Notations Used in the Talk, “AiracV’s Design”

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function composition

$$\begin{array}{rcl} \circ & : & (A \to B) \to (C \to A) \to (C \to B) \\ (f \circ g)\ x & = & f\ (g\ x) \end{array}$$

identity function

$$\begin{array}{rcl} id & : & A \to A \\ id\, x & = & x \end{array}$$

set manipulation and lifting

$$\begin{array}{rcl} \{\} & : & A \to 2^A \\ \{\}\ x & = & \{x\} \\ \\ \bigcup & : & 2^{2^A} \to 2^A \\ \bigcup\ X & = & \{a \in A' \mid A' \in X\} \\ \\ \{f\} & : & 2^A \to 2^B \\ & & \text{where } f : A \to B \\ \{f\}\ A' & = & \{f\ a \mid a \in A'\} \end{array}$$

vector projection and lifting

$$\begin{array}{rcl} \pi_{\vec{i}} & : & A_1 \times \cdots \times A_n \to A_{i_1} \times \cdots \times A_{i_k} \\ \pi_{\vec{i}}\ \vec{a} & = & a_{i_1}, \cdots, a_{i_k} \text{ where } \vec{a} = a_1, \cdots, a_n \\ & & \text{and } \vec{i} = i_1, \cdots, i_k \text{ and } 1 \leq \forall i_j \leq n \\ \\ \vec{f} & : & A^* \to B^* \text{ where } f : A \to B \\ \vec{f}\ \vec{a} & = & f\ a_1, \cdots, f\ a_n \text{ where } \vec{a} = a_1, \cdots, a_n \end{array}$$

function pairing

$$\begin{array}{rcl} \langle f_1, \cdots, f_n \rangle & : & A \to B_1 \times \cdots \times B_n \\ & & \text{where } f_i : A \to B_i \\ \langle f_1, \cdots, f_n \rangle\ a & = & (f_1\ a, \cdots, f_n\ a) \end{array}$$

$$\begin{array}{rcl} \langle\!\langle f_1, \cdots, f_n \rangle\!\rangle & : & A_1 \times \cdots \times A_n \to B_1 \times \cdots \times B_n \\ & & \text{where } f_i : A_i \to B_i \\ \langle\!\langle f_1, \cdots, f_n \rangle\!\rangle & = & \langle f_1 \circ \pi_1, f_n \circ \pi_n \rangle \end{array}$$

relation from/to function

$$\begin{array}{rcl} \mathit{index} & : & 2^{A \times B} \to (A \to 2^B) \\ \mathit{index}\ R & = & \{a \mapsto \{b \mid (a,b) \in R\} \mid (a,b') \in R\} \end{array}$$

$$\begin{array}{rcl} \mathit{couple} & : & (A \to 2^B) \to 2^{A \times B} \\ \mathit{couple}\ m & = & \{(a,b) \mid a \mapsto B' \in m, b \in B'\} \end{array}$$

splitting and mixing tagged union

$$\begin{array}{rcl} \mathit{split} & : & 2^{A+B} \to (2^A \times 2^B) \\ \mathit{split}\ X & = & (\{x_A \in X\}, \{x_B \in X\}) \end{array}$$

$$\begin{array}{rcl} \mathit{mix} & : & (2^A \times 2^B) \to 2^{A+B} \\ \mathit{mix}\ (A', B') & = & \{x_A \mid x \in A'\} \cup \{x_B \mid x \in B'\} \end{array}$$

merging images of maps

$$\begin{array}{rcl} \mathit{merge} & : & 2^{A \to B} \to (A \to 2^B) \\ \mathit{merge}\ M & = & \{a \mapsto (M\ a) \mid m \in M, a \mapsto b' \in m\} \\ & & \text{where } M\ a = \{b \mid m \in M, a \mapsto b \in m\} \end{array}$$

map abstractions

$$\begin{array}{rcl} \alpha_{\Rightarrow}(f,g) & : & (A \to B) \to (\hat{A} \to \hat{B}) \ \ \text{where} \\ & & f : 2^A \to \hat{A} \ \ \text{and} \ \ g : 2^B \to \hat{B} \\ \alpha_{\Rightarrow}(f,g)\ m\ \hat{a} & = & g\ \{b \mid a \mapsto b \in m, (f\ a) \sqcap \hat{a} \neq \bot\} \end{array}$$

$$\begin{array}{rcl} \alpha_{\to}(p,g) & : & (A \to B) \to (A' \to \hat{B}) \ \ \text{where} \\ & & p : A \to A' \ \ \text{and} \ \ g : 2^B \to \hat{B} \\ \alpha_{\to}(p,g)\ m\ a' & = & g\ \{b \mid a \mapsto b \in m, p\ a = a'\} \end{array}$$

components of sequence

$$\begin{array}{rcl} \mathit{slices} & : & A^* \to 2^A \\ \mathit{slices}\ \vec{a} & = & \{a_i\} \text{ where } \vec{a} = a_1, a_2, \cdots, a_n \end{array}$$