNCTION ADDITIVE CONJUNCT
                         NOT-SUBORDINATOR LINKER)
```

```
      :EDITOR   "Nevena")

   (LEXICAL-ITEM
      :NAME   IME-DET
      :SPELLING   "imeto"
      :FEATURES   (OUTCLASSIFY-PROPERNOUN NOUN COMMON-NOUN COUNTABLEES)
      :EDITOR   "DOCHEV")

   (LEXICAL-ITEM
      :NAME   IZBIRAM
      :SPELLING   "izberete"
      :FEATURES   (DO-VERB EFFECTIVE-VERB DISPOSAL-VERB)
      :EDITOR   "DOCHEV")

   (LEXICAL-ITEM
      :NAME   KAM
      :SPELLING   "kam"
      :SAMPLE-SENTENCE   "kam sredata"
      :FEATURES   (NOT-OBJECTNOTREQUIRED NOT-PPOBJECT LOCATION-VERB
                           PREPOSITION)
      :EDITOR   "Nevena")

   (LEXICAL-ITEM
      :NAME   KATO
      :SPELLING   "kato"
      :SAMPLE-SENTENCE   "..kato natisnete.."
      :FEATURES   (NONE-OF-LOCATION-CONCESSION-MATTER-PURPOSE-ROLE-
                           REASON PREPOSITION)
      :EDITOR   "Nevena")

   (LEXICAL-ITEM
      :NAME   KOMANDA
      :SPELLING   "komandata"
      :FEATURES      (OUTCLASSIFY-PROPERNOUN  NOUN  COMMON-NOUN  COUNTABLES
DEFART)
      :EDITOR   "DOCHEV")

   (LEXICAL-ITEM
      :NAME   KOMANDEN
      :SPELLING   "komandnija"
      :FEATURES   (OUTCLASSIFY-DEGREE-ADJ)
      :EDITOR   "DOCHEV")
```

```
(LEXICAL-ITEM
    :NAME   KRAEN
    :SPELLING   "krainata"
    :FEATURES   (ARABICPROP ORDINAL)
    :PROPERTIES   ((ARABICPROP 1))
    :EDITOR   "DOCHEV")

(LEXICAL-ITEM
    :NAME   LINIA
    :SPELLING   "linia"
    :FEATURES   (PLURALFORM IRR NONE-OF-THATCOMP-TYPIC NONSUBSTITUTE
                        COUNTABLE NOT-NOMINALIZATION COMMON-NOUN NOUN)
    :PROPERTIES   ((PLURALFORM "linii"))
    :EDITOR   "DOCHEV")

(LEXICAL-ITEM
    :NAME   LINIATA
    :SPELLING   "liniata"
    :FEATURES   (OUTCLASSIFY-PROPERNOUN NOUN COMMON-NOUN COUNTABLEES)
    :EDITOR   "DOCHEV")

(LEXICAL-ITEM
    :NAME   MASTAB
    :SPELLING   "mastaba"
    :FEATURES   (OUTCLASSIFY-PROPERNOUN NOUN COMMON-NOUN COUNTABLEES)
    :EDITOR   "DOCHEV")

(LEXICAL-ITEM
    :NAME   MASTAB-NONDET
    :SPELLING   "mastab"
    :FEATURES   (OUTCLASSIFY-PROPERNOUN NOUN COMMON-NOUN COUNTABLEES)
    :EDITOR   "DOCHEV")

(LEXICAL-ITEM
    :NAME   MENU
    :SPELLING   "menu"
    :FEATURES  (OUTCLASSIFY-PROPERNOUN NOUN COMMON-NOUN COUNTABLEES))

(LEXICAL-ITEM
    :NAME   MLINE
    :SPELLING   "MLINE"
```

```
    :FEATURES   (NOUN NOUN))

(LEXICAL-ITEM
    :NAME   MULTILINE
    :SPELLING   "MULTILINE"
    :FEATURES   (NOUN NOUN))

(LEXICAL-ITEM
    :NAME   MULTILINIA
    :SPELLING   "multiliniata"
    :FEATURES   (OUTCLASSIFY-PROPERNOUN NOUN COMMON-NOUN COUNTABLEES)
    :EDITOR   "DOCHEV")

(LEXICAL-ITEM
    :NAME   MULTILINIA-NONDET
    :SPELLING   "multilinia"
    :FEATURES   (OUTCLASSIFY-PROPERNOUN NOUN COMMON-NOUN COUNTABLEES)
    :EDITOR   "DOCHEV")

(LEXICAL-ITEM
    :NAME   NA
    :SPELLING   "na"
    :SAMPLE-SENTENCE   "here is a synopsis of our findings."
    :FEATURES   (MATTER-VERB PREPOSITION)
    :EDITOR   "NEVENA")

(LEXICAL-ITEM
    :NAME   NATISKAM
    :SPELLING   "natisnete"
    :FEATURES   (DO-VERB EFFECTIVE-VERB DISPOSAL-VERB)
    :EDITOR   "DOCHEV")

 (LEXICAL-ITEM
    :NAME   OSMI
    :SPELLING   "osmata"
    :FEATURES   (ARABICPROP ORDINAL)
    :PROPERTIES   ((ARABICPROP 1))
    :EDITOR   "KAMENKA")

(LEXICAL-ITEM
    :NAME   OTGORE
    :SPELLING   "otgore"
```

```
    :SAMPLE-SENTENCE   "OTGORE NA LINIJATA"
    :FEATURES   (OBJECTNOTREQUIRED PPOBJECT LOCATION-VERB PREPOSITION)
    :EDITOR   "Nevena")

(LEXICAL-ITEM
    :NAME   OTDOLU
    :SPELLING   "otdolu"
    :SAMPLE-SENTENCE   "OTDOLU NA LINIJATA"
    :FEATURES   (OBJECTNOTREQUIRED PPOBJECT LOCATION-VERB PREPOSITION)
    :EDITOR   "Nevena")

(LEXICAL-ITEM
    :NAME   POSLE
    :SPELLING   "sled tova"
    :SAMPLE-SENTENCE   "Sled tova izberete..."
    :FEATURES   (NOT-SENTENCECONJUNCTION CAUSAL CONJUNCTIVE NOT-
                      PUNCTUATION NOT-SUBORDINATOR LINKER)
    :EDITOR   "Nevena")

(LEXICAL-ITEM
    :NAME   PARVI
    :SPELLING   "parvata"
    :FEATURES   (ARABICPROP ORDINAL)
    :PROPERTIES   ((ARABICPROP 1))
    :EDITOR   " KAMENKA")

(LEXICAL-ITEM
    :NAME   PETI
    :SPELLING   "petata"
    :FEATURES   (ARABICPROP ORDINAL)
    :PROPERTIES   ((ARABICPROP 5))
    :EDITOR   "Dochev")

(LEXICAL-ITEM
    :NAME   PLAVASHTO
    :SPELLING   "plavashtoto"
    :SAMPLE-SENTENCE   "plavashtoto menu"
    :FEATURES   (NOT-PREDICATEONLY NONE-OF-SIZE-PROVENANCE-MATERIAL-
       COLOUR-AGE INTRINSIC DEGREE-ADJ MORE-MOST NOT-CASEPREPOSITIONS
                        ADJECTIVE)
    :EDITOR   "DOCHEV")
```

```
(LEXICAL-ITEM
    :NAME   PLINE
    :SPELLING   "PLINE"
    :FEATURES   (NOUN NOUN))

(LEXICAL-ITEM
    :NAME   PODRAVNIAVAM
    :SPELLING   "podravnite"
    :FEATURES   (DO-VERB EFFECTIVE-VERB DISPOSAL-VERB)
    :EDITOR   "Dochev")

(LEXICAL-ITEM
    :NAME   PODRAVNIAVANE
    :SPELLING   "podravniavaneto"
    :FEATURES   (OUTCLASSIFY-PROPERNOUN NOUN COMMON-NOUN COUNTABLES)
    :EDITOR   "Dochev")

(LEXICAL-ITEM
    :NAME   PODRAVNIAVANE-NONDET
    :SPELLING   "podravniavane"
    :FEATURES   (OUTCLASSIFY-PROPERNOUN NOUN COMMON-NOUN COUNTABLES)
    :EDITOR   "Dochev")

(LEXICAL-ITEM
    :NAME   POIAVIAVAM-SE
    :SPELLING   "se poiavi"
    :FEATURES   (DO-VERB EFFECTIVE-VERB DISPOSAL-VERB)
    :PROPERTIES   ((IMPERATIVE "se poiavi"))
    :EDITOR   "Dochev")

(LEXICAL-ITEM
    :NAME   POJAVJAVA-SE
    :SPELLING   "se pojavjava"
    :FEATURES   (DO-VERB EFFECTIVE-VERB DISPOSAL-VERB)
    :PROPERTIES   ((IMPERATIVE "se poiavi"))
    :EDITOR   "Dochev")

(LEXICAL-ITEM
    :NAME   POLILINIA
    :SPELLING   "poliliniata"
    :FEATURES   (OUTCLASSIFY-PROPERNOUN NOUN COMMON-NOUN COUNTABLEES)
    :EDITOR   "Dochev")
```

```
(LEXICAL-ITEM
    :NAME   POLILINIA-NONDET
    :SPELLING   "polilinia"
    :FEATURES   (OUTCLASSIFY-PROPERNOUN NOUN COMMON-NOUN COUNTABLEES)
    :EDITOR   "Dochev")

(LEXICAL-ITEM
    :NAME   POLYLINE
    :SPELLING   "POLYLINE"
    :FEATURES   (NOUN NOUN))

(LEXICAL-ITEM
    :NAME   PROMENIAM
    :SPELLING   "promenite"
    :FEATURES   (DO-VERB EFFECTIVE-VERB DISPOSAL-VERB)
    :EDITOR   "Dochev")

(LEXICAL-ITEM
    :NAME   PROZOREC
    :SPELLING   "prozorets"
    :FEATURES   (OUTCLASSIFY-PROPERNOUN NOUN COMMON-NOUN COUNTABLEES)
    :EDITOR   "Dochev")

(LEXICAL-ITEM
    :NAME   RETURN
    :SPELLING   "Return"
    :FEATURES   (NOUN PROPER-NOUN))

(LEXICAL-ITEM
    :NAME   RED
    :SPELLING   "red"
    :FEATURES   (OUTCLASSIFY-PROPERNOUN NOUN COMMON-NOUN COUNTABLES)
    :EDITOR  "Dochev")

(LEXICAL-ITEM
    :NAME   SAVE
    :SPELLING   "save"
    :FEATURES   (DO-VERB EFFECTIVE-VERB DISPOSAL-VERB S-D))

(LEXICAL-ITEM
    :NAME   SAVE-DRAWING-AS
```

```
    :SPELLING   "Save Drawing As"
    :FEATURES   (NOUN NOUN))

(LEXICAL-ITEM
    :NAME   SCREEN-LIST
    :SPELLING   "list"
    :FEATURES   (OUTCLASSIFY-PROPERNOUN NOUN COMMON-NOUN COUNTABLEES))

(LEXICAL-ITEM
    :NAME   SEDMI
    :SPELLING   "sedmata"
    :FEATURES   (ARABICPROP ORDINAL)
    :PROPERTIES   ((ARABICPROP 1))
    :EDITOR   "Dochev")

(LEXICAL-ITEM
    :NAME   SEGA
    :SPELLING   "sega"
    :FEATURES   (ADVERB)
    :EDITOR   "Dochev")

(LEXICAL-ITEM
    :NAME   SELECT-FILE
    :SPELLING   "Select File"
    :FEATURES   (NOUN NOUN))

(LEXICAL-ITEM
    :NAME   SHESTI
    :SPELLING   "shestata"
    :FEATURES   (ARABICPROP ORDINAL)
    :PROPERTIES   ((ARABICPROP 1))
    :EDITOR   "Dochev")

(LEXICAL-ITEM
    :NAME   SPISAK
    :SPELLING   "spisaka"
    :FEATURES   (OUTCLASSIFY-PROPERNOUN NOUN COMMON-NOUN COUNTABLEES)
    :EDITOR   "Dochev")

(LEXICAL-ITEM
    :NAME   SREDA
    :SPELLING   "sredata"
```

```
    :SAMPLE-SENTENCE   ""
    :FEATURES   (OBJECTNOTREQUIRED PPOBJECT LOCATION-VERB
                        PREPOSITION)
    :EDITOR   "Nevena")

(LEXICAL-ITEM
    :NAME STARTIRAM
    :SPELLING "startiraite"
    :FEATURES (DO-VERB EFFECTIVE-VERB DISPOSAL-VERB)
    :EDITOR   "Dochev")

(LEXICAL-ITEM
    :NAME   STIL
    :SPELLING   "stila"
    :FEATURES   (OUTCLASSIFY-PROPERNOUN NOUN COMMON-NOUN COUNTABLEES)
    :EDITOR   "Dochev")

(LEXICAL-ITEM
    :NAME   TOCHKA
    :SPELLING   "tochka"
    :FEATURES   (OUTCLASSIFY-PROPERNOUN NOUN COMMON-NOUN COUNTABLES)
    :EDITOR   "Dochev")

(LEXICAL-ITEM
    :NAME TEKSTOV-NONFULLDET
    :SPELLING   "tekstovija"
    :FEATURES   (OUTCLASSIFY-PROPERNOUN NOUN COMMON-NOUN COUNTABLES)
    :EDITOR   "Dochev")

(LEXICAL-ITEM
    :NAME TEKSTOV-FULLDET
    :SPELLING   "tekstovijat"
    :FEATURES   (OUTCLASSIFY-PROPERNOUN NOUN COMMON-NOUN COUNTABLES)
    :EDITOR   "Dochev")

(LEXICAL-ITEM
    :NAME   TRETI
    :SPELLING   "tretata"
    :FEATURES   (ARABICPROP ORDINAL)
    :PROPERTIES   ((ARABICPROP 1))
    :EDITOR   "Kamenka")
```

```
(LEXICAL-ITEM
    :NAME   V
    :SPELLING   "v"
    :SAMPLE-SENTENCE   "v komandnija red"
    :FEATURES   (NOT-OBJECTNOTREQUIRED NOT-PPOBJECT LOCATION-VERB
                        PREPOSITION)
    :EDITOR   "NEVENA")

(LEXICAL-ITEM
    :NAME   VAVEJDAM
    :SPELLING   "vavedete"
    :FEATURES   (DO-VERB EFFECTIVE-VERB DISPOSAL-VERB)
    :EDITOR   "Kamenka")

(LEXICAL-ITEM
    :NAME   VTORI
    :SPELLING   "vtorata"
    :FEATURES   (ARABICPROP ORDINAL)
    :PROPERTIES   ((ARABICPROP 1))
    :EDITOR   "Kamenka")

(LEXICAL-ITEM
    :NAME   VID
    :SPELLING   "vida"
    :FEATURES   (OUTCLASSIFY-PROPERNOUN NOUN COMMON-NOUN COUNTABLEES)
    :EDITOR   "Kamenka")

(LEXICAL-ITEM
    :NAME   VIDPLDET
    :SPELLING   "vidovete"
    :FEATURES   (OUTCLASSIFY-PROPERNOUN NOUN COMMON-NOUN COUNTABLEES)
    :EDITOR   "Kamenka")

(LEXICAL-ITEM
    :NAME   ZADAVAM
    :SPELLING   "zadaite"
    :FEATURES   (DO-VERB EFFECTIVE-VERB DISPOSAL-VERB PASTFORM S-IRR)
    :PROPERTIES   ((PASTFORM "zadaite"))
    :EDITOR   "Kamenka")

(LEXICAL-ITEM
    :NAME   ZATVARJAM
```

```
    :SPELLING   "zatvorete"
    :FEATURES   (DO-VERB EFFECTIVE-VERB DISPOSAL-VERB)
    :EDITOR   "Kamenka")

(LEXICAL-ITEM
    :NAME   ZAVURSHVAM
    :SPELLING   "zavurshite"
    :FEATURES   (DO-VERB EFFECTIVE-VERB DISPOSAL-VERB)
    :EDITOR   "Kamenka")
```

Appendix B: Content of the Russian lexicon

```
(in-language :languages :RUSSIAN)

(LEXICAL-ITEM
    :NAME                    &-LINKER
    :SPELLING                ","
    :FEATURES                (PUNCTUATION SENTENCECONJUNCTION
   ADDITIVE CONJUNCT NOT-SUBORDINATOR LINKER)
    )

(LEXICAL-ITEM
   :NAME   CHETVERTYJ
   :SPELLING   " chetvertyj"
   :SAMPLE-SENTENCE   "Ukazite chetvjertuju tochku muljtilinii"
   :PROPERTIES   (("четверт")  (п 1 а))
)

(LEXICAL-ITEM
   :NAME   CHTOBY
   :SPELLING   "chtoby"
   :SAMPLE-SENTENCE   "Chtoby sokhranitj risunok"
   :PROPERTIES   (("чтобы")  (н))
   :COMMENTS   "To save a drawing"
)

(LEXICAL-ITEM
   :NAME   DEVJATYJ
   :SPELLING   " devjatyj"
   :SAMPLE-SENTENCE   "Ukazite devjatuju tochku muljtilinii"
   :PROPERTIES   (("девят")  (п 1 а))
)

(LEXICAL-ITEM
   :NAME   DIALOGOVYJ
   :SPELLING   " dialogovyj "
   :SAMPLE-SENTENCE   "v dialogovom okne"
   :PROPERTIES   (("диалогов")  (п 1 а))
   :COMMENTS   "in the L dialog box"
)

(LEXICAL-ITEM
   :NAME   EDINITSHNYJ
   :SPELLING   " edinichnyj"
   :SAMPLE-SENTENCE   "L sozdaet edinichnyj ili mnozhestvennye
   linejnye segmenty, yavlyayushchiesya otdeljnymi ob~ektami "
   :FEATURES   (IMPERFECT VERB DO-VERB EFFECTIVE-VERB DISPOSAL-
   VERB)
   :PROPERTIES   (("единичн")  (п 1 а))
   :COMMENTS   "L creates single or multiple line segments that
   are separate objects"
)

(LEXICAL-ITEM
   :NAME   ELLIPSISZERO
)

(LEXICAL-ITEM
```

```
   :NAME   GRANICHNYJ
   :SPELLING   " granichnyj "
   :SAMPLE-SENTENCE   "Ukazhite granichnuyu tochku"
   :PROPERTIES   (("граничн")  (п 1 а))
   :COMMENTS   "Specify the endpoint"
)

(LEXICAL-ITEM
   :NAME   I
   :SPELLING   "i"
   :PROPERTIES   (("и")  (н))
   :COMMENTS   "and"
)

(LEXICAL-ITEM
   :NAME   ILI
   :SPELLING   "ili"
   :PROPERTIES   (("или")  (н))
   :COMMENTS   "or"
)

(LEXICAL-ITEM
   :NAME   IMYA
   :SPELLING   " imya "
   :SAMPLE-SENTENCE   "imya fajla (risunka)"
   :PROPERTIES   (("им" "имен")  (с 8 а))
   :COMMENTS   "the file (drawing) name"
)

(LEXICAL-ITEM
   :NAME   INSTRUMENT
   :SPELLING   " instrument "
   :SAMPLE-SENTENCE   "v palitre L na paneli instrumentov L
   nazhmite knopku L"
   :PROPERTIES   (("инструмент")  (м 1 а))
   :COMMENTS   "From the L flyout on the L toolbar, choose L"
)

(LEXICAL-ITEM
   :NAME   EKRAN
   :SPELLING   "ekran"
   :SAMPLE-SENTENCE   "Na ekrane pojavitsja okno"
   :PROPERTIES   (("экран")  (м 1 а))
   :COMMENTS   "Window appears"
)

(LEXICAL-ITEM
   :NAME   IZMENITJ
   :SPELLING   "IZMENITJ"
   :FEATURES   (DO-VERB EFFECTIVE-VERB DISPOSAL-VERB)
   :PROPERTIES   (("измени" "измен")  (св 4 А))
)

(LEXICAL-ITEM
   :NAME   JAVLJATJCJA
   :SPELLING   " yavlyatjsya"
   :SAMPLE-SENTENCE   "kotorye yavlyayutsya otdeljnymi ob~ektami"
   :FEATURES   (IMPERFECT)
   :PROPERTIES   (("явля")  (нсв 1 А -ся))
```

```
   :COMMENTS   "that are separate objects"
)

(LEXICAL-ITEM
   :NAME   KAZHDYJ
   :SPELLING   " kazhdyj "
   :SAMPLE-SENTENCE   "ukazhite granichnuyu tochku kazhdogo
   slozhnogo segmenta"
   :PROPERTIES   (("кажд")  (п 1 а))
   :COMMENTS   "specify the endpoint of each polyline segment"
)

(LEXICAL-ITEM
   :NAME   KLAVISHA
   :SPELLING   " klavisha "
   :SAMPLE-SENTENCE   "nazhmite klavishu o dlya raboty s
   ob~ektom"
   :PROPERTIES   (("клавиш")  (ж 5 А))
   :COMMENTS   "Enter o for Object"
)

(LEXICAL-ITEM
   :NAME   KNOPKA
   :SPELLING   " knopka "
   :SAMPLE-SENTENCE   "nazhmite knopku OK"
   :PROPERTIES   (("кнопк")  (ж 3 А))
   :COMMENTS   "choose OK"
)

(LEXICAL-ITEM
   :NAME   KOMANDA
   :SPELLING   "komand"
   :SAMPLE-SENTENCE   "zapustite komandu L"
   :PROPERTIES   (("команд")  (ж 1 А))
   :COMMENTS   "start the L command"
)

(LEXICAL-ITEM
   :NAME   KOMBINATSIJA
   :SPELLING   " kombinatsiya"
   :SAMPLE-SENTENCE   "chtoby narisovatj kombinatsiyu linii s
   krivoj"
   :PROPERTIES   (("комбинаци")  (ж 7 А))
   :COMMENTS   "to draw a line and arc combination polyline"
)

(LEXICAL-ITEM
   :NAME   KONECHNYJ
   :SPELLING   "KONECHNYJ"
   :PROPERTIES   (("конечн")  (п 1 а))
   :COMMENTS   "endpoint"
)

(LEXICAL-ITEM
   :NAME   KRIVAJA
   :SPELLING   " krivaya"
   :SAMPLE-SENTENCE   "slozhnaya krivaya"
   :PROPERTIES   (("крив")  (п 1 В))
   :COMMENTS   "polyline"
```

```
)

(LEXICAL-ITEM
   :NAME   LINEJNYJ
   :SPELLING   "linejnyj "
   :SAMPLE-SENTENCE   "poslednij linejnyj segment"
   :PROPERTIES   (("линейн")  (п 1 а))
   :COMMENTS   " the previous line segment"
)

(LEXICAL-ITEM
   :NAME   LINIYA
   :SPELLING   " liniya "
   :SAMPLE-SENTENCE   "Chtoby narisovatj liniyu"
   :PROPERTIES   (("лини")  (ж 7 А))
   :COMMENTS   "To draw a line"
)

(LEXICAL-ITEM
   :NAME   MASSHTAB
   :SPELLING   "MASSHTAB"
   :FEATURES   (OUTCLASSIFY-PROPERNOUN NOUN COMMON-NOUN
   COUNTABLE)
   :PROPERTIES   (("масштаб") (м 1 А))
)

(LEXICAL-ITEM
   :NAME   MENJU
   :SPELLING   " menyu"
   :SAMPLE-SENTENCE   "vybratj v menyu"
   :PROPERTIES   (("меню")  (с 0 А))
   :COMMENTS   "choose from the File menu"
)

(LEXICAL-ITEM
   :NAME   MNOZHESTVENNYJ
   :SPELLING   " mnozhestvennyj"
   :SAMPLE-SENTENCE   "L sozdaet edinichnyj ili mnozhestvennye
   linejnye segmenty, yavlyayushchiesya otdeljnymi ob~ektami "
   :FEATURES   (IMPERFECT VERB DO-VERB EFFECTIVE-VERB DISPOSAL-
   VERB)
   :PROPERTIES   (("множественн")  (п 1 а))
   :COMMENTS   "L creates single or multiple line segments that
   are separate objects"
)

(LEXICAL-ITEM
   :NAME   MOZHNO
   :SPELLING   " mozhno"
   :SAMPLE-SENTENCE   "Mozhno nachatj novuyu liniyu v granichnoj
   tochke poslednego narisovannogo segmenta povtornym zapuskom
   komandy L"
   :PROPERTIES   (("можно")  (н))
   :COMMENTS   "You can start a new line at the endpoint of the
   last line drawn by starting the L command again"
)

(LEXICAL-ITEM
   :NAME   MULJTILINIYA
```

```
   :SPELLING   " muljtiliniya"
   :SAMPLE-SENTENCE   "Ukazite pervuju tochku muljtilinii"
   :FEATURES   (OUTCLASSIFY-PROPERNOUN NOUN COMMON-NOUN)
   :PROPERTIES   (("мультилини") (ж 7 а))
)

(LEXICAL-ITEM
   :NAME   NA
   :SPELLING   " na"
   :SAMPLE-SENTENCE   "na ehkrane"
   :PROPERTIES   (("на")  (н))
   :COMMENTS   "=0"
)

(LEXICAL-ITEM
   :NAME   NACHALJNYJ
   :SPELLING   " nachaljnyj "
   :SAMPLE-SENTENCE   "Ukazhite nachaljnuyu tochku"
   :PROPERTIES   (("начальн")  (п 1 а))
   :COMMENTS   "Specify the start point"
)

(LEXICAL-ITEM
   :NAME   NARISOVATJ
   :SPELLING   " narisovatj"
   :SAMPLE-SENTENCE   "Chtoby narisovatj liniyu; Mozhno nachatj
   novuyu liniyu v granichnoj tochke poslednego narisovannogo
   segmenta povtornym zapuskom komandy L"
   :FEATURES   (PERFECT VERB DO-VERB EFFECTIVE-VERB DISPOSAL-
   VERB)
   :PROPERTIES   (("нарисова" "нарису")  (св 2 А))
   :COMMENTS   "To draw a line; You can start a new line at the
   endpoint of the last line drawn by starting the L command
   again"
)

(LEXICAL-ITEM
   :NAME   NATSHATJ
   :SPELLING   " nachatj"
   :SAMPLE-SENTENCE   "Mozhno nachatj novuyu liniyu v granichnoj
   tochke poslednego narisovannogo segmenta povtornym zapuskom
   komandy L"
   :FEATURES   (PERFECT)
   :PROPERTIES   (("нача" "начн")  (св 14 В -н-))
   :COMMENTS   "You can start a new line at the endpoint of the
   last line drawn by starting the L command again"
)

(LEXICAL-ITEM
   :NAME   NAZHATIE
   :SPELLING   " nazhatie "
   :SAMPLE-SENTENCE   "nazhatiem klavishi L v nachaljnoj tochke"
   :FEATURES   (PERFECT VERB DO-VERB EFFECTIVE-VERB DISPOSAL-
   VERB)
   :PROPERTIES   (("нажати")  (с 7 а))
   :COMMENTS   "choose OK; and pressing L at the start point
   prompt"
)
```

```
(LEXICAL-ITEM
   :NAME   NAZHATJ
   :SPELLING   " nazhatj "
   :SAMPLE-SENTENCE   "nazhmite knopku OK"
   :FEATURES   (PERFECT VERB DO-VERB EFFECTIVE-VERB DISPOSAL-
   VERB)
   :PROPERTIES   (("нажа" "нажм")  (св 14 в -м-))
   :COMMENTS   "choose OK; and pressing L at the start point
   prompt"
)

(LEXICAL-ITEM
   :NAME   NOVYJ
   :SPELLING   " novyj"
   :SAMPLE-SENTENCE   "Mozhno nachatj novuyu liniyu v granichnoj
   tochke poslednego narisovannogo segmenta povtornym zapuskom
   komandy L"
   :PROPERTIES   (("нов")  (п 1 а))
   :COMMENTS   "You can start a new line at the endpoint of the
   last line drawn by starting the L command again"
)

(LEXICAL-ITEM
   :NAME   OBLASTJ
   :SPELLING   " oblastj"
   :SAMPLE-SENTENCE   "Chtoby vychislitj oblastj ob~ekta"
   :PROPERTIES   (("област")  (ж 8 а))
   :COMMENTS   "To calculate the area of an object "
)

(LEXICAL-ITEM
   :NAME   OB~EKT
   :SPELLING   " ob~ekt "
   :SAMPLE-SENTENCE   "Chtoby vychislitj oblastj ob~ekta"
   :PROPERTIES   (("объект")  (м 1 а))
   :COMMENTS   "To calculate the area of an object "
)

(LEXICAL-ITEM
   :NAME   ODIN
   :SPELLING   " odin"
   :SAMPLE-SENTENCE   "Zapustite komandu L, vospoljzovavshisj
   odnim iz sleduyushchikh sposobov"
   :PROPERTIES   (("одн" "один")  (п-мс 3 а))
   :COMMENTS   "... using one of these methods"
)

(LEXICAL-ITEM
   :NAME   OKNO
   :SPELLING   " okno"
   :SAMPLE-SENTENCE   "v dialogovom okne"
   :PROPERTIES   (("окн" "окон") (с 1 * а))
   :COMMENTS   "in the L dialog box"
)

(LEXICAL-ITEM
   :NAME   OTDELJNYJ
   :SPELLING   " otdeljnyj"
   :SAMPLE-SENTENCE   "kotorye yavlyayutsya otdeljnymi ob~ektami"
```

```
   :PROPERTIES   (("отдельн")  (п 1 а))
   :COMMENTS   "that are separate objects"
)

(LEXICAL-ITEM
   :NAME   OTKRYTJ
   :SPELLING   " otkrytj"
   :SAMPLE-SENTENCE   "chtoby otkrytj risunok"
   :FEATURES   (PERFECT VERB DO-VERB EFFECTIVE-VERB DISPOSAL-
   VERB)
   :PROPERTIES   (("откры" "откро")  (св 12 а))
   :COMMENTS   "to open a drawing"
)

(LEXICAL-ITEM
   :NAME   OTMENITJ
   :SPELLING   " otmenitj "
   :SAMPLE-SENTENCE   "Chtoby otmenitj (udalitj, steretj)
   poslednij linejnyj (pryamoj) segment"
   :FEATURES   (PERFECT VERB DO-VERB EFFECTIVE-VERB DISPOSAL-
   VERB)
   :PROPERTIES   (("отмени" "отмен")  (св 4 а))
   :COMMENTS   "To undo the previous line segment"
)

(LEXICAL-ITEM
   :NAME   PALITRA
   :SPELLING   " palitra "
   :SAMPLE-SENTENCE   "v palitre L na paneli instrumentov L
   nazhmite knopku L"
   :PROPERTIES   (("палитр")  (ж 1 а))
   :COMMENTS   "From the L flyout on the L toolbar, choose L"
)

(LEXICAL-ITEM
   :NAME   PANELJ
   :SPELLING   " panelj"
   :SAMPLE-SENTENCE   "v palitreL na paneli instrumentov L
   nazhmite knopku L"
   :PROPERTIES   (("панел")  (ж 8 а))
   :COMMENTS   "From the L flyout on the L toolbar, choose L"
)

(LEXICAL-ITEM
   :NAME   PARALLELJNYJ
   :SPELLING   " paralleljnyj "
   :SAMPLE-SENTENCE   "L sozdaet mnozhestvennye paralleljnye
   linii"
   :PROPERTIES   (("параллельн") (п 1 а))
   :COMMENTS   "L creates multiple parallel lines"
)

(LEXICAL-ITEM
   :NAME   PEREJTI
   :SPELLING   " perejti "
   :SAMPLE-SENTENCE   "chtoby perejti v rezhim L"
   :FEATURES   (PERFECT VERB)
   :PROPERTIES   (("перей" "перейд" "переше") (св 7 В (9)
(PAST-IRREG)))
```

```
   :COMMENTS   "to switch to L mode"
)

(LEXICAL-ITEM
   :NAME   PERVYJ
   :SPELLING   " pervyj "
   :SAMPLE-SENTENCE   "soedinyayushchej nachaljnuyu tochku
   pervogo segmenta i (s) granichnuyu tochki ... "
   :PROPERTIES   (("перв")  (п 1 а))
   :COMMENTS   "to connect the start point of the first segment
   with the endpoint of the last segment"
)

(LEXICAL-ITEM
   :NAME   POKAZATJ
   :FEATURES   (PERFECT VERB DO-VERB EFFECTIVE-VERB DISPOSAL-
   VERB)
   :PROPERTIES   (("показа" "покаж")  (св 4 а))
   :COMMENTS   "display"
)

(LEXICAL-ITEM
   :NAME   POLILINIYA
   :SPELLING   "poliliniya"
   :SAMPLE-SENTENCE   "poliliniya; ukazhite granichnuyu tochku
   kazhdoj polilinii"
   :PROPERTIES   (("полилини")  (ж 7 а))
   :COMMENTS   "polyline; specify the endpoint of each polyline
   segment"
)

(LEXICAL-ITEM
   :NAME   POSLEDNIJ
   :SPELLING   " poslednij "
   :SAMPLE-SENTENCE   "soedinyayushchej nachaljnuyu tochku
   pervogo segmenta i (s) granichnuyu tochki poslednego segmenta;
   poslednij linejnyj (pryamoj) segment"
   :PROPERTIES   (("последн")  (п 2 а))
   :COMMENTS   "to connect the start point of the first segment
   with the endpoint of the last segment; the previous line
   segment"
)

(LEXICAL-ITEM
   :NAME   POVTORNYJ
   :SPELLING   " povtornyj"
   :SAMPLE-SENTENCE   "Mozhno nachatj novuyu liniyu v granichnoj
   tochke poslednego narisovannogo segmenta povtornym zapuskom
   komandy L"
   :PROPERTIES   (("повторн")
 (п 1 а))
   :COMMENTS   "You can start a new line at the endpoint of the
   last line drawn by starting the L command again"
)

(LEXICAL-ITEM
   :NAME   POJAVITJSJA
   :SPELLING   "pojavitjsya"
   :SAMPLE-SENTENCE   "Na ehkrane poyavitsya dialogovoe okno"
```

```
   :FEATURES   (PERFECT VERB)
   :PROPERTIES   (("появи" "появл")  (св 4 в -ся))
   :COMMENTS   "The L dialog box appears"
)

(LEXICAL-ITEM
   :NAME   PRJAMOJ
   :SPELLING   " pryamoj"
   :SAMPLE-SENTENCE   "slozhnaya krivaya s pryamymi segmentami"
   :PROPERTIES   (("прям")  (п 1 в))
   :COMMENTS   "a polyline with straight segments"
)

(LEXICAL-ITEM
   :NAME   PUNKT
   :SPELLING   " punkt "
   :SAMPLE-SENTENCE   "vybrav punkt L v menyu L"
   :PROPERTIES   (("пункт")  (м 1 а))
   :COMMENTS   "=0"
)

(LEXICAL-ITEM
   :NAME   PYATYJ
   :SPELLING   " pyatyj"
   :SAMPLE-SENTENCE   "Ukazite pyatuju tochku muljtilinii"
   :PROPERTIES   (("пят")  (п 1 а))
)

(LEXICAL-ITEM
   :NAME   RABOTA
   :SPELLING   " rabota "
   :SAMPLE-SENTENCE   "nazhmite klavishu o dlya raboty s
   ob~ektom"
   :FEATURES   (VERB DO-VERB EFFECTIVE-VERB DISPOSAL-VERB)
   :PROPERTIES   (("работ")  (ж 1 а))
   :COMMENTS   "Enter o for Object"
)

(LEXICAL-ITEM
   :NAME   REZHIM
   :SPELLING   " rezhim "
   :SAMPLE-SENTENCE   "chtoby perejti v rezhim L"
   :PROPERTIES   (("режим")  (м 1 а))
   :COMMENTS   "to switch to L mode"
)

(LEXICAL-ITEM
   :NAME   RISOVANIE
   :SPELLING   " risovanie"
   :SAMPLE-SENTENCE   "chtoby zavershitj risovanie linii"
   :FEATURES   (VERB DO-VERB EFFECTIVE-VERB)
   :PROPERTIES   (("рисовани")  (с 7 а))
   :COMMENTS   "to complete the line"
)

(LEXICAL-ITEM
   :NAME   RISUNOK
   :SPELLING   " risunok "
   :SAMPLE-SENTENCE   "chtoby otkrytj (sokhranitj) risunok"
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   :PROPERTIES   (("рисунк" "рисунок")  (м 1 а))
   :COMMENTS   "a drawing"
)

(LEXICAL-ITEM
   :NAME   SEDJMOJ
   :SPELLING   " sedjmoj"
   :SAMPLE-SENTENCE   "Ukazite shestuju tochku muljtilinii"
   :PROPERTIES   (("седьм")  (п 1 В))
)

(LEXICAL-ITEM
   :NAME   SEGMENT
   :SPELLING   " segment "
   :SAMPLE-SENTENCE   "Ukazhite granichnuyu tochku sleduyushchego
   segmenta"
   :PROPERTIES   (("сегмент")  (м 1 а))
   :COMMENTS   "Specify the endpoint of the next segment"
)

(LEXICAL-ITEM
   :NAME   SHESTOJ
   :SPELLING   " shestoj"
   :SAMPLE-SENTENCE   "Ukazite shestuju tochku muljtilinii"
   :PROPERTIES   (("шест")  (п 1 В))
)

(LEXICAL-ITEM
   :NAME   SLEDUYUSHCHIJ
   :SPELLING   " sleduyushchij"
   :SAMPLE-SENTENCE   "Zapustite komandu L, vospoljzovavshisj
   odnim iz sleduyushchikh sposobov; Ukazhite granichnuyu tochku
   sleduyushchego segmenta"
   :PROPERTIES   (("следующ")  (п 2 а))
   :COMMENTS   "... using one of these methods; Specify the
   endpoint of the next segment"
)

(LEXICAL-ITEM
   :NAME   SNATSHALA
   :SPELLING   " snachala"
   :SAMPLE-SENTENCE   "Snachala narisujte linejnyj segment"
   :PROPERTIES   (("сначала")  (н))
   :COMMENTS   "First draw the line segment"
)

(LEXICAL-ITEM
   :NAME   SOEDINYATJ
   :SPELLING   " soedinyatj "
   :SAMPLE-SENTENCE   "soedinyayushchej nachaljnuyu ... i (s)
   granichnuyu tochki ... "
   :FEATURES   (IMPERFECT VERB DO-VERB EFFECTIVE-VERB DISPOSAL-
   VERB)
   :PROPERTIES   (("соединя")  (нсв 1 А))
   :COMMENTS   "to connect the start point of the first segment
   with the endpoint of the last segment"
)

(LEXICAL-ITEM
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   :NAME   SOKHRANITJ
   :SPELLING   " sokhranitj"
   :SAMPLE-SENTENCE   "Chtoby sokhranitj risunok"
   :FEATURES   (PERFECT VERB DO-VERB EFFECTIVE-VERB DISPOSAL-
   VERB)
   :PROPERTIES   (("сохрани" "сохран")  (св 4 А))
   :COMMENTS   "To save a drawing"
)

(LEXICAL-ITEM
   :NAME   SOZDAVATJ
   :SPELLING   " sozdavatj "
   :SAMPLE-SENTENCE   "L sozdaet edinstvennyj ili mnozhestvennye
   linejnye segmenty, yavlyayushchiesya otdeljnymi ob~ektami "
   :FEATURES   (IMPERFECT VERB DO-VERB EFFECTIVE-VERB DISPOSAL-
   VERB)
   :PROPERTIES   (("создава" "созда")  (нсв 14 А))
   :COMMENTS   "L creates single or multiple line segments that
   are separate objects"
)

(LEXICAL-ITEM
   :NAME   SPISOK
   :SPELLING   "spisok"
   :SAMPLE-SENTENCE   "Zapustite komandu L, vospoljzovavshisj
   odnim iz sleduyushchikh sposobov"
   :PROPERTIES   (("списк" "список")  (м 3 * а))
   :COMMENTS   "... using one of these methods"
)

(LEXICAL-ITEM
   :NAME   SPOSOB
   :SPELLING   " sposob "
   :SAMPLE-SENTENCE   "Zapustite komandu L, vospoljzovavshisj
   odnim iz sleduyushchikh sposobov"
   :PROPERTIES   (("способ")  (м 1 а))
   :COMMENTS   "... using one of these methods"
)

(LEXICAL-ITEM
   :NAME   STILJ
   :SPELLING   "stilj"
   :SAMPLE-SENTENCE   "Zapustite komandu L, vospoljzovavshisj
   odnim iz sleduyushchikh sposobov"
   :PROPERTIES   (("стил")  (м 2 а))
   :COMMENTS   "... using one of these methods"
)

(LEXICAL-ITEM
   :NAME   STROKA
   :SPELLING   "stroka"
   :SAMPLE-SENTENCE   "Ukazhite nachaljnuyu tochku"
   :PROPERTIES   (("строк")  (ж 3 а))
   :COMMENTS   "Specify the start point"
)

(LEXICAL-ITEM
   :NAME   TEPERJ
   :FEATURES   (PERFECT)
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   :PROPERTIES   (("теперь")  (н))
   :COMMENTS   "now"
)

(LEXICAL-ITEM
   :NAME   TOCHKA
   :SPELLING   " tochka "
   :SAMPLE-SENTENCE   "Ukazhite nachaljnuyu tochku"
   :PROPERTIES   (("точк" "точек")  (ж 3 * а))
   :COMMENTS   "Specify the start point"
)

(LEXICAL-ITEM
   :NAME   TRETIJ
   :SPELLING   " tretij"
   :SAMPLE-SENTENCE   "Ukazite tretjju tochku muljtilinii"
   :PROPERTIES   (("треть трет")  (п-мс 2 а))
)

(LEXICAL-ITEM
   :NAME   UKAZATJ
   :SPELLING   " ukazatj "
   :SAMPLE-SENTENCE   "Ukazhite nachaljnuyu tochku"
   :FEATURES   (PERFECT VERB DO-VERB EFFECTIVE-VERB DISPOSAL-
   VERB)
   :PROPERTIES   (("указа" "укаж")  (св 6 С))
   :COMMENTS   "Specify the start point"
)

(LEXICAL-ITEM
   :NAME   V
   :SPELLING   " v "
   :SAMPLE-SENTENCE   "vybratj v (spiske, menyu), v komande L"
   :FEATURES   (PERFECT)
   :PROPERTIES   (("в")  (н))
   :COMMENTS   "choose from the File menu, click on the file name
   in the L list; during the L command"
)

(LEXICAL-ITEM
   :NAME   VOSJMOJ
   :SPELLING   " vosjmoj"
   :SAMPLE-SENTENCE   "Ukazite shestuju tochku muljtilinii"
   :PROPERTIES   (("восьм")  (п 1 В))
)

 (LEXICAL-ITEM
   :NAME   VTOROJ
   :SPELLING   " vtoroj"
   :SAMPLE-SENTENCE   "Ukazite vtoruju tochku muljtilinii"
   :PROPERTIES   (("втор")  (п 1 В))
)

(LEXICAL-ITEM
   :NAME   VVESTI
   :SPELLING   "vvesti"
   :SAMPLE-SENTENCE   "vybratj (punkt, imya fajla) v (spiske,
   menyu), "
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   :FEATURES   (PERFECT VERB DO-VERB EFFECTIVE-VERB DISPOSAL-
   VERB)
   :PROPERTIES   (("ввес" "введ")  (св 7 А))
   :COMMENTS   "choose from the File menu; click on the file name
   in the L list; select an object"
)

(LEXICAL-ITEM
   :NAME   VYBRATJ
   :SPELLING   " vybratj "
   :SAMPLE-SENTENCE   "vybratj (punkt, imya fajla) v (spiske,
   menyu), "
   :FEATURES   (PERFECT VERB DO-VERB EFFECTIVE-VERB DISPOSAL-
   VERB)
   :PROPERTIES   (("выбра" "выбер")  (св 6 А))
   :COMMENTS   "choose from the File menu; click on the file name
   in the L list; select an object"
)

(LEXICAL-ITEM
   :NAME   VYRAVNIVANIJE
   :FEATURES   (NOUN)
   :PROPERTIES   (("выравнивани")  (с 7 А))
   :COMMENTS   "justification"
)

(LEXICAL-ITEM
   :NAME   VYROVNJATJ
   :FEATURES   (PERFECT VERB DO-VERB EFFECTIVE-VERB DISPOSAL-
   VERB)
   :PROPERTIES   (("выровня")  (св 1 А))
   :COMMENTS   "justify"
)

(LEXICAL-ITEM
   :NAME   VYTSHISLITJ
   :SPELLING   " vychislitj "
   :SAMPLE-SENTENCE   "Chtoby vychislitj oblastj ob~ekta"
   :FEATURES   (PERFECT VERB DO-VERB EFFECTIVE-VERB DISPOSAL-
   VERB)
   :PROPERTIES   (("вычисли" "вычисл")  (св 4 А))
   :COMMENTS   "To calculate the area of an object "
)

(LEXICAL-ITEM
   :NAME   ZADAVATJ
   :SPELLING   "ZADAVATJ"
   :FEATURES   (PERFECT VERB)
   :PROPERTIES   (("задава" "зада")  (нсв 14 А))
   :COMMENTS   "specify"
)

(LEXICAL-ITEM
   :NAME   ZAKONTSHITJ
   :SPELLING   " zakonchitj"
   :SAMPLE-SENTENCE   "nazhmite klavishu L chtoby zakonchitj ili
   klavishu L chtoby zamknutj krivuyu"
   :FEATURES   (PERFECT VERB)
   :PROPERTIES   (("закончи" "законч")  (св 4 А))
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   :COMMENTS   "press L to end, or enter L to close the polyline"
)

(LEXICAL-ITEM
   :NAME   ZAPUSK
   :SPELLING   " zapusk "
   :SAMPLE-SENTENCE   "nazhmite klavishu c dlya zapuska komandy
   Close, soedinyayushchej ... "
   :FEATURES   (VERB DO-VERB EFFECTIVE-VERB DISPOSAL-VERB)
   :PROPERTIES   (("запуск")  (м 1 а))
   :COMMENTS   "enter c for Close to connect ... "
)

(LEXICAL-ITEM
   :NAME   ZAPUSTITJ
   :SPELLING   " zapustitj "
   :SAMPLE-SENTENCE   "zapustite komandu L"
   :FEATURES   (PERFECT VERB DO-VERB EFFECTIVE-VERB DISPOSAL-
   VERB)
   :PROPERTIES   (("запусти" "запущ")  (св 4 А))
   :COMMENTS   "start the L command"
)

(LEXICAL-ITEM
   :NAME   ZATEM
   :SPELLING   " zatem "
   :SAMPLE-SENTENCE   "Zatem nazhmite knopku L"
   :PROPERTIES   (("затем")  (н))
   :COMMENTS   "Then choose L"
)

(LEXICAL-ITEM
   :NAME   ZAVERSHITJ
   :SPELLING   " zavershitj "
   :SAMPLE-SENTENCE   "chtoby zavershitj risovanie linii"
   :FEATURES   (PERFECT VERB)
   :PROPERTIES   (("заверши" "заверш")  (св 4 А))
   :COMMENTS   "to complete the line"
)


(LEXICAL-ITEM
   :NAME SVERKHU
   :SPELLING   " sverkhu "
   :SAMPLE-SENTENCE   " vyberite vyravnivanie sverkhu, po tsentru
   i snizu "
   :PROPERTIES   (("сверху")  (н))
   :COMMENTS   "enter a justification from top, zero and bottom"
)

(LEXICAL-ITEM
   :NAME PO-TSENTRU
   :SPELLING   "po tsentru"
   :SAMPLE-SENTENCE   " vyberite vyravnivanie sverkhu, po tsentru
   i snizu "
   :PROPERTIES   (("по центру")  (н))
   :COMMENTS   "enter a justification from top, zero and bottom"
)
```

```
(LEXICAL-ITEM
   :NAME SNIZU
   :SPELLING   "snizu"
   :SAMPLE-SENTENCE   " vyberite vyravnivanie sverkhu, po tsentru
   i snizu "
   :PROPERTIES   (("снизу")  (н))
   :COMMENTS   "enter a justification from top, zero and bottom"
)

(LEXICAL-ITEM
   :NAME   ZAKRYTJ
   :SPELLING   " zakrytj "
   :SAMPLE-SENTENCE   " zakrytj okno"
   :FEATURES   (PERFECT VERB)
   :PROPERTIES   (("закры" "закро")  (св 12 А))
   :COMMENTS   "to close the window"
)
```