LIN380M Semantics I Homeworks

Zeyuan Hu, iamzeyuanhu@utexas.edu

EID:zh4378 Spring 2018

1 HW1

Translate the following sentences into predicate logic. (You may choose your own letters to serve as non-logical constants. Translate "but" as if it were "and")

1. **John loves Mary, but she doesnt love him.**

   $\texttt{love}(J, M) \wedge \neg\texttt{love}(M, J)$

2. **John believes all things that Mary believes and some other things as well.**

   $(\forall y)((\texttt{things}(y) \wedge \texttt{believe}(M, y)) \rightarrow \texttt{believe}(J, y)) \wedge (\exists x)(\texttt{things}(x) \wedge \texttt{believe}(J, x) \wedge \neg\texttt{believe}(M, x))$

3. **If a cat and a mouse are in the same room and the mouse doesnt run away, then either the mouse is dead or the cat is dead.**

   $(\forall x)(\forall y)(\texttt{cat}(x) \wedge \texttt{mouse}(y) \wedge \texttt{inTheSameRoom}(x, y) \wedge \neg\texttt{runAway}(y)) \rightarrow (\texttt{dead}(x) \vee \texttt{dead}(y))$ [1]

4. **Everyone who has two jobs neglects one of them.**

   $(\forall x)(\exists y)(\exists z)(\texttt{Human}(x) \wedge \texttt{job}(y) \wedge \texttt{job}(z) \wedge \texttt{hasJob}(x, y) \wedge \texttt{hasJob}(x, z)) \rightarrow ((\texttt{neglect}(y) \wedge \neg\texttt{neglect}(z)) \vee (\texttt{neglect}(z) \wedge \neg\texttt{neglect}(y)))$

5. **If an argument with two premises is valid and its conclusion is false, then one of the premises is false.**

   $((\forall x)(\forall y)(\forall z)(\forall k)(\texttt{argument}(x) \wedge \texttt{premise}(y) \wedge \texttt{premise}(z) \wedge \texttt{belongToArgument}(y, x) \wedge \texttt{belongToArgument}(z, x) \wedge \texttt{valid}(x)) \rightarrow (\neg\texttt{conclusion}(k))) \rightarrow (\neg y \vee \neg z)$

6. **There are three dishes that John doesnt like.**

   $((\exists x)(\exists y)(\exists z)(\texttt{dish}(x) \wedge \texttt{dish}(y) \wedge \texttt{dish}(z))) \rightarrow (\neg\texttt{like}(J, x) \wedge \neg\texttt{like}(J, y) \wedge \neg\texttt{like}(J, z))$

[1] Here, I interpret "either ... or" as `OR` in logic term. If we treat "either ... or" as `XOR` instead, the PC of the sentence then becomes $(\forall x)(\forall y)(\texttt{cat}(x) \wedge \texttt{mouse}(y) \wedge \texttt{inTheSameRoom}(x, y) \wedge \neg\texttt{runAway}(y)) \rightarrow ((\texttt{dead}(x) \wedge \neg\texttt{dead}(y)) \vee (\texttt{dead}(y) \wedge \neg\texttt{dead}(x)))$