A Very Interesting Title

Jared Coleman[1]

[1]Loyola Marymount University

December 2, 2024

Abstract

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris. Nam arcu libero, nonummy eget, consectetuer id, vulputate a, magna. Donec vehicula augue eu neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Mauris ut leo. Cras viverra metus rhoncus sem. Nulla et lectus vestibulum urna fringilla ultrices. Phasellus eu tellus sit amet tortor gravida placerat. Integer sapien est, iaculis in, pretium quis, viverra ac, nunc. Praesent eget sem vel leo ultrices bibendum. Aenean faucibus. Morbi dolor nulla, malesuada eu, pulvinar at, mollis ac, nulla. Curabitur auctor semper nulla. Donec varius orci eget risus. Duis nibh mi, congue eu, accumsan eleifend, sagittis quis, diam. Duis eget orci sit amet orci dignissim rutrum.

1 Introduction

An agent starts at $(0,0)$ with an object and is moving in a straight line towards $(1,0)$ to deliver it. Because the start may fail, we deploy a second agent (called the *finisher*), starting at position (x,y) that can pick up the object and finish the delivery to $(1,0)$. Suppose the starter fails at $(0,0)$ with probability p and at $(1,0)$ with probability $1-p$. We only consider the object to be delivered when the finisher and the object are co-located at $(1,0)$. Both agents always move at a maximum speed of 1. The finisher can start, stop, and change direction instantaneously.

Let's start by considering the case where $(x-1)^2+y^2 \leq 1$. In this case, the finisher can always reach the object before it reaches $(1,0)$. Observe the point $(m,0)$ where $m = \frac{x^2+y^2}{2x}$ is the point where, supposing the starter does not fail, the two agents can meet at the same time (time $t=m$). Let's consider three candidate algorithms:

1. A_0: The finisher moves directly to $(0,0)$, then to $(1,0)$, guaranteeing a delivery time of $1+\sqrt{x^2+y^2}$.
2. A_1: The finisher moves directly to $(1,0)$. Then, with probability p the delivery time is $2+\sqrt{(x-1)^2+y^2}$, and with probability $1-p$ the delivery time is 1.
3. A_m: The finisher moves to $(m,0)$, then to $(0,0)$, then to $(1,0)$. Then with probability p the delivery time is $2m+1+\sqrt{(x-m)^2+y^2}$, and with probability $1-p$ the delivery time is 1.

Let D_0, D_1, and D_m be the expected delivery times for algorithms A_0, A_1, and A_m, respectively. Then $D_0 = 1+\sqrt{x^2+y^2}$, $D_1 = p(2+\sqrt{(x-1)^2+y^2})+(1-p)$, and $D_m = p(2m+\sqrt{(x-m)^2+y^2})+(1-p)$.