

Drone Package Delivery

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1 Introduction

Suppose you are a recently-hired Amazon employee and you are practicing using the delivery drone. In one practice run, the drone starts 5 miles east of your home and you aim to fly it directly back home. The drone is programmed to travel directly towards your home at a speed of \mathbf{b} mph. However, there is a wind blowing north at a constant \mathbf{w} mph. Assuming the drone flies at a constant height, we consider how to construct a system of differential equations for this situation along with methods for modeling and visualizing the drone's trajectory.

Our approach involves forming a parametric curve to represent the drone's trajectory, using the information about the velocity the drone experiences at various points to derive information about its instantaneous change in position. We then use this information with modern numerical methods for closely approximating solutions to differential equations which may not have analytical solutions.

2 Analysis

We start by visualizing the problem on the 2D plane. We can do so since the drone always flies at the same height. Let the origin represent your home and the drone will be represented by a point.

