

**Definition** (Union of design problems). Given two design problems  $\mathbf{f} : \mathbf{A} \multimap \mathbf{B}$  and  $\mathbf{g} : \mathbf{A} \multimap \mathbf{B}$ , their *union*  $\mathbf{f} \vee \mathbf{g} : \mathbf{A} \multimap \mathbf{B}$  is defined by

$$(\mathbf{f} \vee \mathbf{g}) : \mathbf{A}^{\text{op}} \times \mathbf{B} \rightarrow_{\text{Pos}} \mathbf{Bool}$$

$$\langle a^*, b \rangle \mapsto \mathbf{f}(a^*, b) \vee \mathbf{g}(a^*, b).$$