An Iterative Method of Translation

We have constructed most of PL and have learned how to calculate truth values of compounds in it. We now want to learn how to translate from English to PL. An argument in either language is just a structured set of sentences, so it suffices to learn how to translate sentence by sentence.

Translating simple statements is no problem. Simply pick a capital letter (if one has not been selected already). But compound statements can be tricky. In what follows, we will discuss a few hints about translating types of English sentences, and then a general method (an interactive or stepwise method) for translation, which minimizes the possibility of errors. Think of the hints we give as suggestions for translating idioms. An idiom is a phrase that cannot be translated literally. For example, the French idiom "mon petit choux" means literally "my little cabbage," but is more accurately translated as "sweetheart" or "darling." The English phrases we will examine are idiomatic from the PL point of view.

We begin with the hints. The first two hints pertain to simple statements, the other hints relate to compound statements.

**Hint No. 1:** Spell out indexicals. An indexical is a term that refers to the context of utterance. For example, the pronoun "I" refers to the person who utters it. Other common indexicals are listed in Table 9.5.

In assigning letters to simple statements, fill in all references. Example:

He likes sushi.
Table 9.5  Common English Indexicals

<table>
<thead>
<tr>
<th>Common Indexical</th>
<th>English Equivalent</th>
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<tbody>
<tr>
<td>I</td>
<td>There</td>
</tr>
<tr>
<td>Me</td>
<td>Then</td>
</tr>
<tr>
<td>Myself</td>
<td>Now</td>
</tr>
<tr>
<td>Mine</td>
<td>At that time</td>
</tr>
<tr>
<td>You</td>
<td>At that point</td>
</tr>
<tr>
<td>Yours</td>
<td>Former</td>
</tr>
<tr>
<td>Yourself</td>
<td>Latter</td>
</tr>
<tr>
<td>He, him</td>
<td>We</td>
</tr>
<tr>
<td>She, her</td>
<td>They</td>
</tr>
<tr>
<td>It</td>
<td>Those</td>
</tr>
<tr>
<td>Hers</td>
<td>That</td>
</tr>
<tr>
<td>His</td>
<td>Them</td>
</tr>
<tr>
<td>Its</td>
<td>This</td>
</tr>
<tr>
<td>Himself, herself</td>
<td>At that place</td>
</tr>
<tr>
<td>Itself</td>
<td>Here</td>
</tr>
</tbody>
</table>

should be spelled out completely before symbolization:

\[ R: \text{Renaldo Kupie likes sushi.} \]

**Hint No. 2:** Clarify vagueness and ambiguity. We saw in Chapter 6 that vagueness and ambiguity can lead to logical fallacies. In symbolization, then, take care to assign letters to atomic sentences (simple statements) that are precise and unambiguous.

**Hint No. 3:** Watch out for covert negations. Often a statement that appears simple at first glance is really a negation. Some examples:

Desmond lacks the qualities that make nurses great.

(This is the negation “It is not the case that Desmond has the qualities that make nurses great,” which is translated as \( \neg D \).)

Rhonda is disinclined to accept Giorgio’s word.

(This is the negation “It is not the case that Rhonda is inclined to accept Giorgio’s word,” translated as \( \neg R \).)

Mookie is unconscious.

(This is the negation “It is not the case that Mookie is conscious,” translated as \( \neg M \).)
Although we could symbolize such statements as atomic, they are better symbolized as negations.

Table 9.6 lists the most common English words used to express negation.

**Hint No. 4:** Watch out for the scope of the dash. Compare the following statements:

1. Maria wrote ten incorrect answers.
2. Maria did not write ten correct answers.

In (1), the negation is applied directly to the predicate: Maria wrote ten answers that were not correct. In (2), the negation applies to the whole statement: it is not the case that Maria wrote ten correct answers. Only the latter is correctly symbolizable as \( \neg F \). A similar caution applies to contraries and contradictories as follows:

Sally is sad.

is not the negation of

Sally is happy.

**Hint No. 5:** The word 'and' does not always express conjunction. The virtue of PL is that its words are unambiguous. Not so with English. In particular, while the word 'and' usually expresses conjunction, it does not always do so. Consider these two examples:

1. Juan and Gary are Democrats.
2. Juan and Gary are cousins.

The first statement is equivalent to "Juan is a Democrat and Gary is a Democrat"—clearly a conjunction—whereas the second statement

<table>
<thead>
<tr>
<th><strong>Table 9.6</strong></th>
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<tbody>
<tr>
<td><strong>English Phrase</strong></td>
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<tr>
<td>Not ( \bigcirc )</td>
</tr>
<tr>
<td>It is not the case that ( \bigcirc )</td>
</tr>
<tr>
<td>It is false that ( \bigcirc )</td>
</tr>
<tr>
<td>Non-Occurring inside ( \bigcirc )</td>
</tr>
<tr>
<td>Un-Occurring inside ( \bigcirc )</td>
</tr>
<tr>
<td>Dis-Occurring inside ( \bigcirc )</td>
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<tr>
<td>-less</td>
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</tbody>
</table>
is not equivalent to “Juan is a cousin and Gary is a cousin.” The point is that they are cousins of each other. In that second statement, the word ‘and’ is used relationally: to express relation. The ampersand does not capture this use. Thus (1) is translated as $J \& G$, but (2) is misleadingly translated as $J \& G$.

**Hint No. 6:** Many other words in English besides ‘and’ are used to express conjunction. English has a large vocabulary, capable of expressing many subtle points. PL has a small, precisely defined vocabulary, which is not as expressive. So not surprisingly, something often gets lost in translating English into PL.

Table 9.7 lists some of the most common English phrases or punctuation that express conjunction.

Even though something may get lost in the translation, translate all of them using the ampersand.

For instance, “He whistled while he shaved” means more than that he whistled and that he shaved; the statement asserts that he did both at the same time. But this temporal aspect is lost when we translate into PL. ($W \& S$ is the best we can do.)

The point holds for the word ‘and’ as well. “Nina hit the vase and it broke” does more than just assert the conjunction of the two facts—it asserts a causal link between them. This does not get reflected in the PL translation ($H \& B$). This loss of meaning will not trouble us, however, because the arguments we want to assess using PL do not depend on temporal or causal factors.

**Hint No. 7:** Translate the word ‘or’ with the wedge. The English word ‘or’ is ambiguous. It has an **inclusive sense**, as when a counselor says, “You can satisfy the foreign language requirement by taking either Japanese or German.” The counselor means that you can satisfy the requirement by taking one or the other, or both. On the

<table>
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<th>English Phrase</th>
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<tbody>
<tr>
<td>○ and □</td>
<td>○ moreover □</td>
</tr>
<tr>
<td>○ yet □</td>
<td>○ although □</td>
</tr>
<tr>
<td>○ still □</td>
<td>○ whereas □</td>
</tr>
<tr>
<td>○ while □</td>
<td>○ however □</td>
</tr>
<tr>
<td>○ albeit □</td>
<td>○ also □</td>
</tr>
<tr>
<td>○ even though □</td>
<td>○ but □</td>
</tr>
<tr>
<td>○ nonetheless □</td>
<td>○ ; □</td>
</tr>
<tr>
<td>○ nevertheless □</td>
<td></td>
</tr>
</tbody>
</table>

Table 9.7
other hand, when the menu says, “You may have soup or salad,” it is using the word ‘or’ in the exclusive sense of ruling out (excluding) your having both.

A wedge translates the word ‘or,’ even though that automatically assumes the word is being used in its inclusive sense. If the English sentence explicitly says, “... but not both,” we have a way to translate that into PL. For instance, “You may have soup or salad, but not both” is rendered:

\[(S \lor L) \land \neg(S \land L)\]

(Where \(S = \text{you may have soup}, \ L = \text{you may have salad}.\)

This hint is again only heuristic. In the statement:

Either Fred or Tanya could beat Joe.

what is asserted is conjunction, not a disjunction:

Fred could beat Joe, and Tanya could beat Joe.

**Hint No. 8:** Use a wedge to translate ‘unless’ (always) and ‘without’ (usually). The word ‘unless’ can be translated in various ways, but it is always wise to translate it in the easiest way possible: with a wedge. Thus “John will fail the class unless he does exceptionally well on the final exam” would be best translated as \(F \lor W\).

Words that have the same meaning as ‘unless’ include ‘except,’ ‘save,’ ‘barring,’ ‘supposing not,’ and ‘waiving.’ Here are some examples:

The store is always open, except on Sunday.
The store is always open, save on Sunday.
She will succeed, barring interference by others.
She will succeed, supposing no interference by others.
Waiving interference by others, she will succeed.

All these examples should be translated with the wedge.

A similar point holds with respect to the word ‘without.’ It, too, can be translated in several ways, but the easiest is with the wedge. Thus “Andrea won’t go to the party without her sister” is translated as \(\neg A \lor S\).
Table 9.8 summarizes what we have just discussed. These hints are heuristic tips, as opposed to mechanical rules. As such, they admit exceptions. For example, the sentence:

Mona is going to law school without financial support.

is translated as

\[ L \& \neg F \]

rather than (as the hint suggests)

\[ L \lor \neg F \]

We must understand what we are translating to make sure that our translation captures the initial statement correctly.

**Hint No. 9:** The occurrence of the words ‘either’ and ‘both’ indicates how to bracket the PL sentence. How a PL sentence is bracketed is crucial. \((A \lor B) \& C\) is quite different from \(A \lor (B \& C)\) (at times the first may be T, yet the second may be F). The words ‘either’ and ‘both’ can help you decide how to bracket or, in other words, how to spot the main connective.

Consider these two sentences, both composed of the same words:

1. Either Tibor and Maria or Sue will go.
2. Tibor and either Maria or Sue will go.

The only difference between (1) and (2) is where the word ‘either’ is placed, but it is a big difference. Sentence (1) asserts the disjunction:

\[(T \& M) \lor S\]

whereas (2) asserts the conjunction:

\[T \& (M \lor S)\]

<table>
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<th>English Phrase</th>
<th>Symbolization</th>
</tr>
</thead>
<tbody>
<tr>
<td>○ or □</td>
<td>○ save □</td>
</tr>
<tr>
<td>○ unless □</td>
<td>○ barring □</td>
</tr>
<tr>
<td>Unless ○, □</td>
<td>○ except □</td>
</tr>
<tr>
<td>○ without □</td>
<td>○ waiving □</td>
</tr>
</tbody>
</table>

\[O \lor □\]
The word ‘either’ signals that the material which follows it and comes before the ‘or’ is to be bundled together by brackets.

A similar point holds regarding the word ‘both.’ Compare:

1. Both Fred or Tibor and Sue will go.
2. Fred or both Tibor and Sue will go.

(1) is translated as

\[(F \lor T) \& S\]

(2) as

\[F \lor (T \& S)\]

with the placement of the word ‘both’ making the difference in bracketing.

**Hint No. 10:** Translate “neither ○ nor □” as \(\neg\,\neg\,\&\,\neg\). The phrase “neither ○ nor □” habitually causes problems. Consider the claim:

You will get neither a-Porsche nor a Ferrari for Christmas.

What claim is being made? One way to put it is:

You are not getting a Porsche and you are not getting a Ferrari for Christmas.

Picking the letters \(P\) and \(F\) for the simple statements “You will get a Porsche” and “You will get a Ferrari,” respectively, we can render this as \(\neg P \& \neg F\). But we can also equivalently say:

It is not the case that you are getting either a Porsche or a Ferrari for Christmas.

which can be rendered \(\neg(P \lor F)\). We may choose to translate “neither ○ nor □” as \(\neg\,\&\,\neg\) or as \(\neg(\neg\,\lor\,\neg)\), but a good idea is to choose one way and always stick with that practice. We will accordingly always symbolize “neither ○ nor □” as \(\neg\,\&\,\neg\).

But both \(\neg(P \& F)\) and \(\neg P \lor \neg F\) are bad translations. The first says that you will not get both the Porsche and the Ferrari—but it leaves it open that you might get one of them. \(\neg P \lor \neg F\) is bad, since
it says you will either not get the Porsche or not get the Ferrari. But that leaves open the chance that you might get one of them.

The reason the phrase “neither $\bigcirc$ nor $\blacksquare$” is an idiom in PL is that we don’t have a connective which allows us to symbolize the phrase directly (that is, in the form $\bigcirc \lor \blacksquare$). The reason we don’t have such a connective (the ‘nor’ connective) is explained in Section 9.13.

**Hint No. 11:** When the words ‘both’ and ‘not’ occur together in a sentence, the one that occurs first is usually the main connective. Consider these examples:

1. Bush and Clinton will not both be elected.
2. Bush and Clinton will both not be elected.

(1) states the trivial fact that any presidential election can only have one winner. We translate this as:

$$-(B \& C)$$

(2) says more—it says that Bush will lose and Clinton will lose. It is translated:

$$-B \& -C$$

**Hint No. 12:** Restore proper clause order before translating. English evolved as a spoken language. A consequence is that we often encounter clauses put at the end of the sentence for rhetorical emphasis. For example, an instructor might express the statement:

You will fail unless you study.

as:

Unless you study, you will fail.

to dramatize what will happen to the student if that student does not study. Before translating such a sentence, restore the logical clause order:

$$\bigcirc \text{ unless } \blacksquare$$
In PL, the wedge connects two sentences together; a string of the form:

\[ \lor \quad \square \]

makes no sense.

Indeed, several other English words are often found in front of the clauses they connect:

\[ \text{While } \lor, \square \]
\[ \text{Even though } \lor, \square \]
\[ \text{Unless } \lor, \square \]
\[ \text{Without } \lor, \square \]

In every case, we should bring the end clause out front before symbolizing. This will be especially important in Section 9.7.

So much for hints. Let us talk now about a general method for translating from English to PL. Keep in mind that while computation is something that can be done mechanically, translation involves insight and understanding. But the following approach to translation can maximize the chances of success.

The stepwise method of translating involves doing the translation in steps or \textit{iteratively}: translating only one connective at a time. Recall our earlier discussion in Chapter 1 (Section 1.2) of heuristics. We found that, as a general rule of problem-solving, we should try to tackle a big problem in stages. This rule lies behind the method we discuss now.

Suppose we are asked to symbolize the compound:

\[ \text{Unless both SANDRA and DOLORES don't show up, the PARTY will be a success.} \]

\textbf{Step 1:} Select some constants. The choice is entirely ours, except that we must be consistent—a capital letter must stand for one and only one simple statement. To make things easier, I have capitalized some words in these examples to indicate which letters to choose. In our example:

\[ S = \text{Sandra shows up.} \]
\[ D = \text{Dolores shows up.} \]
\[ P = \text{The party will be a success.} \]
Step 2: Spot the main connective, restore clause order if necessary, and then symbolize just that one connective. Put the remaining English in brackets.

[The party will be a success] \( \lor \) [both Sandra doesn’t show up and Dolores doesn’t show up.]

(Fill in omitted words whenever you can.)

Step 3: Repeat step 2 on each bracketed part. Whenever you hit a simple statement, replace it by the corresponding capital letter.

\( [P] \lor [\neg (\text{Sandra does not show up}) \land \neg (\text{Dolores does not show up})] \)

\( P \lor \neg (\text{Sandra shows up}) \land \neg (\text{Dolores shows up}) \)

\( P \lor \neg S \land \neg D \)

Do not try to solve it all at once. Break the problem down into parts.

Example: Either it isn’t true both that the WARREN Report is biased and that Garrison’s case is PLASABLE, or it isn’t at all true that both OSWALD was not guilty and that he was COMMUNIST-inspired.

Step 1: \( W = \) The Warren Report is biased.
\( P = \) Garrison’s case is plausible.
\( O = \) Oswald was guilty.
\( C = \) Oswald was communist-inspired.

Step 2: [It is not true both that the Warren Report is biased and that Garrison’s case is plausible.] \( \lor \) [It is not true both that Oswald was not guilty and that he was communist-inspired.]

Step 3: [The Warren Report is biased and Garrison’s case is plausible] \( \lor \) \[Oswald was not guilty and Oswald was communist-inspired.\]

Step 4: \( \neg (W \land P) \lor \neg (\neg O \land C) \)

Example: Either Juan will take Mary to the dance and Fred will take Billie Mae, or else Juan will take Billie Mae and Fred will take Mary, but one thing’s sure—Juan won’t take Fred.

Step 1: \( J = \) Juan takes Mary to the dance.
\( F = \) Fred takes Billie Mae to the dance.
H = Juan takes Billie Mae to the dance.
L = Fred takes Mary to the dance.
K = Juan takes Fred to the dance.

Our artificial language is so sparse that it cannot show tenses—"Juan takes Mary to the dance," "Juan took Mary to the dance," and "Juan will take Mary to the dance" are all symbolized the same way.

**Step 2:** \{Either (Juan takes Mary and Fred takes Billie Mae) or (John takes Billie Mae and Fred takes Mary)\} and (It is not the case that John takes Fred.)

**Step 3:** \{[(Juan takes Mary) and (Fred takes Billie Mae)] or [(Juan takes Billie Mae) and (Fred takes Mary)]\} and \(\neg K\).

**Step 4:** \((J & F) \lor (H & L)\) \& \(\neg K\)

**CISES 9.6**

*Symbolize the following sentences. Pick sentential constants suggested by the words in capital letters. (An asterisk indicates problems that are answered in the back of the book.)*

*Example:* Unless FRED objects, KELLY will go to the dance.

becomes:

KELLY will go to the dance unless FRED objects.

which is symbolized:

\(K \lor F\)

1. Either Paolo won’t go to COLLEGE or else he will go to NIGHT school.
2. JACQUE or KAREN will buy the tacos.
3. ALI won’t marry Sue and neither will BILL.
4. YVETTE won’t help Andrea unless Andrea’s SISTER doesn’t help Andrea.
5. Without YVETTE helping her, ANDREA won’t pass the exam.
6. Either JACQUE and BILL both went up the hill or else they both didn’t.
7. Either JACQUE and BILL went up the hill, or else Jacque went without Bill.
8. Unless KIM fails to fix the car, GARY and BINDHU will drive to Barstow.