

Goal: Add the Z-Axis to Tracking Data	Meth
Passing and pass defense have become increasingly important in modern football With the importance of passing, understanding features of the pass itself is vital While we have the projection of the ball onto the plane of the field, launch angle and launch velocity are not available	We ha path, s We co In orde 1. We assum We ca using
Background: Current use of Tracking Data	
Currently, tracking data allows one to create 2D plots of the play, animating it allows one to see player movements While is informative, we lose the nuance of some of the motion, especially the ball In 2D animations of tracking data, the ball looks like it passes over players, we are unable to determine anything about the pass	
(5:27) (Shotgun) R.Wilson pass deep left to DK.Metcalf for 19 yards, TOUCHDOWN.	Poel
Image: constrained of the state of the st	Average Lau 24 (see be) 24 (see be) (see b
NFL Player Tracking Data	N.Mullens
The data is taken from the NGS Highlights Dataset. For each play, motion is collected at 10 HzxysdisdireventdisplayName317286.0527.432.170.27324.93pass_forwardChris Jones319382.3030.291.540.17260.50pass_arrivedChris Jones319482.1330.251.510.17256.76NaNChris Jones319581.9730.181.510.17253.07NaNChris Jones319681.7930.141.540.18249.08NaNChris Jones	We c means

defenders

Chris Jones

Chris Jones

Chris Jones

Chris Jones

There are 17000 passing plays between the 2018 and 2019 NFL seasons.

3200 81.26 29.81 1.53 0.17 240.60 pass_outcome_incomplete

3197 81.66 30.09 1.55 0.14 245.69

3198 81.54 30.00 1.55 0.15 243.16

3199 81.40 29.90 1.55 0.17 241.67

NFL3D: Adding Dimension to Football Tracking Data Rishav Dutta₁, Sam Ventura_{2.3}, Ron Yurko₂

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ods: Construction of the Problem and Kinematics

ave the motion of the ball through the plane of the field. We would like to project the flight so we must interpolate the z-axis. onstruct the problem as follows:



Time split for each play

ler to apply Kinematics equations we must make assumptions about our environment.

assume no air resistance 2. We assume the ball is launched and received at 6ft 3. We ne the only force on the ball is gravity

an then treat the motion of the ball as a projectile motion problem, and solve for position time of flight

Its and Applications of NFL3D

ollowing charts are a result of an application of NFL3D:



can see throwing with a higher angle s throwing slower and vice-versa. The obvious exception is Josh Allen.

Using NFL3D one can start to evaluate the angle and velocity a quarterback uses to beat

By adding context to a pass, we can start to understand its mechanics and complexity

Advanced Visual: Spray Charts With NFL3D we are able to create passer spray charts for the first time. Here are the 3D spray charts for Aaron Rodgers from the 2018-2019 seasons: Forces Aaron Rodgers Spray Charts We can see from the spray charts the variations Rodgers applies to angle and velocity From this ridgeplot we can see that Patrick Ma-**Results: Max Velocity** homes throws with a wide variety of velocities Arm strength is an important trait a quarterback can have Distribution of Velocity Types for top 12 Quarterbacks Players like Josh Allen and Patrick Mahomes use thier arm strength to their advantage ••• ••• Launch Velocity (mph) Fastest Pass from the 2018 Season

References

The Drag Force on an American Football - Robert G. Watts The Physics of Football - Timothy Gay





