

# QBot Platform

Forward Kinematics

© 2024 Quanser Inc., All rights reserved.

Quanser Inc.  
119 Spy Court  
Markham, Ontario  
L3R 5H6  
Canada

info@quanser.com  
Phone: 19059403575  
Fax: 19059403576  
Printed in Markham, Ontario.



For more information on the solutions Quanser Inc. offers, please visit the web site at:  
<http://www.quanser.com>

This document and the software described in it are provided subject to a license agreement. Neither the software nor this document may be used or copied except as specified under the terms of that license agreement. Quanser Inc. grants the following rights: a) The right to reproduce the work, to incorporate the work into one or more collections, and to reproduce the work as incorporated in the collections, b) to create and reproduce adaptations provided reasonable steps are taken to clearly identify the changes that were made to the original work, c) to distribute and publicly perform the work including as incorporated in collections, and d) to distribute and publicly perform adaptations. The above rights may be exercised in all media and formats whether now known or hereafter devised. These rights are granted subject to and limited by the following restrictions: a) You may not exercise any of the rights granted to You in above in any manner that is primarily intended for or directed toward commercial advantage or private monetary compensation, and b) You must keep intact all copyright notices for the Work and provide the name Quanser Inc. for attribution. These restrictions may not be waved without express prior written permission of Quanser Inc.

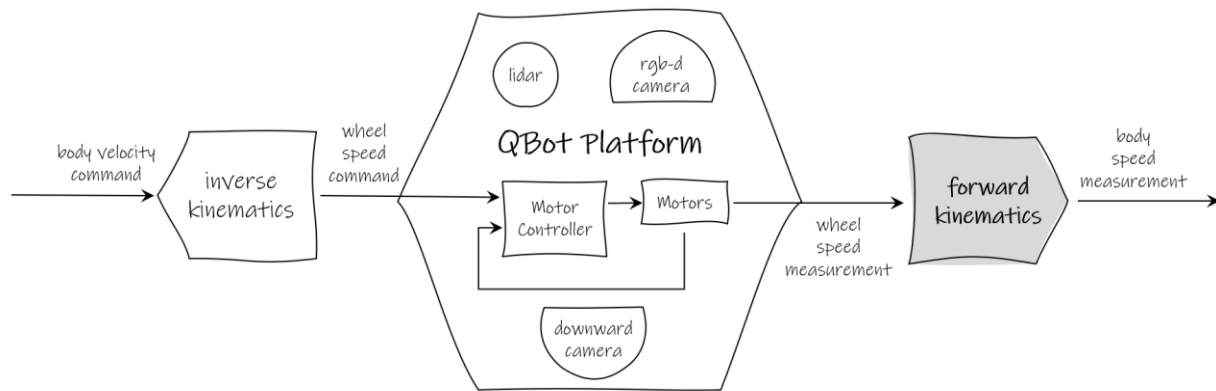
# QBot Platform – Application Guide

## Forward Kinematics

**Why** explore forward kinematics?

---

Forward kinematics help us understand how the basic joint movements translate to high level robot position and orientation, which is fundamental to robotics automation. This lab is the beginning of your journey to automate the robot to complete tasks such as line following and object avoidance. Here, you will learn how to control the overall motion of the robot by controlling individual wheels, commonly referred to as Tank Drive.



## Background

Mobile robots are commonly built with two actuated wheels and numerous passive support castors to take on the payload. The two actuated wheels are placed lateral to the bilateral axis of the robot, with each wheel's velocity playing a pivotal role in the overall robot's forward and rotational velocities.

## Tank Drive

In this lab, you will command wheel velocities for the QBot Platform, referred to as a Tank Drive mode for the robot. This mode trains you to intuitively control each wheel's velocity to move the robot around. While driving the QBot Platform in Tank Drive, wheel speed measurements will give you an idea of whether the commanded velocities are being obtained by the onboard speed controllers, the performance of which is out of scope of this lab.

## Forward Kinematics

It is also important to measure what the QBot Platform's overall body velocity. A formulation to map the measured wheel velocities to the body velocities is called Forward Kinematics, which you will also develop in this lab. For further information, please refer to the Differential Kinematics file under Concept Reviews in "`~\Documents\Quanser\concept_reviews`".

## Before you begin

Please review the following before beginning this lab,

1. Ensure you have completed the **Play** lab from Skills Progressions 0 in your language of choice.
2. Ensure that you have read the following concept reviews,
  - a. Position Kinematics

b. Differential Kinematics