Assignment3 – Fragment 2

Problem 3.1 (Recap: Model generation with propositional tableaux)

Objective: apply *propositional tableau calculus*

Use the *propositional tableau calculus* to generate a *models* for the *propositional formula*.

$$(A \vee B) \wedge \neg(A \wedge C) \wedge (\neg C \vee \neg A)$$

Hint: The *formula* above has *conjunction* with three *conjuncts*. For your *tableau* you may want to add parentheses so that the *tableau rules* for the (*binary*) *connectives* apply more easily.

Problem 3.2

Consider the *sentence*

The dog chased the cat. It climbed up the tree.

1. Construct a *model generation tableau* to *represent* the following *discourse*, incorporating only *information* contained in the *sentences*.

   Hint: You can treat "*climbed up*" as a complex *transitive verb* with *translation* climbed-up'.

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2. How many possible *readings* are *predicted*?
3. Now modify the *tableau* by including a *representation* of the *world knowledge* that the dog does not climb up anything.

Problem 3.3 (Problems with Fragment 2)

1. Consider the following *discourse*

   Peter lives in Edinburgh. He has a dog John.

   Let us assume the following *translation* to *logic*

   $$livein(peter, edinburgh)$$

   $$have(X, john) \wedge dog(john)$$

   and the *world knowledge*

   $$(have(A,B) \wedge dog(B) \Rightarrow human(A))^{\mathsf{T}}$$

   $$(city(C) \Rightarrow \neg human(C))^{\mathsf{T}}$$

   $$(dog(D) \Rightarrow \neg human(D))^{\mathsf{T}}$$

   $$city(edinburgh)^{\mathsf{T}}$$

   Construct a *model generation tableau*.

2. Now let us assume that we do not *know* the name of the dog:

   Peter lives in Edinburgh. He has a dog.

   We can introduce a *variable* Y for the dog instead:

   $$livein(peter, edinburgh)$$

   $$have(X, Y) \wedge dog(Y)$$

   Why does the *model generation* not work in this case? How could it be fixed?

3. Let us consider the following piece of (hypothetical) *world knowledge*:

   Every human who lives in Edinburgh has a dog.

   We could *represent* it as

   $$human(H) \wedge live(H, edinburgh) \Rightarrow have(H, D) \wedge dog(D)$$

   Why is this problematic? What would go wrong if you add this *world knowledge* to the first subproblem of this problem?