Bigraphs: a model for mobile agents

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I. How agents are linked and placed independently
II. How to build complex systems from simple ones
III. Dynamical theory, illustrated for CCS
IV. Stochastic dynamics, e.g. for membrane budding
V. Foundation for behavioural equivalence
VI. Ubiquitous systems: a context for bigraphs

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Lecture I
How agents are linked and placed independently

A fanciful system

The bi-structure of bigraphs

A bare bigraph $G$

its forest

its hypergraph

How to build bigraphs? Give them interfaces ...
An interface takes the form \( \langle m, X \rangle \). The origin is \( \epsilon \overset{\text{def}}{=} \langle 0, \emptyset \rangle \).
A built environment $G$

Each node has a control, with arity, e.g. $A$ has arity 2.

\[
G = \neg B_z \cdot (\text{Roomfull}_{xz} \mid \neg y A_{xy} \mid \text{Roomfull}_{xz}) \parallel \text{Roomfull}_{zw}
\]

where $\text{Roomfull}_{xz} \triangleq R_z \cdot \neg y (A_{xy} \mid C_{yz})$.

The signature $\mathcal{K} = \{A : 2, B : 1 \ldots\}$ gives controls with arities.

The complete system $H \circ G$

\[
H = id_1 \mid id_x \mid \neg w B_w \cdot (\neg y A_{xy} \mid R_z \cdot \neg y C_{yw} \mid id_w \mid id_1).
\]

...... and after one reaction
......and after two reactions

Three possible reaction rules

(1) \[ A \rightarrow A \]
(2) \[ A \rightarrow R \]
(3) \[ A \rightarrow C \]

The anatomy of bigraphs

place = root or node or site
link = edge or outer name
point = port or inner name