Signal and System

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def. **Signal**
x is a Signal $\iff$ $x \in A^B$ where A, B is sets, or it can be represented by x is a function, $f : B \to A$.
anno. the elements of A^B *is functions* $f : B \to A$.
def. **System**
x is a System $\iff$ $x \in \left(A^B\right)^{\left(A^B\right)}$ where A, B is sets.
def. **continuous time signal**
x is continuous time signal $\iff$ $x \in A^R$ where A is a set.
def. **discrete time signal**
x is discrete time signal $\iff$ $x \in A^Z$ where A is a set.
At this scope, the codomain is typically R, e.g., a continuous time signal is a element in R^R.
oper. **addition** of **signal**
prer. the domain A and codomain B of the two signals, f, g, is the same, and B has addition operation.
The addition of the two signals is $f + g$ generated by the equation $(\forall x \in A)[(f + g)(x) = f(x) + g(x)]$.
oper. **scaling** of **signal**
prer. the codomain B of the signal f has scaling operation with scaling factor in the sets C.
The scaling of the signal f with factor a is af generated by the equation $(\forall x \in A)[(af)(x) = a(f(x))]$ where A is the domain of f.
oper. **addition** of **system**
prer. the domain and codomain A of the two systems, f, g, is the same, and A has addition operation.
The addtition of the two systems is $f + g$ generated by the equation $(\forall x \in A)[(f + g)(x) = f(x) + g(x)]$.
oper. **scaling** of **system**
prer. the domain and codomain A of the system f has scaling operation with scaling factor in the sets B.
The scaling of the system f with factor a is af generated by the equation $(\forall x \in A)[(af)(x) = a(f(x))]$.
prop. **stability** of **system**
prer. A is the domain and codomain of the system f. The codomain B of A is measurable to R.
f is stable $\iff$ $(\forall x \in A)[(\forall y \in B)[|x(y)| < \infty] \to (\forall y \in B)[|f(x(y))| < \infty]]$.