Where we are:

Important concepts, symbols, and equations

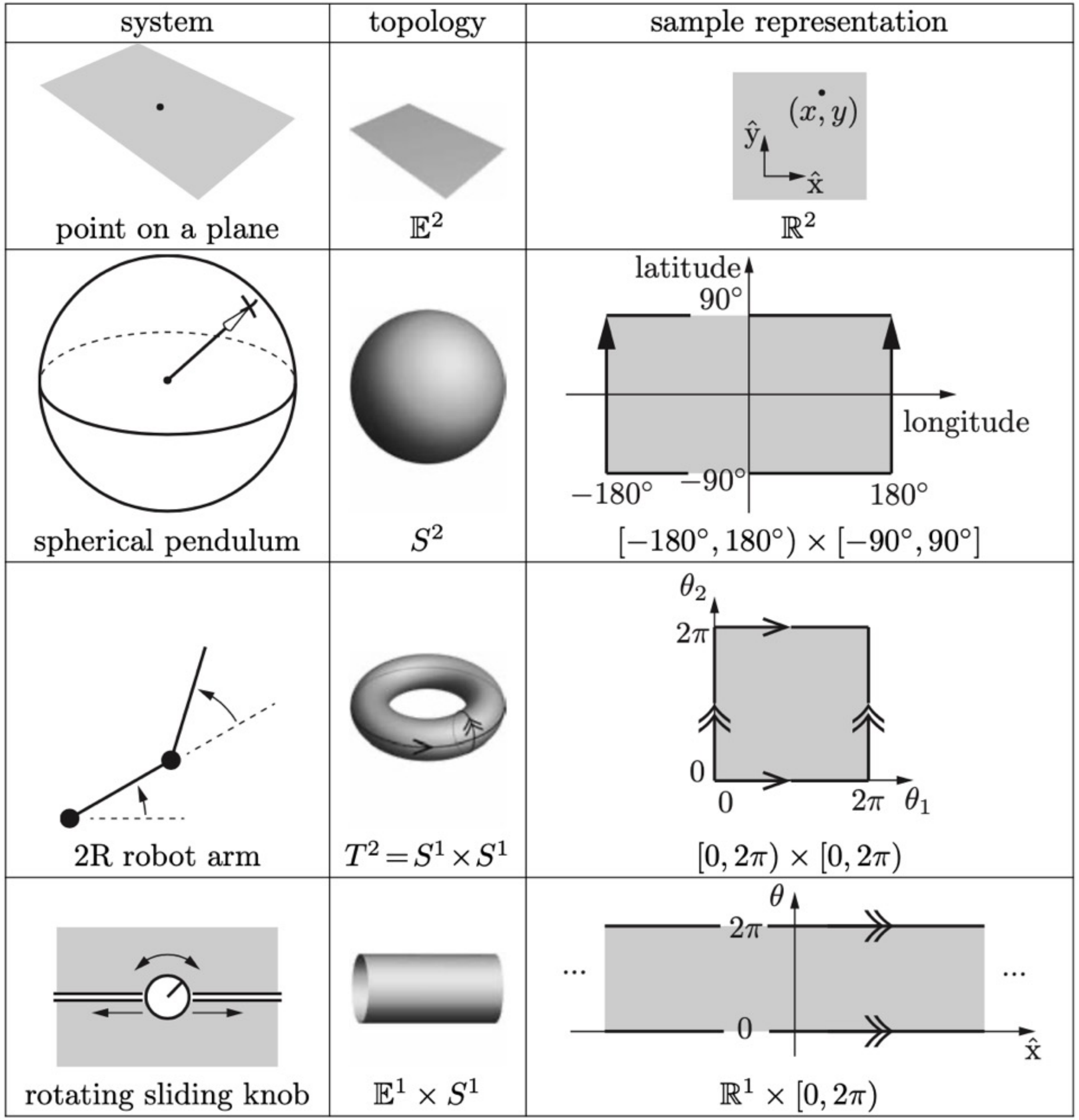
- Two C-spaces may have the same dof but differ in other ways. The **topology** ("shape") of a space is independent of how we **represent** it.

- Two spaces are **topologically equivalent** if one can be continuously deformed to the other without cutting or pasting.

- Some spaces are **Cartesian products** of spaces of lower dimension, e.g.,

  (1d) $\mathbb{E}$, $S = T$ **(2d)** $\mathbb{E} \times \mathbb{E} = \mathbb{E}^2$, $S \times S = T^2$, S^2, $\mathbb{E} \times S$ **(higher)** $\mathbb{E}^k \times S^m \times T^n$

- Represent Euclidean ("flat") spaces $\mathbb{E}^n$ as $\mathbb{R}^n$. For curved spaces, choose
  - minimum-parameter **explicit parameterizations** (choose between **singularities** or an **atlas** of **coordinate charts**), OR
  - **implicit representation** (use more numbers subject to constraints).



Any value in an atlas of coordinate charts?
An implicit representation?

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An implicit representation?

hexrotor with two 5-DOF arms

https://www.prodrone.com/archives/1420/

C-space topology, with and without arm joint limits, rotor angles?
Implicit/explicit representations?
Grübler’s formula?

KUKA youBot
mecanum-wheel omnidirectional base
moving on flat ground
plus 5-DOF robot arm + gripper

C-space topology and representation?
Include gripper, wheel angles?