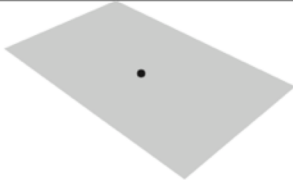

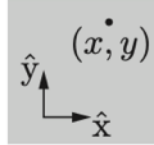
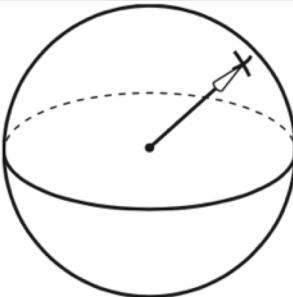

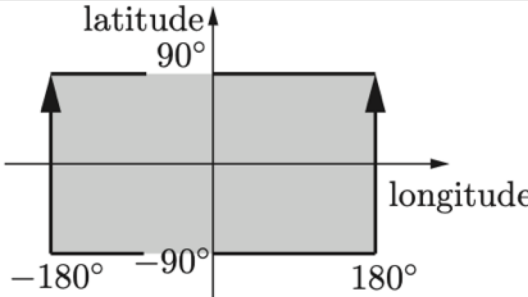
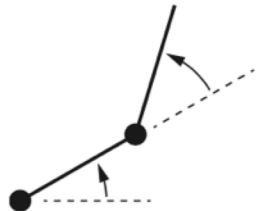

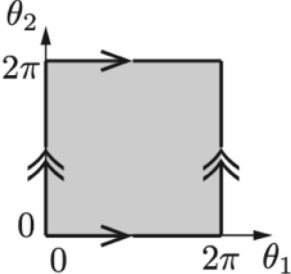
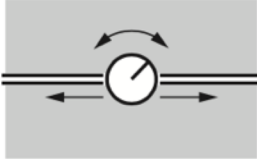

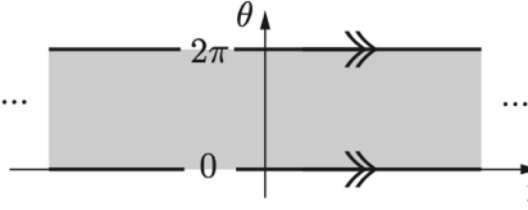


Chapter 2	Configuration Space
	2.1 DOF of a Rigid Body
	2.2 DOF of a Robot
	2.3 C-space Topology and Representation
Chapter 3	Rigid-Body Motions
Chapter 4	Forward Kinematics
Chapter 5	Velocity Kinematics and Statics
Chapter 6	Inverse Kinematics
Chapter 7	Kinematics of Closed Chains
Chapter 8	Dynamics of Open Chains
Chapter 9	Trajectory Generation
Chapter 10	Motion Planning
Chapter 11	Robot Control
Chapter 12	Grasping and Manipulation
Chapter 13	Wheeled Mobile Robots

## 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.

system	topology	sample representation
 point on a plane	 $\mathbb{E}^2$	 $\mathbb{R}^2$
 spherical pendulum	 $S^2$	 $[-180^\circ, 180^\circ] \times [-90^\circ, 90^\circ]$
 2R robot arm	 $T^2 = S^1 \times S^1$	 $[0, 2\pi) \times [0, 2\pi)$
 rotating sliding knob	 $\mathbb{E}^1 \times S^1$	 $\mathbb{R}^1 \times [0, 2\pi)$

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

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

Any value in an atlas of coordinate charts?  
 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?



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

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