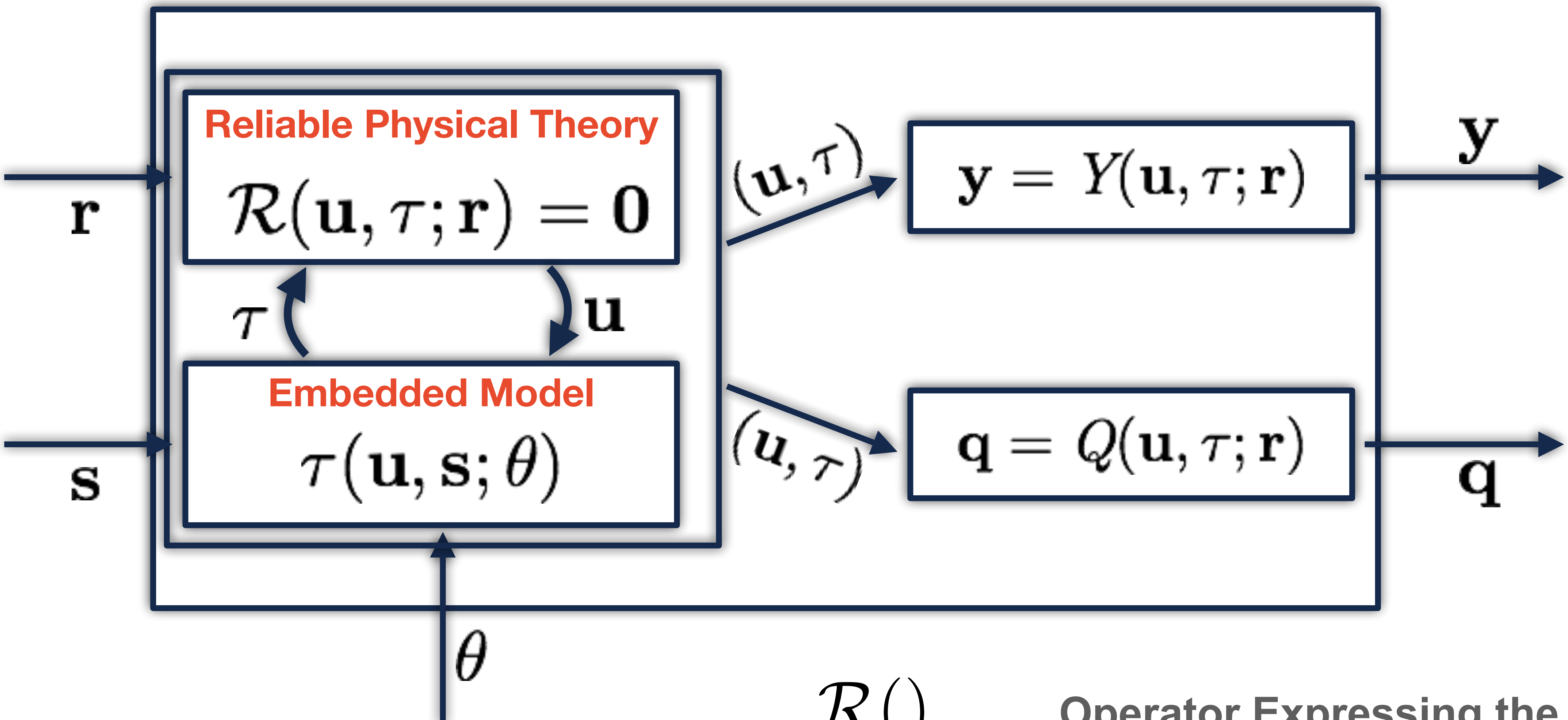
Introduction

The computational models are generally physics based, and they are constructed upon theories that are known to be highly reliable within well-defined domains of applicability.



$\mathcal{R}()$	Operator Expressing the Theory
$\mathbf{u}$	State Variables
τ	Closure Variables
θ	Parameters of the Embedded Model
$\mathbf{r} \cup \mathbf{s} = \mathbf{x}$	Input for the Scenario

Introduction

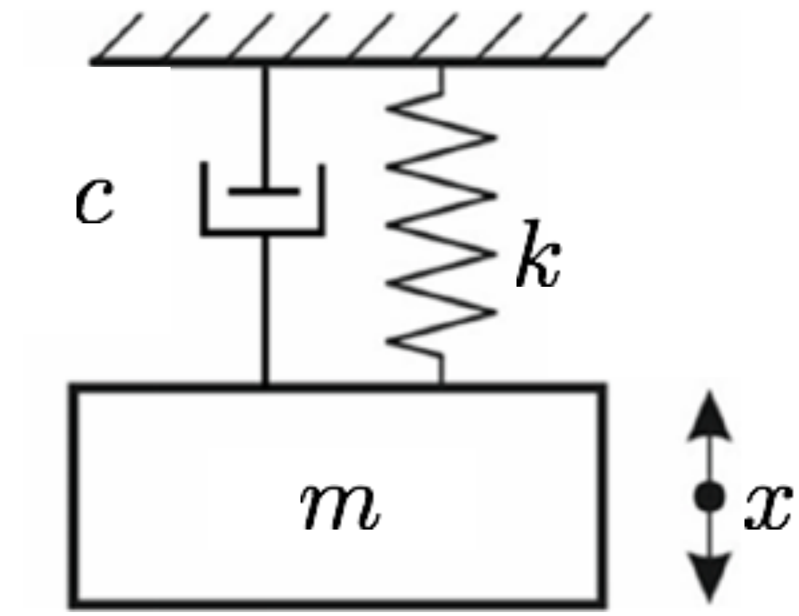
Example: Mass-Spring-Damper, Real World System

Reliable Physical Theory

$$\mathcal{R}(\mathbf{u}, \tau; \mathbf{r}) = \mathbf{0}$$

$$\boxed{m\ddot{x} + c\dot{x} + kx = 0}$$

$$\mathbf{u} = \begin{bmatrix} x \\ \dot{x} \end{bmatrix} \qquad \tau = \begin{bmatrix} c \\ k \end{bmatrix} \qquad \mathbf{r} = \begin{bmatrix} m \\ x(0) \\ \dot{x}(0) \end{bmatrix}$$



Real World Embedded Model

$$\tau = (\mathbf{u}, \mathbf{v}, \mathbf{s}, \theta)$$

$$\boxed{\begin{aligned} k &= \text{const} \\ c(T) &= \exp\left(\frac{T_0}{T} - 1\right) \\ \dot{T} &= c(T)\dot{x}^2 - \frac{T - T_0}{t_T} \end{aligned}}$$

$$\mathbf{v} = T \qquad \mathbf{s} = \begin{bmatrix} T_0 \\ t_T \end{bmatrix} \qquad \theta = k$$

$$\boxed{\begin{aligned} \mathbf{y} &= x \\ \mathbf{q} &= \max(\dot{x}) \end{aligned}}$$