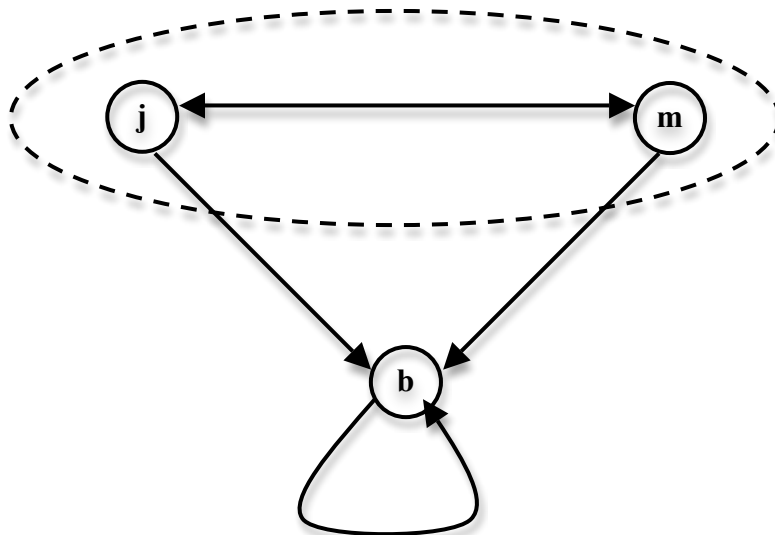


1 Value assignment to type-theoretic logical constants



The diagram graphically represents a model structure $M = \langle U, V \rangle$ with a universe consisting of our old friends John, Bill, and Mary. The dashed line encloses those individuals who are students, the arrow indicates the helping relation.

Write out the value assignment function V_M for the following lexical expressions / type-theoretic non-logical constants:

- (a) $\text{john}', \text{bill}', \text{mary}' \in \text{Con}_e$
- (b) $\text{student}' \in \text{Con}_{(e,t)}$
- (c) $\text{help}' \in \text{Con}_{(e,(e,t))}$
- (d) $E \in \text{Con}_{(e,(e,t))}$; take E to be the second-order predicate that denotes those predicates which apply to some student
- (e) $N \in \text{Con}_{((e,t),(e,t))}$; take N to be the predicate modifier that maps all first-order one-place predicates to their complement

Hint: Instead of explicit enumeration of argument-value pairs, you may, where applicable:

- use the more compact set notation instead of the function notation (think of characteristic functions!)
 - specify the function in a systematic way.
- (f) How would you describe the meaning of the constants E and N intuitively? In which relation do they stand to standard FOL concepts?

2 Interpretation of type-theoretic expressions

Compute the truth value of the following type-theoretic expressions in M , using the recursive definition of interpretation given in the slides. \mathcal{F} is a variable over first-order predicates ($\in \text{Var}_{(e,t)}$).

- (a) $\forall x(\text{help}'(x)(x) \rightarrow \neg \text{student}'(x))$
- (b) $\forall \mathcal{F} \exists x \mathcal{F}(x)$
- (c) $\exists \mathcal{F}(\mathbf{E}(\mathcal{F}) \wedge \mathbf{E}(\mathbf{N}(\mathcal{F})))$

To be turned in by Thursday, 2009-06-25