Translating Between English and Propositional Logic

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English Sentences Expressing Complex Propositions and Their Usual PL Counterparts

Translating the Connectives

Negation

(In the following, E and F abbreviate English declaratives that are translated into PL as P and Q, respectively.)

- Negation is easy to recognize because it almost always includes the word *not* or morphemes like *un-*, *ir-*, etc.

- For example, *it's not the case that E* or *it's not true that E.*

- Other instances include declarative expressions containing an embedded *not*. Example:

  (1)   a. Clint went to the Chatterbox Cafe.
          b. Clint did not go to the Chatterbox Cafe.

- If (1a) is translated as P, then (1b) is translated as $\neg P$.

Conjunction

- Conjunction sometimes involves the word *and*, **but not always**.

- If E and F are English declaratives, then *E and F*, *E but F*, *E nonetheless F*, *E however F*, *E nevertheless F*, and *E moreover F* are all translated as PL conjunctions. For example:

  (2)   Pastor Ingqvist is a Lutheran but Father Wilmer is not.

- If *Pastor Ingqvist is a Lutheran* is translated as P and *Father Wilmer is a Lutheran* as Q, then (2) is translated as $P \wedge \neg Q$.

Disjunction

- Disjunction usually involves the word *or* (but is inclusive in PL). Sentences like *E or F* and *either E or F* are translated using or as $P \vee Q$.

Implication

- Implication is used to capture conditionality.

- English sentences like the following are all translated using PL implication: *if E then F*; *F provided that E*; *assuming E, F*; *E only if F*; *F if E*; and *F given E.*

- (3)   Wally eats Powdermilk biscuits only if Evelyn makes them.

- With *Wally eats Powdermilk biscuits* as P and *Evelyn makes them* as Q, we translate (3) into PL as $P \rightarrow Q$.

Biimplication

- Biimplication makes a stronger claim than the conditional. It's used to translate English sentences of the form *E if and only if F* and *E just in case F.*

Note

Translating certain English constructions into PL may involving combining one or more of the approaches described above.

Common Combinations

Negated Disjunction

- English sentences like *neither . . . nor . . .* are essentially a negated disjunction, a negative version of *either . . . or . . . .*

  (4)   Florian neither washed the car nor went to the mercantile.

- With *Florian washed the car* as P and *Florian went to the mercantile* as Q, we translate (4) as $\neg(P \vee Q)$.

Negated Conjunction

- Sometimes we also negate conjunctions in English. This kind of sentence usually takes the form *it's not true that both E and F* or *not E and F.*

- (5)   It's not true that Clint owns both a Ford and a Chevy dealership.

- Given that *Clint owns a Ford dealership* is translated as P and *Clint owns a Chevy dealership* is translated as Q, a translation of (5) would be $\neg(P \wedge Q)$.

Unless . . .

- One of the more confusing English words to translate is *unless.*

- This word expresses a dependency between two propositions, but one which is not always as straight-forward as the conditional with *if . . . then . . . .*

- For example:

  (6)   Myrtle doesn't cook a Walleye unless Clint catches it.

- If *Myrtle cooks a Walleye* is P and *Clint catches a Walleye* is Q, then (6) can be translated as either $\neg Q \rightarrow \neg P$, $P \rightarrow Q$, or $\neg P \vee Q$.

- Why can we choose any of these three?

Homework

Exercises

Problem 1. Come up with a translation of each of the following English sentences into PL:

    a. It didn't rain in Lake Wobegon, however it did snow there.

    b. Provided the lutefish shipment arrives on time, Pastor Ingqvist can have the festival on Sunday.

    c. Clarence goes down the fish shack just in case the weather is perfect.

    d. Myrtle didn't make it to the Sidetrack Tap today.

    e. Either the mercantile is closed for repairs, or it's not a weekday.

    f. Neither Clint nor Clarence were able to catch a Walleye.

    g. Wally and Evelyn don't both have to show up to work the beer cart.