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The Best Angle of 3-point shoots Based on Stephen Curry

Kelvin Chan

Department of Mathematics
University of Macau

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Contents

Introduction

Introduction

Find the best shooting angle for Curry in this model.

Figure: Stephen Curry

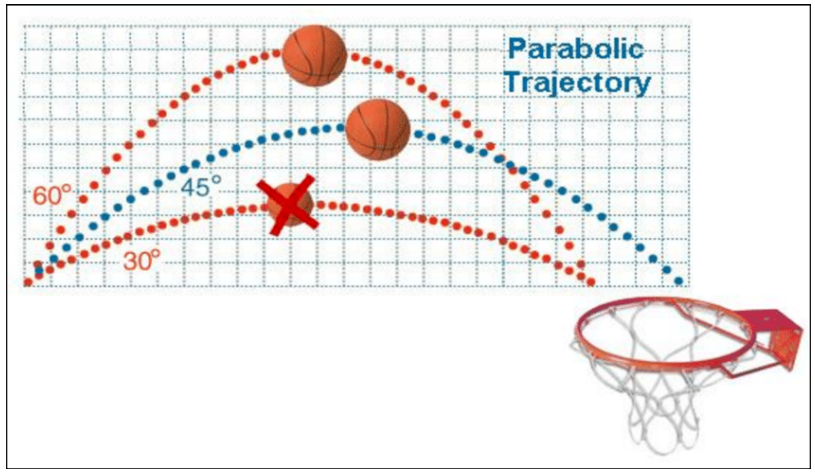

Figure: Ball trajectory

Approaches

Approaches

1. Resolving the initial velocity:

$$v_H = v_0 cos(\theta_0) \quad u_V = v_0 sin(\theta_0)$$

2. Find the horizontal distance and vertical distance of motion:

$$l = x(t) = v_0 cos(\theta_0) t, \quad h = v_0 sin(\theta_0) + \frac{1}{2} g t^2$$

3. Find the initial velocity:

$$v_0 = \frac{l}{cos(\theta_0)} \sqrt{\frac{-g}{2(l tan(\theta_0) - h)}}$$

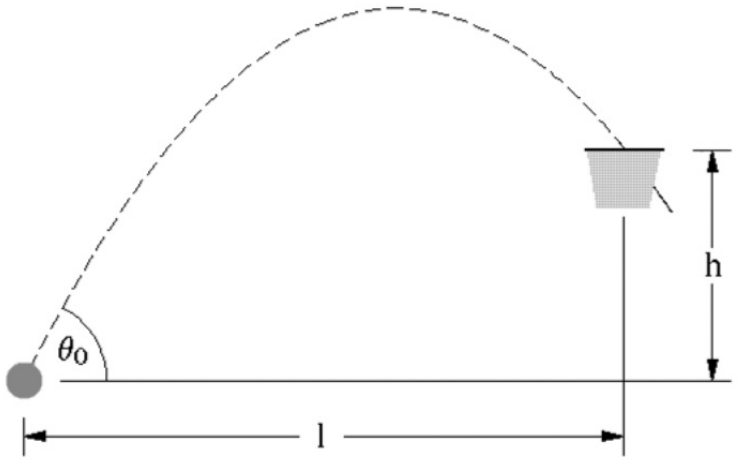

Figure: The conceptualization of shooting

Two criteria

1. The basketball does not touch the front of rim
2. The basketball hit the back of the rim

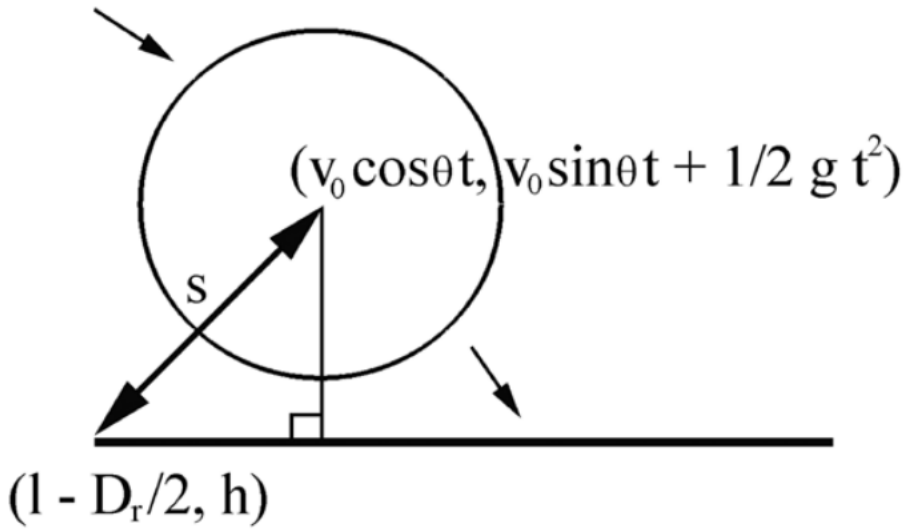

Figure: Two Criteria

Error Analysis

1. Discretization
2. Implemented Eular's Method : Track of the minimum distance
3. Stability: Convergent and bound by Lipschitz condition

$$|f(t,y) - f(t,z)| \leq L\,|y - z|$$

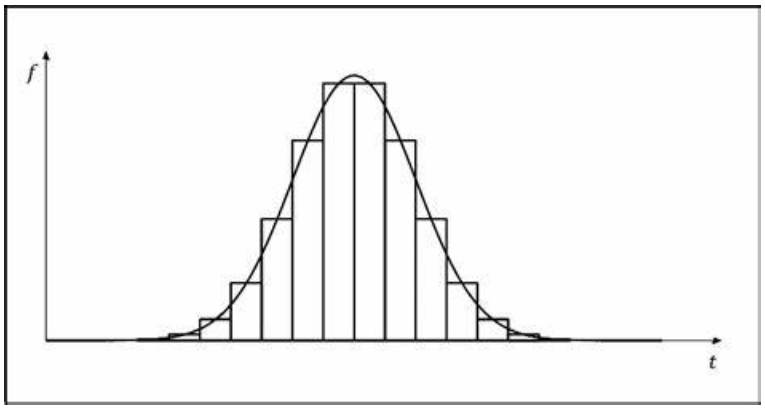

Figure: Discretization

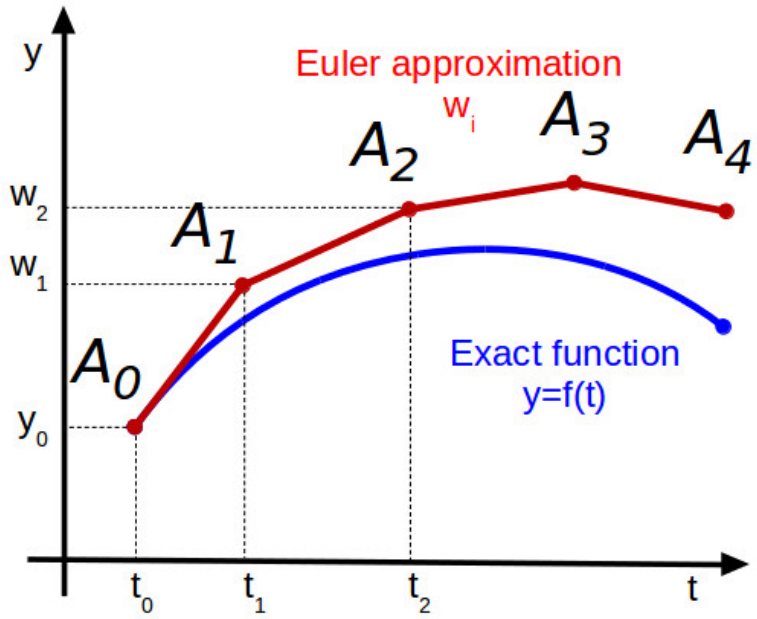

Figure: Eular's method

Solution

Solution

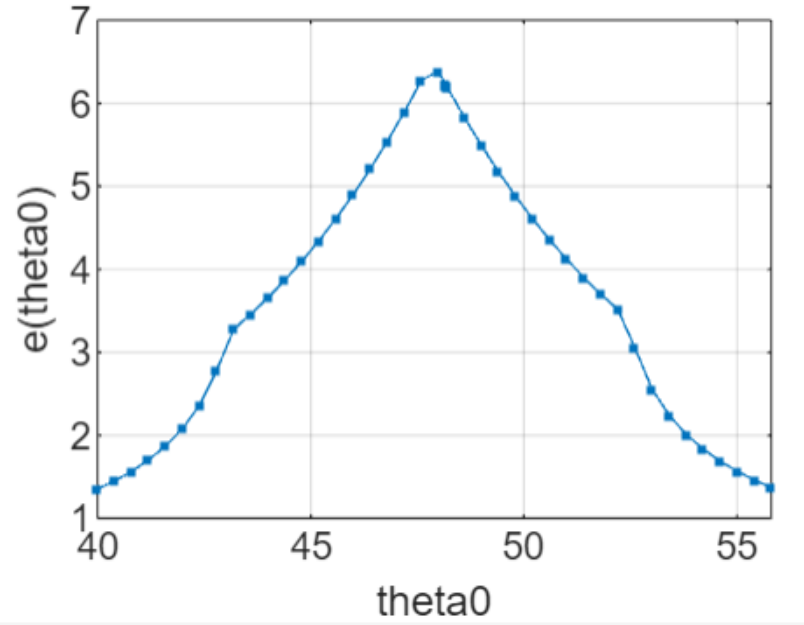

Figure: The Error About θ_0 For Which The Basketball Still Goes In (discretization)

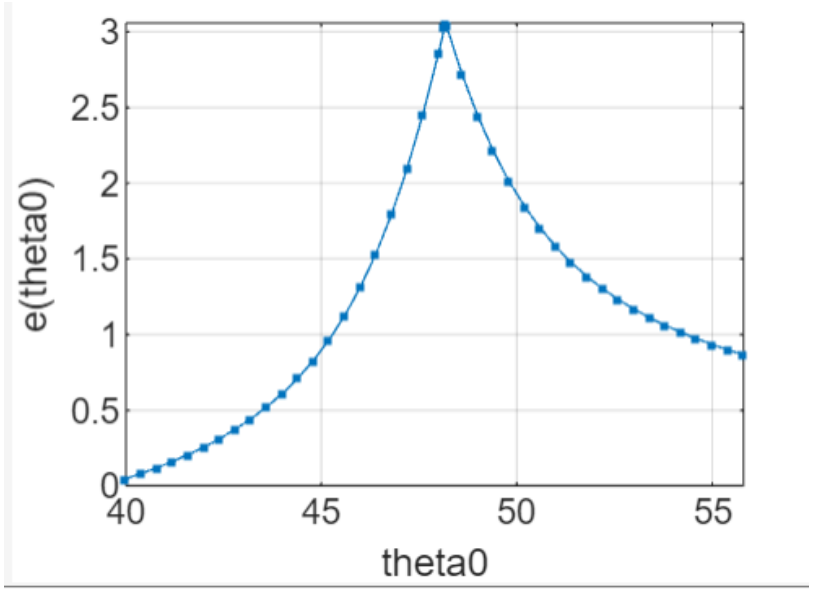

Figure: Result without discretiztion

Conclusion

Conclusion

1. Good demonstration: Hard-working, keep learning
2. Done by Successful: Runnable Code, correct graph
3. Challenges: Error Analysis(New), Messy function
4. Improvement: More variables, Classification, Accuracy

Thank you!