Given a design problem  $\mathbf{d}: \mathbf{P} \times \mathbf{R} \longrightarrow \mathbf{Q} \times \mathbf{R}$ , its trace  $\mathrm{Tr}^{\mathbf{R}}_{\mathbf{P},\mathbf{Q}}(\mathbf{d}): \mathbf{P} \longrightarrow \mathbf{Q}$  is

defined as follows:

**Definition** (Trace of a design problem)

 $\operatorname{Tr}_{\mathbf{P},\mathbf{O}}^{\mathbf{R}}(\mathbf{d}): \mathbf{P}^{\mathrm{op}} \times \mathbf{Q} \to_{\mathbf{Pos}} \mathbf{Bool},$ 

 $\langle p^*, \mathbf{q} \rangle \mapsto \sqrt{\mathbf{d}(\langle p, r \rangle^*, \langle \mathbf{q}, r \rangle)}.$