MODULE 2: KR EXERCISE

Sentences

- Stay at home as much as possible (C_1)
- work from home if you can (C_2)
- limit contact with other people (C_3)
- Keep your distance if you go out (2 metres apart where possible) (C_4)
- do not leave home if you or anyone in your household has symptoms (C_5)
- wash your hand regularly (C_6)

① I extend the knowledge with

- If you follow the above rule you're safe (C_7)
- If you do not follow the above rule you're ~~not~~ unsafe (C_8)
- Unsafe people can be infected (C_9)
- Infected people might die, or ~~if~~ infected other unsafe people. (C_{11})
  (C_{10})

② I decide to use FOL to encode the Knowledge.

C_1: $\forall x$ Human$(x) \rightarrow$ Stay-home(x)

C_2: $\forall x$ Human$(x) \rightarrow$ Work-from-home(x)

C_3: $\forall x \forall y$ Human$(x) \wedge$ Human$(y) \wedge \neg(x=y) \rightarrow$ limit_contact(x,y)

C_4: $\forall x$ Human$(x) \wedge$ Go-out$(x) \rightarrow$ Keep_distance(x)

C_5: $\forall x$ Human$(x) \wedge ($Symptoms$(x) \vee \exists y$Havehelds$(y) \wedge$ Symptoms$(y))$

$\qquad \rightarrow$ stay-home(x)

C_6: $\forall x$ Human$(x) \rightarrow$ Wash-hands(x)

C_7: $\forall x . \underbrace{(C_1 \wedge C_2 \wedge C_3 \wedge C_4 \wedge C_5 \wedge C_6)}_{\text{for brevity}} \rightarrow$ Safe(x)

C_8: $\forall x \overbrace{\neg(C_1 \wedge C_2 \wedge C_3 \wedge C_4 \wedge C_5 \wedge C_6)}^{\text{for brevity}} \rightarrow$ Unsafe(x)

C_9: $\forall x$ (Human$(x) \wedge$ Infected$(x) \rightarrow$ Unsafe$(x))$

C_{10}: $\forall x$ (Human$(x) \wedge$ ill$e(x) \rightarrow$ Infected$(x))$

C_{11}: $\forall x$ (Human$(x) \wedge$ Unsafe$(x) \rightarrow (\exists y$. Transmit$(y,x) \rightarrow$ Human$(y) \wedge$ Infected$(y))$

I selected FOL, because we need to reason on relations between formulae components (between "objects").

③ Let's add some individuals to our Knowledge base:

Human (Clara).   Transmit(Mary, Bob).
Human (Bob).
Safe (Clara).
Unsafe (Bob).
Human (Mary).
Unsafe (Mary).
Infected (Mary).

④ A possible query is the following

$$\exists x \; Human(x) \wedge Transmit(x,y) \wedge Human(y) \; ?$$

☆ With the individuals introduced in point 3, the answer to this query is $X = Mary$.