

**William Daniels**  
**CSCI 4202**  
**Artificial Intelligence**  
**Homework #5 02/25/2015**

1. First, we'll re-list the axioms from assignment 4 in clause form:

- (a)  $\neg food(x_1) \vee like(x_1, John)$
- (b)  $food(Apples)$
- (c)  $food(Chicken)$
- (d)  $\neg eats(x_4, y_4) \vee killedBy(x_4, y_4) \vee food(x_4)$
- (e)  $\neg eats(Peanuts, Bill) \vee \neg killedBy(peanuts, Bill)$
- (f)  $\neg eats(x_6, Bill) \vee eats(x_6, Sue)$

alright, excellent, now we're going to prove that John likes peanuts. So, first we negate our statement and put it into clause form (in that order!):  $\neg like(Peanuts, John)$

Sweet, now using a substitution we apply the resolution procedure as follows:

$$\neg like(Peanuts, John)$$

$$1 \rightarrow \text{Replacement: } \left( \frac{Peanuts}{x_1} \right) \neg food(Peanuts)$$

$$4 \rightarrow \text{Replacement: } \left( \frac{Peanuts}{x_4}, \frac{Bill}{y_4} \right) \neg eats(Peanuts, Bill) \vee killedBy(Peanuts, Bill)$$

$$5 \rightarrow \neg eats(Peanuts, Bill) \vee \neg eats(Peanuts, Bill)$$

this is true and true, therefore, our clause is false, John does not like peanuts.

2. First, we represent the facts in predicate logic:

- (1)  $ClubMember(Joe)$
- (2)  $ClubMember(Sally)$
- (3)  $ClubMember(Ellen)$
- (4)  $ClubMember(Bill)$
- (5)  $Married(Joe, Sally)$
- (6)  $Siblings(Bill, Ellen)$
- (7)  $\forall x, \forall y : ClubMember(x) \wedge married(x, y) \rightarrow ClubMember(y)$
- (8)  $LastMeetingAtHouseOf(Joe)$

Now, for part (b) we need to turn this into clause form, which is thankfully very simple:

- (1) *ClubMember(Joe)*
- (2) *ClubMember(Sally)*
- (3) *ClubMember(Ellen)*
- (4) *ClubMember(Bill)*
- (5) *Married(Joe, Sally)*
- (6) *Siblings(Bill, Ellen)*
- (7)  $\neg \text{ClubMember}(x_7) \vee \neg \text{married}(x_7, y_7) \vee \text{ClubMember}(y_7)$
- (8) *LastMeetingAtHouseOf(Joe)*

easy enough, Now. we need to try and decide the truth of the requested information, first: *LastMeetingAtHouseOf(Sally)* Now, we negate it, and begin our resolution procedure:

$$\neg \text{LastMeetingAtHouseOf}(Sally)$$

$$8 \rightarrow \text{Replacement: } \left( \frac{Joe}{Sally} \right) \text{Nothingelsetodo, wearefinished. } \square$$

now for, Ellen not being married. This one we cannot do, since the clause:  $\neg \text{married}(Ellen, y)$  there is no associated item which which to pair it, therefore we must add some facts to the database. we add:

$$(9) \forall x \forall y : \text{siblings}(x, y) \rightarrow \neg \text{married}(x, y)$$

then into clause form:  $\neg \text{siblings}(x_9, y_9) \vee \text{married}(x_9, y_9)$  From there it becomes simple, the derivation looks like the following:

$$\neg \text{married}(Ellen, x)$$

$$9 \rightarrow \text{Replacement: } \left( \frac{x}{y_9} \right) \text{Siblings}(Ellen, x)$$

$$6 \rightarrow \text{Replacement: } \left( \frac{Bill}{y_9} \right)$$

Nothing else to do, we are finished. Ellen and Bill would not be siblings in this case, contradiction.  $\square$