

Symmetric Rules for Translation of English and Chinese

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ABSTRACT

A system of grammars using symmetric phrase structure and translation rules in a Lisp version of Prolog is shown to provide symmetric bidirectional translation between English and Chinese for a fragment of the two languages. It is argued that symmetric grammars and translation rules significantly reduce the total grammar writing requirement for translation systems, and that research on symmetric translation systems deserves further study.

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INTRODUCTION

The intriguing notion that a single procedural logic grammar could be written so as to accomplish both parsing from English to logical form and generation of English from the logical form was investigated in Simmons and Chester [1982]. That paper showed a successful treatment in a rule-base of about eighty grammar rules. Later unpublished work by Usui [1982] showed a similar finding for both English and Japanese grammars, and in Simmons [1984] techniques were shown for using such symmetric grammars to control the automatic computation of English summaries from the logical representation. Usui's thesis, an experiment in English-Japanese translation, raised the interesting question as to whether the paraphrase rules that were used to transform from the logical structure of one language to that of another could be written in a symmetric form so that one set of translation rules could be used to translate in both directions.

This paper studies that hypothesis by investigating the form and application of completely symmetric rules for translation between a few English and Chinese sentences. Although the sample of language is too small to warrant conclusions that immediately apply to large translation systems, the experiment was successful in showing that symmetric ruleforms can be designed, written, and used successfully to achieve symmetric translation at least for fragments of the two languages. The significance of the finding is discussed in the concluding section of the paper.

1. Theory of Symmetric Grammars

A predicate logic statement in Prolog begins with a predicate name followed by a set of variables and/or constants. For example (R _X _Y _Z) where R is a predicate name with its variables _X, _Y and _Z. a Prolog relation, (R _X _Y _Z) may be called with some or all of the variables uninstantiated. If it succeeds, usually the uninstantiated variables will be bound as a consequence. A rule has its premises placed in the righthand side of the rule form and its conclusion placed in the lefthand side. An example function BETWEEN can be written as follows:

```
(BETWEEN _X _Y _Z) <- (LEFTOF _X _Y)(RIGHTOF _Z _Y)
```

It states that, if X is to the left of Y and Z is to the right of Y, then Y is between X and Z. This procedure can be called with various bindings, e.g.

(BETWEEN RED-BLOCK _X BLUEBLOCK), which states that X stands between red block and blue block, to identify the middle one,

(BETWEEN _X GREEN-BLOCK BLUEBLOCK), which states that green block stands between X and blue block, to find the left one,

(BETWEEN RED-BLOCK GREEN-BLOCK _X), which states that green block stands

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between red block and X, to find the right-hand one.

It is equally possible to write a rule for parsing a noun phrase, NP such as,

(NP_STRING_STRUCTURE_REMAINDER) <- (...)

where predicate NP has an input sentence string `_STRING`, noun phrase case structure `_STRUCTURE` and sentence remainder `_REMAINDER`, and call it with the **string** instantiated and the other variables unbound, or the **structure** instantiated and the other variables unbound. The result of successful parsing returns a binding for the unbound variables. From a linguistic point of view this is most reasonable in that for any string that it can accept, a grammar will return at least one structure, and that structure will generate, among others, that string. In other words, constituent string-i \Leftrightarrow constituent structure-i; it is a bi-implication. The fact that there is a many-many mapping, that is structure-i will generate not only string-i, but also perhaps string-j, string-k, etc. and that string-i may also generate structure-h, structure-g, etc. does not prevent the symmetry. The reason is that the grammar has a particular ordering of rules and each rule has a particular ordering of constraints. Thus whether string-i or structure-i is the bound variable, the rules are consulted in the same order and each rule's constraints are applied in the same order to result in the bi-implication.

The same principle applies to paraphrase rules where if structure-i, is a paraphrase of structure-j, then structure-j is necessarily a paraphrase of structure-i. Providing that the antecedents of the paraphrase or translation rule are written to avoid the use of any functions that have no inverse [e.g. (IS_Y (RANDOM-NBR))] or relations that try to match unbound variables, the rules will be symmetric.

In other words there is a triangular relation among constituent, structure, and grammar; given any two elements the third can be deduced.⁵ In order to use this principle to obtain symmetric grammars the grammar writer must follow the discipline of writing only symmetric rules. Our experience in the several previously cited studies shows that this is not an arduous task.

2. The Translation System

This investigation of automated translation between Chinese and English uses procedural logic rules interpreted by a Lisp version of Prolog. The grammar rules are context-free phrase-structure rules, each augmented with a semantic testing and transformation component that translates each phrase-structure constituent into a Semantic Relation (SR) which is a form of deep-case analysis explained in full detail in Simmons[1984]. As each larger constituent is encountered, the analysis of its component constituents is embedded until finally when the sentence rule is completed, the full case analysis has been accomplished. The grammar rules are written directly in procedural logic and are directly interpretable by the Lisp-Prolog interpreter.

The problem of the study is to define English and Chinese grammars, and translation rules in such a form that the well-known symmetric properties of logical relations⁶ will enable symmetric translation between the two languages. Our requirement for symmetric translation implies that there will be one Chinese grammar that both parses and generates Chinese sentences, one English grammar with the same constraint, and one set of rules for translating from the semantic relational structure of one to the other, in either direction. The common paradigm for translation usually requires two grammars for each language, one each for generation and for parsing, and two sets of translation (paraphrase or substitution) rules, one for use in either direction of translation -- from Chinese to English or English to Chinese. If it is possible to scale upward the findings of this study to a larger and more representative

⁵This principle has also been applied successfully to inducing a grammar from sentences and their parsings by Howard Smith [1984].

⁶see Kowalski[1979]

sample of translations between the two languages, the consequence will be to halve the rule-writing requirements for achieving translation.

The study was conducted on a small number of sentences requiring only a small set of grammar and translating rules. The source language is parsed into semantic relational form **SRc** or **SRe**, then translation is accomplished between Chinese semantic relations **SRc** and English semantic relations **SRe**. Finally, the target language is generated from **SRe** or **SRc**. The entire procedure is described as follows:

English sentence \leftrightarrow SRe \leftrightarrow SRc \leftrightarrow Chinese sentence

Taking advantage of symmetric relations in Prolog, the translation can be done in both directions under the same grammar rules. Because Chinese is quite different from English, it is usually impossible to get a good quality translation in the surface language level by word-for-word translation. However, both languages can be analyzed into deep case structures which have largely overlapping case names. Such cases as Agent, Instrument, Affected-Entity, Source, Goal, etc. are common to both. But some constructions in each language do not occur in the other, so each language provides some unique cases. For examples, the NP cases (i.e. slots) Determiner and Number occur in English, but not in Chinese, while the particles "le" (completed) and "zhengzai" (ongoing) are examples of a Chinese marker we can call "Tense-Particle" that is unique to Chinese. Thus there is a need for a system of translation rules that paraphrase case structures from one language to those of the other. *If symmetry is maintained in the translation rules, then symmetric translation using only one set of translation rules is possible.*

Three sets of rules and appropriate lexical structures were designed:

Chinese grammar rules **MY-SRc** --- a set of Sc rules,

English grammar rules **MY-SRe** --- a set of Se rules, and

translating rules **MY-TRANS** --- a set of TRANS0 rules,

a vocabulary entity **MY-WORDS** and,

a set of semantic event forms **MY-SEF**.

The basic rule-forms are outlined below:

Sc --- parse Chinese sentence into Chinese semantic relation SRc and vice versa.
(Sc <Chinese sentence> <SRc>)

Se --- parse English sentence into English semantic relation SRe and vice versa.
(Se <English sentence> <SRe>)

TRANS0 --- translate SRe into SRc and vice versa.
(TRANS0 <SRe> <SRc>)

Both English and Chinese grammar rules share the same vocabulary entity, which is a set of tuples with 4 or 5 items:

(<constituent> <English> <word-feature> <Chinese>)
(<constituent> <English> <word-feature> <Chinese> <constraint>)

Since in Chinese nouns are not distinguished by singular and plural, and verbs are not marked for tense, the constituents NBR and TNS were omitted in this study. A set of semantic event forms constrains the translation to semantically well-formed constituents.

3. Differences between English sentences and Chinese sentences:

3.1. Word order:

Word order in Chinese sentences is quite different from that in English. Compare the two sentences:⁷

"Since 1980 the Chinese puppet troupes have made several visits to Europe and the United States."

*(Since-pre 1980 year since-post Chinese puppet troupes have to Europe and the United States made several visits.)

"Zicong 1980 nian< yilai Zhongguo muou jutuan yijing dao Ouzhou he Meiguo jinxingle duoci fangwen."

S1 = PP NP AUX VERB NP1 PP --- English grammar

S2 = PP NP1 AUX PP VERB NP1 --- Chinese grammar

In this example the Chinese PP is embedded between AUX and VERB, while in English it follows the verb and its object.

3.2. The constituents and order of PPs:

The Chinese PP has several different constituents:

PP::= PREP NP PREP | PREP NP | NP PREP

In the example above preposition "since" is split into two parts: "zicong" and "yilai". 1980 nian (year) is put in between.

since 1980 ----> *(since-pre 1980 year since-post)
zicong 1980 nian yilai

The following example shows the order difference between English PPe and Chinese PPc:

"The visit of Chinese puppet troupe"
NP_e PP_e = PREP NP_e

*(Chinese puppet troupe of visit)
"Zhongguo muou jutuan de fangwen"
PP_c = NP_{c1} PREP NP_c

The attributive modifier (Zhongguo muou jutuan de) is put in the front of NP_c (fangwen) and the preposition (de)⁸ follows NP_{c1} (Zhongguo muou jutuan).

3.3. Determiners:

In Chinese sentences, the determiner "the" is not used. In translating any English sentence into a Chinese sentence, a rule simply deletes the determiner "the". But in translating Chinese into English the question arises:

In which instance should articles be placed in front of NP_{e1}?

This question offers difficulties that have not yet been generally resolved in thirty years of linguistic research.

⁷in order to make the Chinese sentences readable, each word for word Chinese identification is placed inside the parentheses marked by a * and followed by its translation equivalent.

⁸Actually it is a post-position or adposition, but called PREP in our grammar.

3.4. English idiomatic expression interpretation:

"They brought this Chinese ancient art form to the attention of more foreigners".

The English idiomatic expression "to bring something to somebody's attention" first must be interpreted as "let somebody notice something" or "let something to be noticed by somebody", then be translated into Chinese. The Chinese sentence will look like:

*(they let this Chinese ancient art form cause more foreigners of attention.)

"Tamen shide zhezong Zhongguo gudaide yishu xingshi yingqile henduo waiguoren de zhuyi."

The translation rules accomplish this paraphrase.

3.5. Date representation:

In Chinese, "day", "month" or "year" must follow the date and indicate the year first, month next and day last.
 in October 1984 ---> *(in 1984 year 10 month)
 zai 1984 nian 10 yue

3.6. Multiple interpretation:

One English word corresponding to several Chinese words happens frequently. For example, in this program the preposition "to" has several interpretations in different cases, for example

to the attention --- *TO to Europe --- LOC

Four sentences are chosen to illustrate the problems mentioned above.

" Since 1980 Chinese puppet troupes have made several visits to Europe and the United States."

"They brought this Chinese ancient art form to the attention of more foreigners."

"The 1981 American debut of the Fujian puppet troupe was an unparalleled success."

"In October 1984 the visit of the Shanghai puppet troupe delighted San-Francisco audiences."

4. Mechanism of translation:

Based on the differences between the ordering conventions for the two languages, paraphrase rules between SRe and SRc map the ordering of one into the ordering of the other, substituting elements from the target lexicon for the source lexical elements. The grammars for English and Chinese are designed to provide for each a canonical ordering of the case analysis. For Chinese and English the case ordering is very similar and thus the ordering tasks of the translation rules are minimized. The writer of translation rules must be aware of the standard ordering that results from a parse so as to provide an appropriate input to the symmetric grammars for target language generation.

Grammar rules MY-SRe parse English sentences according to the order of constituents.

Se ::= NP_e VP_e | PP_e NP_e VP_e
 NP_e ::= ART NP_{e1} PP_e | ART NP_{e1} | NP_{e1}
 NP_{e1} ::= ADJ NP_{e1} | NOUN | PRON
 VP_e ::= AUX VERB VCOMP_e | VERB VCOMP_e
 PP_e ::= PREP NOUN NOUN | PREP NP_e *AND NP_e

| PREP NP_e
 VCOMP_e::= NP_e PP_e | NP_e | NIL

For Chinese sentences, grammar rules MY-SR_c reflect the ordering of Chinese constituents. These rules result in a somewhat different ordering of cases in the resulting parse.

Sc ::= NP_c VP_c | PP_c NP_c VP_c
 NP_c ::= ART NP_{c1} | PP_c NP_c | NP_{c1}
 NP_{c1} ::= ADJ NP_{c1} | NOUN | PRON
 VP_c ::= VERB VCOMP_c | AUX NP_c VERB NP_c
 | AUX PP_c VP_c | PP_c VP_c
 PP_c ::= PREP NOUN | PREP NOUN NOUN
 | PREP NP_c NP_c | NP_c PREP
 VCOMP_c::= PP_c NP_c | NP_c | NIL

Context-sensitive translation rules are used to map between the word orderings in the two languages. Compare two grammar rules below:

NP_e = ART NP_{e1} PP_e
 NP_c = PP_c NP_c

These rules contrast the English noun phrase NP_e,

"the visit of Chinese puppet troupe"

with the Chinese noun phrase NP_c,

*(Chinese puppet troupe of visit)
 "Zhongguo muou jutuan de fangwen"

VP_e = AUX VERB VCOMP_e => AUX VERB NP_e PP_e
 VP_c = AUX PP_c VP_c => AUX PP_c VERB NP_c

These two rules contrast the English verb phrase VP_e,

"have made several visits to Europe and the United States"

with the Chinese verb phrase VP_c,

*(have to Europe and the United States made several visits)
 "yijing dao Ouzhou he Meiguo jinxingle duoci fangwen"

Translation rules could be written to map syntactic constituents of one language into those of the other, but a finer control of translation quality is obtained by mapping between the case relations, SR_e and SR_c. The following examples show the form of the translation rules.

Rule

((TRANS (W (X DET the . S) .R) (W (X1 .S1) .R1)) <
 (NOUN X NF X1 the)
 (TRANS S S1)
 (TRANS R R1))

will delete the semantic relation pair (DET the) when translating English into Chinese and will add it to the right place when translating Chinese into English. In the same way, rule

((TRANS (TIME (X .S) .R) (TIME (X1 MSR X2 .S1) .R1)) <
 (NOUN X TIME X1 X2)
 (TRANS S S1)
 (TRANS R R1))

handles the date representation when the noun has feature "TIME" and constraint "nian".

Rule

PP = PREP NP NP | PREP NP NCOMP.

This study keeps the balance between generality and efficiency by means of writing general translation rules associated with SEFs and purposely writing special rules for some special phrases. In the limit, it will also be necessary to include idiomatic expressions in the lexicon for verbatim translation, although such a technique was not studied here.

6.2. Rule order affects the efficiency and correctness of translation:

For English grammar:

Se ::= NPe VPe | PPe NPe VPe
 PPe ::= PREP NOUN NOUN | PREP NPe *AND NPe
 | PREP NPe

since all PPs start with preposition, a sentence beginning with PP will fail at the first word parsing for the rule Se = NPe VPe. A sentence beginning with NPe also will fail at the first word parsing for the rule Se ::= PPe NPe VPe. In this instance, the rule order makes no big difference. On the contrary, the rule order in Chinese grammar affects the efficiency.

Sc ::= PPc NPc VPc | NPc VPc
 PPc ::= PREP NOUN NOUN | PREP NOUN
 | PREP NPc NPc | NPc PREP

In the example of PPc = NPc PREP, it is difficult to tell which grammar rule will match the sentence until reaching the preposition. If PPc turns out to be a failure, the NPc will be recomputed once again which is very inefficient. A good idea is to assert the NPc when parsing NPc succeeds. This desire introduces the principle of the well-formed substring table that eliminates the need for recomputing phrases when back-up is necessary.

The rule order also affects the correctness of the translation. For example,

VCOMPc ::= NPc PPc | NPc

writing VCOMPc = NPc first will cause incorrect translation. When parsing NPc succeeds, sometimes the PPc part following NPc will be missing. Writing rules recursively

VCOMPc ::= NPc VCOMPc | PPc VCOMPc | NIL

can solve this problem. But, again, it will affect the translating speed.

The strategy we used for ordering rules is:

- If special rules are a subset of general rules, write the special rules first.
- If special rules are not a subset of general rules write the frequently used rules first.

6.3. The role of Semantic Event Forms --- SEF:

Semantic event forms are n-tuples composed of class terms of which the words in a constituent are instances. For example in English the constituent "angry pitcher" is an instance of (EMOTION PERSON EMOTION) where EMOTION is a case or slot that relates the two terms into the SR, (PITCHER-1 EMOTION ANGRY). At once, the SEFs provide a semantic test of well-formedness and a case relation name to relate the elements of a constituent. Notice that "empty pitcher" is an instance of (STATE PHYSOBJ STATE) leading to the SR, (PITCHER-2 STATE EMPTY), where PITCHER-1 has the type PERSON and PITCHER-2 has type PHYSOBJ. The SEFs are a convenient method for selecting sense meanings and appropriate case relations for nominal phrases and as a result

provide semantic constraints which to some extent improve the interpretations.

During the implementation of Chinese-English translation the SEFs accomplished the following roles:

- Controlling word order --- During the procedure of parsing surface language into semantic relations, SEFs select case relation names that provide signals to the translation rules to rearrange the word order to result in better quality translation.

- Avoiding ambiguity:

Sc = PPc NPc VPc

PPc modifies VPc, as selected by SEF.

Sc = NPc VPc => PPc NPc VPc

PPc modifies NPc, as selected by its SEF.

Given two sentences:

*(In 1980 Chinese puppet troupe visited the U.S.)

"Zai 1980 nian Zhongguo muou jutuan fangwenle Meiguo"

*(Chinese puppet troupe of visit delighted San Francisco audiences)

"Zhongguo muou jutuan de fangwen doulele San-Francisco guangzhong"

Based on SEF (ACT TIME TIME) the first sentence matches the first grammar rule, and the second sentence matches the second rule, relying on SEF (EVT HUMAN *OF). As a result the ambiguity is avoided.

- Controlling multiple interpretations: Preposition "to" has four different interpretations in these two short texts:

- Indicate location:

"to Europe and the U.S."

"to China"

"to a number of countries"

"to Tibet"

- Indicate event:

"to the attention of more foreigners"

- Indicate object:

"to Westerners"

"to ordinary Chinese viewers"

- Indicate range:

"from intrigued puzzlement to angry rejection"

In each example the preposition *to* corresponds to different Chinese prepositions or is omitted. By assigning different features to each preposition sense *to*, e.g. LOC, TO, OBJ, *TO, associated with Semantic Event Form : (ACT LOC LOC), (ACT ACTION TO), (ST OBJ OBJ) and (ACT *TO *TO) respectively, the system is able to select appropriate sense meanings and to use an appropriate Chinese form resulting in a good translation.

A more complete discussion of the use of SEFs is provided in Simmons[1984]. The reader should be warned, however, that the SEF system needs to be augmented by the use of a grammar with rules that contain syntactic features and tests of these for use in any large application; otherwise the size of the SEF set will grow too rapidly for practical control of the system. In large grammars the SEFs find a primary use in resolving noun-noun and conjunctive phrases, where often, only semantic patterns can reduce the inherent ambiguity.

7. Conclusions

We conclude that it is definitely possible to write grammars to translate between two subsets of natural languages using symmetric rule forms.

Even from the study of this tiny corpus of language, it is also possible to conclude, tentatively, that the human factors task of maintaining symmetry in the three grammars places no excessive burden on the grammar writer.

We propose that a translation grammar can be characterized by the following diagram:

Lang1 \Leftarrow Grammar1 \Rightarrow SR1 \Leftarrow Transrules \Rightarrow SR2 \Leftarrow Grammar2 \Rightarrow Lang2

Essentially for any two languages L1 and L2, the syntactic grammars for translating between strings and logical structures can be symmetric, and a single set of symmetric translation rules can be used to map the SR interpretations from one to the other. This finding is supported by previous work already cited as well as by earlier unpublished experiments using parsers and generators written in Lisp. We know of no other work so far that has investigated symmetry of translation, but we recently re-examined Usui's English/Japanese system and determined that it too can use symmetric translation rules of the type presented here.

These appear to be fairly strong conclusions for a study of translation in a limited sentence corpus. But the conclusions concern ruleforms and computational procedures rather than effective and useful translation systems. We must be concerned, not only as to whether the technique will scale up to large applied translation grammars, but also whether the constraints on writing rules so as to maintain symmetry will prove practicable on a large scale from a human factors viewpoint. Much more experience with these rule forms is needed before such pragmatic issues can be firmly settled.

In the present state of the translation art, (see Slocum [1985]) the several existing European and American systems and the dozen or so Japanese ones do not typically use Prolog grammars, rarely use semantic constraints, have evolved over several years based on one or another syntactic theory, and are much more concerned with developing large vocabularies and grammars than with improving the translation model. Indeed, the concerns with coverage and accuracy of grammars and lexicon, and the search for effective linguistic acquisition tools currently outweigh theoretical questions of how many grammars need be used to accomplish translations.

But despite current heavy emphasis on developmental engineering, it must be remembered that the science of automated translation still requires much research. Our conclusion that symmetric translation is a potentially viable option is a research finding that deserves further attention.

Appendix A

Examples of the translating procedure:⁹

 THE DETAILED PROCEDURE OF TRANSLATING ENGLISH TO CHINESE.

1. Translate English into SRE.

((SE (since 1980 Chinese puppet troupes have made several visits to Europe and the US)

⁹The technical report with detailed program and demonstration is available in the AI lab of Dept of Computer Science in UT under the same title, AI-TR86-26.

(made AGT (troupes NAME Chinese TYPE puppet)
 TIME (1980 PREP since)
 AUX have
 AE (visits MODEL several)
 LOC (Europe PREP to *AND (US DET the))))

2. Translate SRE to SRC.

((TRANSO (made AGT (troupes NAME Chinese TYPE puppet)
 TIME (1980 PREP since)
 AUX have
 AE (visits MODEL several)
 LOC (Europe PREP to *AND (US DET the)))
 (jinxingle AGT (jutuan NAME Zhongguo TYPE muou)
 TIME (1980 MSR nian PREP zicong PREP yilai)
 AUX yijin
 AE (fangwen MODEL duoci)
 LOC (Ouzhou PREP to *HE (Meiguo))))))

3. Generate Chinese from SRC.

((SC (zicong 1980 nian yilai Zhongguo muou jutuan yijin dao Ouzhou he Meiguoguo
 jinxingle duoci fangwen)
 (jinxingle AGT (jutuan NAME Zhongguo TYPE muou)
 TIME (1980 MSR nian PREP zicong PREP yilai)
 AUX yijin
 AE (fangwen MODEL duoci)
 LOC (Ouzhou PREP dao *HE (Meiguoguo))))))

 THE DETAILED PROCEDURE OF TRANSLATING CHINESE TO ENGLISH.

1. Translate Chinese into SRC.

((SC (Fujian muou jutuan de 1981 nian meiguode souciyianchu shi yige kongqiande
 chengong)
 (shi AE (souciyianchu *OF (jutuan PREP de NAME Fujian TYPE muou)
 TIME (1981 MSR nian)
 LOC meiguode)
 AE (chengong DET yige MODEL kongqiande))))

2. Translate SRC into SRE.

((TRANSO (was AE (debut DET the
 *OF (troupe DET the PREP of NAME Fujian TYPE puppet)
 TIME 1981
 LOC American)
 AE (success DET an MODEL unparalleled))
 (shi AE (souciyianchu *OF (jutuan PREP de NAME Fujian TYPE muou)
 TIME (1981 MSR nian)
 LOC meiguode)
 AE (chengong DET yige MODEL kongqiande))))

3. Generate English from SRE.

((SE (the 1981 American debut of the Fujian puppet troupe was an unparalleled
 success)
 (was AE (debut DET the
 *OF (troupe PREP of DET the NAME Fujian TYPE puppet)
 TIME 1981
 LOC American))

AE (success DET an MODEL unparalleled)))

Appendix B

 DEMONSTRATION OF TRANSLATING ENGLISH TO CHINESE

TEXT 1.

*(TRY E1)

((TRANSEC (since 1980 Chinese puppet troupes have made several visits to Europe and the US)

(zicong 1980 nian yilai Zhongguode muou jutuan yijin dao Ouzhou he Meiguo jinxingle duoci fangwen)))

*RTIME

(15.827 SECS)

*(TRY E2)

((TRANSEC (they brought this ancient art form to the attention of more foreigners)

(tamen shide zhezong gudaide yishu xingshi yingqile henduo waiguoren da zhuyi)))

*RTIME

(3.375 SECS)

*(TRY E3)

((TRANSEC (the 1981 American debut of the Fujian puppet troupe was an unparalleled success)

(Fujian muou jutuan de 1981 nian meiguode souciyianchu shi yige kongqiande chengong)))

*RTIME

(1.186 SECS)

*(TRY E4)

((TRANSEC (in October 1984 the visit of the Shanghai puppet troupe delighted SanFrancisco audiences)

(zai 1984 nian 10 yue Shanghai muou jutuan de yianchu doulele SanFrancisco guanzhong)))

*RTIME

(2.957 SECS)

TEXT 2.

*(TRY E5)

((TRANSEC (over the past five years Rauschenberg has traveled to a number of countries to take photographs and videotapes)

(zai guoqude wu nian Rauschenberg yijing luyouguo xuduo guojia bin paishela zhaopian he dianshipian)))

*RTIME

(2.754 SECS)

*(TRY E6)

((TRANSEC (these become the raw materials of his art)

(zhexie chengwui tade yishu de yuanshi cailiao)))

*RTIME

(1.732 SECS)

*(TRY E7)

((TRANSEC (a few years ago he got around to China)

(jinji nian qian ta dao Zhongguo quguo))

*RTIME
(5.108 SECS)

*(TRY E8)

((TRANSEC (last fall and winter Rauschenberg returned to China with a huge art roadshow)

(qunian qiutian he dongtian Rauschenberg daizhe yige daxingde yishu xunhui-zhanlan hui dao Zhongguo)))

*RTIME
(5.567 SECS)

*(TRY E9)

((TRANSEC (this big exhibition took up a number of rooms in Beijing's China Art Gallery then traveled on to Tibet)

(zhezhong daxin zhanlanhui zhanjule zai Beijingde Zhongguo Yishu Guan lide xuduo fanjian ranhou dao Xizhan jixuluyou)))

*RTIME
(3.968 SECS)

*(TRY E10)

((TRANSEC (since fifties Rauschenberg's particular modern brand has become familiar to Westerners)

(zicong wushi niandai yilai Rauschenbergde techude xiandaihuade biaozi duiyu xifanren yijing chengwui henshuxile)))

*RTIME
(7.358 SECS)

*(TRY E11)

((TRANSEC (to ordinary Chinese viewers all of these was quite new)

(duiyu yibande Zhongguode pinglunzhe suoyou de zhexie shi shifen xinxiande)))

*RTIME
(14.092 SECS)

*(TRY E12)

((TRANSEC (the reactions ranged from intrigued puzzlement to angry rejection)

(fanying cong youxinqude mihuo dao fengnude fandui gebuxantong)))

*RTIME
(6.47 SECS)

References

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-

[PHOTO: Recording initiated Wed 19-Mar-86 12:31PM]

[Link from CS.JIN, TTY36]

Tops-20 Command processor 5.1(222700)
End of Comand.Cmd.10

2@ty trans.hcp

```
{: =====  
file <TRANS.HCP> includes a set of axioms:  
  translation rules      <MY-TRANSLATION>  
  English grammar rules <MY-SRE>  
  Chinese grammar rules <MY-SRC>  
  vocabulary entry      <MY-WOEDS>  
  semantic event forms  <MY-SEF>  
and a set of testing sentences.  
===== }
```

```
(VARIABLES E C C X X0 X1 X2 Y Y0 Y1 Y2 Z Z1 Z2 R R1 S S1 W W1 W2 V V1 U U1  
  NE NE1 NE2 AF VE PF AUE)
```

```
{: -----  
MY-TRANSLATION is the top level of translation.  
  
TRANSEC translates English into Chinese.  
  (TRANSEC <English sentence> <Chinese esntence> )  
  
TRANSCE translates Chinese into English.  
  (TRANSCE <Chinese sentence> <English esntence> )  
----- }
```

```
(SETQ MY-TRANSLATION '(  
  ((TRANSEC E C) < (SE E Y) (TRANS0 Y Z) (SC C Z))  
  ((TRANSCE E C) < (SC C Z) (TRANS0 Y Z) (SE E Y)) ))
```

```
(AXIOMS MY-TRANSLATION)
```

```
{: -----  
MY-TRANS translates English semantic Relation (SRE) into Chinese  
  Semantic Relation (SRC) and verse via.  
  (TRANS0 <SRE> <SRC> )  
----- }
```

```
(SETQ MY-TRANS '(  
  ((TRANS0 (X .R) (X1 .R1)) < (VERB X VF X1) (TRANS R R1))  
  ((TRANS0 (X .R) (X1 .R1)) < (VERB X VF X1 X2) (TRANS R R1))  
  
  ((TRANS (*AND (X DET the .S) .R) (*HE (X1 .S1) .R1)) < (NOUN X NE X1 the)  
  (TRANS S S1 )  
  (TRANS R R1))  
  
  ((TRANS (W (X DET the .S) .R) (W (X1 .S1) .R1))  
  < (NOUN X NE X1 the)  
  (TRANS S S1)  
  (TRANS R R1))  
  
  ((TRANS (*TO (X PREP to DET the .S) .R) (*TO (X1 .S1) .R1))  
  < (NOUN X NE X1 X2)  
  (TRANS S S1)  
  (TRANS R R1))
```

```

((TRANS (W (X Y Z DET the .S) .R) (W (X1 Y Z1 .S1) .R1))
      < (NOUN X NF X1 the )
        (PREP Z PF Z1)
        (TRANS S S1)
        (TRANS R R1))
((TRANS (W (X .S) .R) (W (X1 .S1) .R1)) < (NOUN X NF X1)
      (TRANS S S1)
      (TRANS R R1))
((TRANS (AGT X .R) (AGT X1 .R1)) < (NOUN X NF X1)
      (TRANS R R1))
((TRANS (AGT (X) .R) (AGT (X1) .R1)) < (PRON X NF X1)
      (TRANS R R1))
((TRANS (W X .R) (W X1 .R1)) < (ADJ X W X1) (TRANS R R1))
((TRANS (TIME (X .S) .R) (TIME (X1 MSR X2 .S1) .R1)) < (NOUN X TIME X1 X2)
      (TRANS S S1)
      (TRANS R R1))
((TRANS (TIME X .R) (TIME (X1 MSR X2) .R1)) < (ADJ X TIME X1 X2) (TRANS R R1))
((TRANS (TIME X .R) (TIME (X1 MSR X2) .R1)) < (NOUN X TIME X1 X2) (TRANS R R1))
((TRANS (AUX X .R) (AUX X1 .R1)) < (AUX X AUF X1) (TRANS R R1))
((TRANS (DET X .R) (DET X1 .R1)) < (ART X X1) (TRANS R R1))
((TRANS (PREP X .R) (PREP X1 .R1)) < (PREP X PF X1) (TRANS R R1))
((TRANS (PREP X .R) (PREP X1 PREP X2 .R1)) < (PREP X PF X1 X2) (TRANS R R1))
((TRANS NIL NIL) )

```

(AXIOMS MY-TRANS)

```

{; -----
  MY-SRE translates English into SRE and verse via.
    (SE <English sentence> <SRE> )
  -----}

```

```

(SETQ MY-SRE '(
((SE X (W U X0 .W1)) < (NPE X NF Y X0)
      (VPE Y VF NIL (W .W1))
      (NE VF U))
((SE X (W U Y0 S X0 .W1)) < (PPE X PE Y X0)
      (NPE Y NF Z Y0)
      (VPE Z VF NIL (W .W1))
      (VF PF S)
      (NE VF U))
((NPE (X .Y) NF R (V DET X U (W .W1) .V1)) < (ART X X1)
      (NPE1 Y NF Z (V .V1))
      (PPE Z PF R (W .W1))
      (NE PF U))
((NPE (X .Y) NF R (V DET X .V1)) < (ART X X1) (NPE1 Y NF R (V .V1)))
((NPE X NF R X0) < (NPE1 X NF R X0))

((NPE1 (X .Y) NF R (V S X .V1)) < (ADJ X AF X1)
      (NPE1 Y NF R (V .V1))
      (NE AF S))
((NPE1 (X .Y) NF R (V S X .V1)) < (ADJ X AF X1 X2)
      (NPE1 Y NF R (V .V1))
      (NE AF S))
((NPE1 (X .Y) NF Y (X)) < (NOUN X NF X1))
((NPE1 (X .Y) NF Y (X)) < (NOUN X NF X1 X2))
((NPE1 (X .Y) NF Y (X)) < (PRON X NF X1))

((VPE (X Y .Z) VF R (Y S X .W)) < (AUX X AUF X0)
      (VERB Y VF Y0)
      (AUF VF S))

```

((VPE (X .Z) VF R (X .W)) < (VERB X VE X0)
(VCOMPE Z VE R W))
((VPE (X .Z) VF R (X AUX X2 .W)) < (VERB X VE X0 X2)
(VCOMPE Z VE R W))

((VCOMPE NIL VE NIL NIL))
((VCOMPE X VE NIL (U X0 S Y0)) < (NPE X NE Y X0)
(VE NE U)
(PPE Y PE NIL Y0)
(VE PE S))
((VCOMPE X VE NIL (U X0)) < (NPE X NE NIL X0)
(VE NE U))

((PPE (X Y Z .R) PE R (Y TIME Z1 PREP X))
< (PREP X PF X1)
(NOUN Y TIME Y1 Y2)
(NOUN Z TIME Z1 Z2))
((PPE (X .Y) PE R (V PREP X *AND Z1 .V1)) < (PREP X PF X1)
(NPE Y NE (and .Z) (V .V1))
(NPE Z NE R Z1))
((PPE (X .Y) PE R (V PREP X .V1)) < (PREP X PF X1 X2)
(NPE Y NE R (V .V1)))
((PPE (X .Y) NE R (V PREP X .V1)) < (PREP X PF X1)
(NPE Y NE R (V .V1))))

(AXIOMS MY-SRE)

{: -----
MY-SRC translates Chinese into SRC and verse via.
(SC <Chinese sentence> <SRC>)
----- }

(SETQ MY-SRC '(
((SC X (W U Y1 S X1 .W1)) << (PPC X PF Y X1)
(NPC Y NE Z Y1)
(VPC Z VE NIL (W .W1))
(VE PE S)
(NE VE U))
((SC X (W U X1 .W1)) < (NPC X NE Y X1) (VPC Y VE NIL (W .W1)) (NE VE U))
((NPC (X1 .Y) NE R (V DET X1 .V1)) < (ART X X1) (NPC1 Y NE R (V .V1)))
((NPC X NE R (V U X1 .V1)) < (PPC X PF Y X1)
(NPC Y NE R (V .V1))
(NE PE U))
((NPC X NE R X1) < (NPC1 X NE R X1))
((NPC1 (X1 .Y) NE R (V S X1 .V1)) < (ADJ X AF X1)
(NPC1 Y NE R (V .V1))
(NE AF S))
((NPC1 (X1 X2 .Y) NE R (V S (X1 MSR X2) .V1)) < (ADJ X TIME X1 X2)
(NPC1 Y NE R (V .V1))
(NE TIME S))
((NPC1 (X1 .Y) NE Y (X1)) < (NOUN X NE X1))
((NPC1 (X1 .Y) NE Y (X1 MSR X2)) < (NOUN X TIME X1 X2))
((NPC1 (X1 .Y) NE Y (X1)) < (NOUN X NE X1 X2))
((NPC1 (X1 .Y) NE Y (X1)) < (PRON X NE X1))
((VPC (X1 .Y) VE NIL (X1 S Y1)) < (VERB X VE X1))

(NPC Y NE NIL Y1)

(VF NE S))

((VPC (X1 .Y) VF NIL (W AUX X1 U Y1 S Z1)) < (AUX X AUX X1)
(NPC Y NE1 (W.Z) Y1)
(VERB W1 VF W W2)
(NPC Z NE2 NIL Z1)
(VF NE1 U)
(VF NE2 S))

((VPC (X1 .Y) VF NIL (W AUX X1 .W1)) < (AUX X AUX X1)
(VPC Y VF NIL (W .W1)))

((VPC X VF NIL (W W1 W2 U X1)) < (PPC X PF Y X1)
(VPC Y VF NIL (W W1 W2))
(VF PF U))

((PPC (X1 Z1 Z2 X2 .R) TIME R (Z1 MSR Z2 PREP X1 PREP X2))
< (PREP X TIME X1 X2)
(NOUN Z TIME Z1 Z2))

((PPC (X1 Z1 Z2 Y1 Y2 .R) TIME R (Y1 MSR Y2 TIME (Z1 MSR Z2) PREP X1))
< (PREP X PF X1)
(NOUN Y TIME Y1 Y2)
(NOUN Z TIME Z1 Z2))

((PPC (X1 .Y) PF R (V PREP X1 *HE Z1 .V1))
< (PREP X PF X1)
(NPC Y NE (he .Z) (V .V1))
(NPC Z NE R Z1))

((PPC X PF R (V PREP Y1 .V1)) < (NPC1 X NE (Y1 .R) (V .V1))
(PREP Y PF Y1)))

(AXIOMS MY-SRC)

{: -----
vocabulary entry.
(<constituent> <English> <feature> <Chinese> <constraint>)
-----}

(SETQ MY-WORDS '(
(NOUN troupes HUMAN jutuan))
(NOUN visits EVT fangwen))
(NOUN Europe LOC Ouzhou))
(NOUN US LOC Meiguo the))
(NOUN 1980 TIME 1980 nian))
(VERB made ACT jinxingle))
(AUX have AUX yijin))
(ADJ Chinese NAME Zhongguo))
(ADJ puppet TYPE muou))
(ADJ several MODEL duoci))
(ART the the))
(CONJ *AND *HE))
(PREP to *TO to))
(PREP to LOC dao))
(PREP since TIME zicong yilai))

(NOUN form EVT xingshi))
(NOUN attention ACTION zhuyi the))
(NOUN foreigners HUMAN waiguoren))
(PRON they HUMAN tamen))
(VERB brought ACT yingqile let))
(AUX let AUX shide))
(ADJ ancient TYPE gudaide))

```

((ADJ art TYPE yishu ))
((ADJ more MODEL henduo ))
((ART this zhezong ))
((PREP of *OF de ))

((NOUN debut ACTION souciyianchu the ))
((NOUN troupe HUMAN jutuan the ))
((NOUN success EVT chengong ))
((NOUN visit ACTION yianchu the ))
((NOUN 1984 TIME 1984 nian))
((NOUN audiences HUMAN guanzhong ))
((NOUN October TIME 10 yue ))
((ADJ SanFrancisco LOC SanFrancisco ))
((VERB was ST shi ))
((VERB delighted ACT doulele ))

```

```

((ADJ 1981 TIME 1981 nian ))
((ADJ American LOC meiguode ))
((ADJ Fujian NAME Fujian ))
((ADJ unparalleled MODEL kongqiande ))
((ADJ Shanghai NAME Shanghai ))
((ADJ Rod NAME Rod ))
((ART an yige ))
((PREP in TIME zai ))

```

(AXIOMS MY-WORDS)

```

{; -----
MY-SEE is a set of semantic event forms.
( <NF> <VF> U ) semantic relation between subject NP and VP
( <NF> <PF> U ) semantic relation between NP and PP
( <NF> <AF> U ) semantic relation between NP and ADJ
( <VF> <NF> U ) semantic relation between VP and object NP
( <VF> <PF> U ) semantic relation between VP and PP
( <AUF> <VF> U ) semantic relation between AUX and VP
-----
}

```

```

(SETQ MY-SEE '(
(HUMAN ACT AGT ))
(ACTION ACT AE ))
(ACT HUMAN AE ))
(ACT EVT AE ))
(ACT TIME TIME ))
(ACT ACTION *TO ))

(ACT LOC LOC ))
(ACT AUX AUX ))
(AUX ACT AUX ))
(AUX EVT AE ))
(HUMAN NAME NAME ))
(HUMAN TYPE TYPE ))
(HUMAN LOC LOC ))
(HUMAN MODEL MODEL ))
(EVT MODEL MODEL ))
(EVT LOC LOC ))
(EVT TIME TIME ))
(EVT TYPE TYPE ))
(ACTION HUMAN *OF ))
(ACTION TIME TIME ))

```

```

((ACTION LOC      LOC      ))
((ACTION ST       AE       ))
((ACTION *OF      *OF      ))
((ST      EVT     AE       )) ))

```

(AXIOMS MY-SEE)

```

{: =====
      a set of test sentences
===== }

```

```

{: -----
  Ci --- translate Chinese into English
  Ei --- translate English into Chinese
----- }

```

```

(SETQ C1 '(TRANSCE X ( zicong 1980 nian yilai Zhongguo muou jutuan yijin
dao Ouzhou he Meiguo jinxingle duoci fangwen)))
(SETQ C2 '(TRANSCE X (tamen shide zhezong gudaide yishu xingshi yingqile
henduo waiguoren de zhuyi)))
(SETQ C3 '(TRANSCE X (Fujian muou jutuan de 1981 nian meiguode
souciyianchu shi yige kongqiande chengong)))
(SETQ C4 '(TRANSCE X (zai 1984 nian 10 yue Shanghai Rod muou jutuan de
yianchu doulele SanFrancisco guanzhong)))
(SETQ E1 '(TRANSEC (since 1980 Chinese puppet troupes have made several
visits to Europe and the US ) X))
(SETQ E2 '(TRANSEC (they brought this ancient art form to the attention of
more foreigners) X ))
(SETQ E3 '(TRANSEC (the 1981 American debut of the Fujian puppet troupe
was an unparalleled success) X ))
(SETQ E4 '(TRANSEC (in October 1984 the visit of the Shanghai Rod puppet
troupe delighted SanFrancisco audiences) X))

```

```

{: -----
  ENGLISH1 --- translate SRE into SRC.
----- }

```

```

(SETQ ENGLISH1 '(TRANS0 (made AGT (troupes NAME Chinese TYPE puppet)
TIME (1980 PREP since)
AUX have
AE (visits MODEL several)
LOC (Europe PREP to *AND (US DET the)))
X ))

```

```

(SETQ ENGLISH2 '(TRANS0 (brought AGT (they)
AE (form DET this TYPE ancient TYPE art)
*TO (attention PREP to DET the
*OF (foreigners PREP of
MODEL more)))
X ))

```

```

(SETQ ENGLISH3 '(TRANS0
(was AE (debut DET the
*OF (troupe PREP of DET the
NAME Fujian TYPE puppet)
TIME 1981
LOC American)
AE (success DET an MODEL unparalleled)) X ))

```



```
(SETQ ENGLISH4 '(TRANS0 (delighted AE (visit DET the
                                *OF (troupe PREP of
                                        DET the
                                        NAME Shanghai
                                        NAME Rod
                                        TYPE puppet))
                                TIME (October TIME 1984 PREP in)
                                AE (audiences LOC SanFrancisco)) X ))
```

```
{: -----
  ENG1 --- generate English sentence from SRE
  ----- }
```

```
(SETQ ENG1 '(SE X (made AGT (troupes NAME Chinese TYPE puppet)
                    TIME (1980 PREP since)
                    AUX have
                    AE (visits MODEL several)
                    LOC (Europe PREP to *AND (US DET the)) ) ))
```

```
{: in ENG2 extra constituent (AUX let) is for matching SRC }
(SETQ ENG2 '(SE X (brought AGT (they)
                    AUX let
                    AE (form DET this TYPE ancient TYPE art)
                    *TO (attention PREP to DET the
                        *OF (foreigners PREP of
                            MODEL more)) ) ))
```

```
(SETQ ENG3 '(SE X
              (was AE (debut DET the
                      *OF (troupe PREP of DET the
                          NAME Fujian TYPE puppet)
                      TIME 1981
                      LOC American)
              AE (success DET an MODEL unparalleled)) ))
```

```
(SETQ ENG4 '(SE X (delighted AE (visit DET the
                                *OF (troupe PREP of
                                        DET the
                                        NAME Shanghai
                                        NAME Rod
                                        TYPE puppet))
                                TIME (October TIME 1984 PREP in)
                                AE (audiences LOC SanFrancisco)) ))
```

```
{: -----
  CHINESE1 --- translate SRC into SRE.
  ----- }
```

```
(SETQ CHINESE1 '(TRANS0 X
                 (jinxingle AGT (jutuan NAME Zhongguo TYPE muou)
                 TIME (1980 MSR nian PREP zicong PREP yilai)
                 AUX yijin
                 AE (fangwen MODEL duoci)
                 LOC (Ouzhou PREP dao *HE (Meiguo)) ) ))
```

```
(SETQ CHINESE2 '(TRANS0 X
                 (yingqile AGT (tamen)
                 AUX shide
                 AE (xingshi DET zhezhong TYPE gudaide
                     TYPE yishu )
```

*TO (zhuyi *OF (waiguoren PREP de
MODEL henduo))))

(SETQ CHINESE3 ' (TRANS0 X
(shi AE (souciyianchu *OF
(jutuan PREP de NAME Fujian TYPE muou)
TIME (1981 MSR nian)
LOC meiguode)
AE (chengong DET yige MODEL kongqiande))))

(SETQ CHINESE4 ' (TRANS0 X (doulele AE (yianchu *OF (jutuan PREP de
NAME Shanghai
NAME Rod
TYPE muou))
TIME (1984 MSR nian TIME (10 MSR yue)
PREP zai)
AE (guanzhong LOC SanFrancisco))))

{: -----
CHI --- generate Chinese sentence from SRC
----- }

(SETQ CH1 ' (SC X
(jinxingle AGT (jutuan NAME Zhongguo TYPE muou)
TIME (1980 MSR nian PREP zicong PREP yilai)
AUX yijin
AE (fangwen MODEL duoci)
LOC (Ouzhou PREP dao *HE (Meiguo))))

(SETQ CH2 ' (SC X
(yingqile AGT (tamen)
AUX shide
AE (xingshi DET zhezhong TYPE gudaide
TYPE yishu)
*TO (zhuyi *OF (waiguoren PREP de
MODEL henduo))))

(SETQ CH3 ' (SC X
(shi AE (souciyianchu
*OF (jutuan PREP de NAME Fujian
TYPE muou)
TIME (1981 MSR nian)
LOC meiguode)
AE (chengong DET yige MODEL kongqiande))))

(SETQ CH4 ' (SC X (doulele AE (yianchu *OF (jutuan PREP de
NAME Shanghai
NAME Rod
TYPE muou))
TIME (1984 MSR nian TIME (10 MSR yue)
PREP zai)
AE (guanzhong LOC SanFrancisco))))

{: -----
SENEi --- translate English sentence into SRE.
----- }

(SETQ SENE1 ' (SE (since 1980 Chinese puppet troupes have made several visits
to Europe and the US) X))

(SETQ SENE2 ' (SE (they brought this ancient art form to the attention of

more foreigners) X))

(SETQ SENE3 '(SE (the 1981 American debut of the Fujian puppet troupe was an unparalleled success) X))

(SETQ SENE4 '(SE (in October 1984 the visit of the Shanghai Rod puppet troupe delighted SanFrancisco audiences) X))

{: -----
 SENC1 ---- translate Chinese sentence into SRC.
-----}

(SETQ SENC1 '(SC (zicong 1980 nian yilai Zhongguo muou jutuan yijin dao Ouzhou he Meiguo jinxingle duoci fangwen) X))

(SETQ SENC2 '(SC (tamen shide zhezhong gudaide yishu xingshi yingqile henduo waiguoren de zhuyi) X))

(SETQ SENC3 '(SC (Fujian muou jutuan de 1981 nian meiguode souciyianchu shi yige kongqiande chengong) X))

(SETQ SENC4 '(SC (zai 1984 nian 10 yue Shanghai Rod muou jutuan de yianchu doulele SanFrancisco guanzhong) X))

(SETQ LIMIT 5000)

(SETQ DEPTH 20)

(SETQ LENGTH 20)

2@elisp

[Keeping Elisp]

Elisp, 10 14 85

The variable MSG shows how to begin and MSG1 shows how to save your files.

"HCPRVR.FLAP.1"

*(loadf "trans.hcp")
Files-Loaded

*{: =====
 Demonstration of translating English to Chinese .
===== }

NIL

*(TRY E1)

((TRANSEC (since 1980 Chinese puppet troupes have made several visits to Europe and the US)

(zicong 1980 nian yilai Zhongguo muou jutuan yijin dao Ouzhou he Meiguo jinxingle duoci fangwen)))

ANOTHER? *N

NIL

*RTIME

(3.258 SECS)

*(TRY E2)

((TRANSEC (they brought this ancient art form to the attention of more
foreigners)
(tamen shide zhezong gudaide yishu xingshi yingqile henduo waiguoren
de zhuyi)))

ANOTHER? *N
NIL

*RTIME
(1.82 SECS)

*(TRY E3)
((TRANSEC (the 1981 American debut of the Fujian puppet troupe was an
unparalleled success)
(Fujian muou jutuan de 1981 nian meiguode souciyianchu shi yige
kongqiande chengong)))

ANOTHER? *N
NIL

*RTIME
(1.032 SECS)

*(TRY E4)
((TRANSEC (in October 1984 the visit of the Shanghai Rod puppet troupe
delighted SanFrancisco audiences)
(zai 1984 nian 10 yue Shanghai Rod muou jutuan de yianchu doulele
SanFrancisco guanzhong)))

ANOTHER? *N
NIL

*RTIME
(1.587 SECS)

*
*{: =====
Demonstration of translating Chinese to English.
===== }

NIL

*
*(TRY C1)
((TRANSC (since 1980 the Chinese puppet troupe have made several visits to
Europe and the US)
(zicong 1980 nian yilai Zhongguo muou jutuan yijin dao Ouzhou he
Meiguo jinxingle duoci fangwen)))

ANOTHER? *N
NIL

*RTIME
(2.183 SECS)

*(TRY C2)
((TRANSC (they brought this ancient art form to the attention of more
foreigners)
(tamen shide zhezong gudaide yishu xingshi yingqile henduo waiguoren
de zhuyi)))

ANOTHER? *N
NIL

*RTIME
(1.78 SECS)

*(TRY C3)
((TRANSC (the 1981 American debut of the Fujian puppet troupe was an
unparalleled success)
(Fujian muou jutuan de 1981 nian meiguode souciyianchu shi yige
kongqiande chengong)))

ANOTHER? *N
NIL

*RTIME
(3.256 SECS)

*(TRY C4)
((TRANSC (in October 1984 the visit of the Shanghai Rod puppet troupe
delighted SanFrancisco audiences)
(zai 1984 nian 10 yue Shanghai Rod muou jutuan de yianchu doulele
SanFrancisco guanzhong)))

ANOTHER? *N
NIL

*RTIME
(2.735 SECS)

*
*{: =====
Statistics of translations.
===== }

NIL

*(TRY E1)
((TRANSEC (since 1980 Chinese puppet troupes have made several visits to Europe
and the US)
(zicong 1980 nian yilai Zhongguo muou jutuan yijin dao Ouzhou he
Meiguo jinxingle duoci fangwen)))

ANOTHER? *Y
((TRANSEC (since 1980 Chinese puppet troupes have made several visits to Europe
and the US)
(zicong 1980 nian yilai Zhongguo muou jutuan yijin dao Ouzhou he
Meiguo jinxingle duoci fangwen)))

ANOTHER? *Y
NIL

*(TRY E2)
((TRANSEC (they brought this ancient art form to the attention of more
foreigners)
(tamen shide zhezhong gudaide yishu xingshi yingqile henduo waiguoren
de zhuyi)))

ANOTHER? *Y

((TRANSEC (they brought this ancient art form to the attention of more
foreigners)
(tamen shide zhezong gudaide yishu xingshi yingqile henduo waiguoren
de zhuyi)))

ANOTHER? *Y
NIL

* (TRY E3)
((TRANSEC (the 1981 American debut of the Fujian puppet troupe was an
unparalleled success)
(Fujian muou jutuan de 1981 nian meiguode souciyianchu shi yige
kongqiande chengong)))

ANOTHER? *Y
((TRANSEC (the 1981 American debut of the Fujian puppet troupe was an
unparalleled success)
(Fujian muou jutuan de 1981 nian meiguode souciyianchu shi yige
kongqiande chengong)))

ANOTHER? *Y
NIL

* (TRY E4)
((TRANSEC (in October 1984 the visit of the Shanghai Rod puppet troupe
delighted SanFrancisco audiences)
(zai 1984 nian 10 yue Shanghai Rod muou jutuan de yianchu doulele
SanFrancisco guanzhong)))

ANOTHER? *Y
((TRANSEC (in October 1984 the visit of the Shanghai Rod puppet troupe
delighted SanFrancisco audiences)
(zai 1984 nian 10 yue Shanghai Rod muou jutuan de yianchu doulele
SanFrancisco guanzhong)))

ANOTHER? *Y
NIL

* (TRY C1)
((TRANSC (since 1980 the Chinese puppet troupe have made several visits to
Europe and the US)
(zicong 1980 nian yilai Zhongguo muou jutuan yijin dao Ouzhou he
Meiguo jinxingle duoci fangwen)))

ANOTHER? *Y
((TRANSC (since 1980 Chinese puppet troupes have made several visits to Europe
and the US)
(zicong 1980 nian yilai Zhongguo muou jutuan yijin dao Ouzhou he
Meiguo jinxingle duoci fangwen)))

ANOTHER? *Y
((TRANSC (since 1980 the Chinese puppet troupe have made several visits to
Europe and the US)
(zicong 1980 nian yilai Zhongguo muou jutuan yijin dao Ouzhou he
Meiguo jinxingle duoci fangwen)))

ANOTHER? *Y

((TRANSC E (since 1980 Chinese puppet troupes have made several visits to Europe and the US)
(zicong 1980 nian yilai Zhongguo muou jutuan yijin dao Ouzhou he Meiguo jinxingle duoci fangwen)))

ANOTHER? *Y
NIL

* (TRY C2)
((TRANSC E (they brought this ancient art form to the attention of more foreigners)
(tamen shide zhezhong gudaide yishu xingshi yingqile henduo waiguoren de zhuyi)))

ANOTHER? *Y
((TRANSC E (they brought this ancient art form to the attention of more foreigners)
(tamen shide zhezhong gudaide yishu xingshi yingqile henduo waiguoren de zhuyi)))

ANOTHER? *Y
NIL

* (TRY C3)
((TRANSC E (the 1981 American debut of the Fujian puppet troupe was an unparalleled success)
(Fujian muou jutuan de 1981 nian meiguode souciyianchu shi yige kongqiande chengong)))

ANOTHER? *Y
((TRANSC E (the 1981 American debut of Fujian puppet troupes was an unparalleled success)
(Fujian muou jutuan de 1981 nian meiguode souciyianchu shi yige kongqiande chengong)))

ANOTHER? *Y
((TRANSC E (the 1981 American debut of the Fujian puppet troupe was an unparalleled success)
(Fujian muou jutuan de 1981 nian meiguode souciyianchu shi yige kongqiande chengong)))

ANOTHER? *Y
((TRANSC E (the 1981 American debut of Fujian puppet troupes was an unparalleled success)
(Fujian muou jutuan de 1981 nian meiguode souciyianchu shi yige kongqiande chengong)))

ANOTHER? *Y
NIL

* (TRY C4)
((TRANSC E (in October 1984 the visit of the Shanghai Rod puppet troupe delighted SanFrancisco audiences)
(zai 1984 nian 10 yue Shanghai Rod muou jutuan de yianchu doulele SanFrancisco guanzhong)))

ANOTHER? *Y

((TRANSC (in October 1984 the visit of Shanghai Rod puppet troupes delighted SanFrancisco audiences)
(zai 1984 nian 10 yue Shanghai Rod muou jutuan de yianchu doulele SanFrancisco guanzhong)))

ANOTHER? *Y

((TRANSC (in October 1984 the visit of the Shanghai Rod puppet troupe delighted SanFrancisco audiences)
(zai 1984 nian 10 yue Shanghai Rod muou jutuan de yianchu doulele SanFrancisco guanzhong)))

ANOTHER? *Y

((TRANSC (in October 1984 the visit of Shanghai Rod puppet troupes delighted SanFrancisco audiences)
(zai 1984 nian 10 yue Shanghai Rod muou jutuan de yianchu doulele SanFrancisco guanzhong)))

ANOTHER? *Y

NIL

*{; =====
* The detailed procedure of translating English to Chinese.
* ===== }

NIL

*{; 1. Translate English into SRE.

*(TRY SENE1)

((SE (since 1980 Chinese puppet troupes have made several visits to Europe and the US)
(made AGT
(troupes NAME Chinese TYPE puppet)
TIME
(1980 PREP since)
AUX
have
AE
(visits MODEL several)
LOC
(Europe PREP to *AND (US DET the))))))

ANOTHER? *

*{; 2. Translate SRE to SRC.

*

NIL

ANOTHER? *

*(TRY ENGLISH1)

((TRANS0 (made AGT
(troupes NAME Chinese TYPE puppet)
TIME
(1980 PREP since)
AUX
have
AE
(visits MODEL several)
LOC

(Europe PREP to *AND (US DET the)))
(jinxingle AGT
(jutuan NAME Zhongguo TYPE muou)
TIME
(1980 MSR nian PREP zicong PREP yilai)
AUX
yijin
AE
(fangwen MODEL duoci)
LOC
(Ouzhou PREP to *HE (Meiguo))))

ANOTHER? *

*{; 3. Generate Chinese from SRC.

*
}

NIL

ANOTHER? *

*(TRY CH1)

((SC (zicong 1980 nian yilai Zhongguo muou jutuan yijin dao Ouzhou he Meiguo
jinxingle duoci fangwen)
(jinxingle AGT
(jutuan NAME Zhongguo TYPE muou)
TIME
(1980 MSR nian PREP zicong PREP yilai)
AUX
yijin
AE
(fangwen MODEL duoci)
LOC
(Ouzhou PREP dao *HE (Meiguo))))

ANOTHER? *

*{; The detailed procedure of translating Chinese to English.

*
}

NIL

ANOTHER? *

*{; 1. Translate Chinese into SRC.

*
}

NIL

ANOTHER? *

*(TRY SENC3)

((SC (Fujian muou jutuan de 1981 nian meiguode souciyianchu shi yige kongqiande
chengong)
(shi AE
(souciyianchu *OF
(jutuan PREP de NAME Fujian TYPE muou)
TIME
(1981 MSR nian)
LOC
meiguode)
AE
(chengong DET yige MODEL kongqiande))))

ANOTHER? *

*{; 2. Translate SRC into SRE.

*
NIL

*(TRY CHINESE3)

((TRANS0 (was AE

(debut DET

the

*OF

(troupe DET the PREP of NAME Fujian TYPE puppet)

TIME

1981

LOC

American)

AE

(success DET an MODEL unparalleled))

(shi AE

(souciyianchu *OF

(jutuan PREP de NAME Fujian TYPE muou)

TIME

(1981 MSR nian)

LOC

meiguode)

AE

(chengong DET yige MODEL kongqiande))))

ANOTHER? *

*{; 3. Generate English from SRE.

*
NIL

ANOTHER? *

*(TRY ENG3)

((SE (the 1981 American debut of the Fujian puppet troupe was an unparalleled success)

(was AE

(debut DET

the

*OF

(troupe PREP of DET the NAME Fujian TYPE puppet)

TIME

1981

LOC

American)

AE

(success DET an MODEL unparalleled))))

ANOTHER? *

*~C

2@POP

[PHOTO: Recording terminated Wed 19-Mar-86 12:51PM]