



Dimension (CLUSTER)	Summary	Range of key examples
INTERACTION	How do users manifest their ideas, evaluate the result, and generate new ideas in response?	
Feedback Loops	How wide are the various gulfs of <i>execution</i> and <i>evaluation</i> and how are they related?	Immediate Feedback (short) vs. batch mode (long) gulf of evaluation
Modes of Interaction	Which sets of feedback loops only occur together?	Setup vs. editing vs. debugging
Abstraction Construction	How do we go from abstractions to concrete examples and vice versa?	Programming by Example vs. first principles
NOTATION	How are the different textual / visual programming notations related?	
Notational Structure	What notations are used to program the system and how are they related?	Notations overlap and need sync vs. complement each other
Surface / Internal Notations	What is the connection between what a user sees and what a computer program sees?	Sequence Editing vs. Rendering, Structure Editing vs. Recovery
Primary / Secondary Notations	Is one notation more important than others?	Secondary build scripts vs. visual editor and code on equal footing in Flash
Expression Geography	Do similar expressions encode similar programs?	Concise yet error-prone vs. explicit yet verbose
Uniformity of Notations	Does the notation use a small or a large number of basic concepts?	Lisp S-expressions vs. English-like textual notations
CONCEPTUAL STRUCTURE	How is meaning constructed? How are internal and external incentives balanced?	
Conceptual Integrity vs. Openness	Does the system present as elegantly <i>designed</i> or pragmatically <i>improvised</i> ?	Integrity (Everything is a X) vs. openness (compatible mixtures)
Composability	What are the primitives? How can they be combined to achieve novel behaviors?	Sequence, selection, repetition, function abstraction, recursion, logical connectives
Convenience	Which wheels do users not need to reinvent?	Small vs. expansive standard libraries
Commonality	How much is <i>common structure</i> explicitly marked as such?	Common structure is redundantly flattened vs. factored out
CUSTOMIZABILITY	Once a program exists in the system, how can it be extended and modified?	
Staging of Customization	Must we customize <i>running</i> programs differently to <i>inert</i> ones? Do these changes last beyond termination?	Source code vs. config files, Developer Tools tab, auto image-based persistence, scripting language
Externalizability	Which portions of the system's state can be referenced and transferred to/from it?	None (state is private) vs. all state exposed as human-legible, CSS-like addressing
Additive Authoring	How far can the system's behavior be changed by <i>adding</i> expressions?	None (requires power to change original) vs. full (anything can be overridden repeatedly)
Self-Sustainability	How far can the system's behavior be changed from within?	None (rely on external tools) vs. self-sufficient (contains everything needed)
COMPLEXITY	How does the system structure complexity and what level of detail is required?	
Factoring of Complexity	What programming details are hidden in reusable components and how?	Domain-specific (more hiding) vs. general-purpose (less hiding)
Level of Automation	What part of program logic does not need to be explicitly specified?	Garbage collection (low-tech) vs. Prolog engine (hi-tech)
ERRORS	What does the system consider to be an <i>error</i> ? How are they prevented and handled?	
Error Detection	What errors can be detected in which feedback loops, and how?	Human inspection in live coding vs. partial automation in static typing
Error Response	How does the system respond when an error is detected?	Does it stop, recover automatically, ignore the error or ask the user how to continue?
ADOPTABILITY	How does the system facilitate or obstruct adoption by both individuals and communities?	
Learnability	What is the attitude towards the <i>learning curve</i> and what is the target audience?	HyperCard for the general public vs. FORTRAN for scientists
Sociability	What are the social and economic factors that make the system the way it is?	Funding, volunteers, code sharing, Q/A sites vs. documentation, sense of belonging