

# Football Kicking Simulator

## A. Goals:

- Solve Model 1 and 2 equations of trajectory
- Work on visualization
- Finalize mounting and frame ideas
- Finish mounting and framing for prototype
- Test sensors with Aaron's code
- Communication with Aarons code and my formulas
- Find possible place for simulator to end up

# Football Kicking Simulator

## B. Brief Description:

- The objective of the UTSA Football Kicking Simulator we have designed is to have a real-time training tool that would give a kicker the ability to practice off the field and receive the same kind of attention to detail they would experience at a training camp. The training tools that we expect to see in the final product will be; calculation of trajectory taking into consideration real life circumstances of drag and lift on the football for players to know the range covered by their kick, the left to right angles of the kick which will be beneficial for coaches to know during a game and taking into consideration which hash would be best to kick off for each player, a pressure sensing mat that would show the kicker their foot print trail so they can adjust their footsteps or make sure it is consistent, noise to simulate crowd and give a sense of pressure that would be on the field, and have high speed cameras taking video from different views for the player or coach to replay and evaluate the kick.

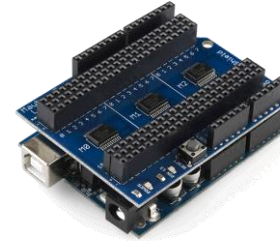
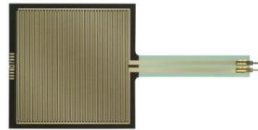
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C. Heights of Achievements this semester (using bullets):

- Solved Model 1 and 2 of trajectory equations using Excel and Maple
- Made equations more accurate by forming good equations for drag and lift.
- Team settled on design for mounting and standing support.
- Testing designs for proper sensor feedback

# Football Kicking Simulator

Technology being used



Model 2 Eqs

$$\begin{aligned}
 m &= 1 && (3) \\
 g &= 10 && (4) \\
 L &= 0.15 && (5) \\
 w &= 2 && (6) \\
 d &= 0.2 && (7) \\
 \text{sys} &= m \cdot \text{diff}(x(t), t, 2) + m \cdot w \cdot \text{diff}(x(t), t) + d \cdot \text{diff}(x(t), t) = 0, m \cdot \text{diff}(y(t), t, 2) - m \cdot w \cdot \text{diff}(y(t), t) + m \cdot g - L \cdot \text{diff}(x(t), t) = 0 && (8) \\
 & \frac{d^2}{dt^2} x(t) + 2 \left( \frac{d}{dt} x(t) \right) + 0.2 \left( \frac{d}{dt} x(t) \right) = 0, \frac{d^2}{dt^2} y(t) = 0, \frac{d^2}{dt^2} z(t) - 2.15 \left( \frac{d}{dt} x(t) \right) + 10 = 0 && (9) \\
 f &= \{x(t), y(t), z(t)\} && (9) \\
 & \{x(t), y(t), z(t)\} && (9) \\
 \text{solve}(\text{sys}); &&& \\
 \left[ x(t) = \frac{20}{43} e^{-\frac{1}{10}t} \sin\left(\frac{1}{10}\sqrt{429}t\right) - C3 + \frac{20}{43} e^{-\frac{1}{10}t} \cos\left(\frac{1}{10}\sqrt{429}t\right) - C2 - \frac{400}{1849} + \frac{200}{43}t + C1, y(t) = -C5t + C6, z(t) = -\frac{1}{43}C3\sqrt{429}e^{-\frac{1}{10}t} \cos\left(\frac{1}{10}\sqrt{429}t\right) - \frac{1}{43}e^{-\frac{1}{10}t} \sin\left(\frac{1}{10}\sqrt{429}t\right) - C3 - \frac{1}{43}e^{-\frac{1}{10}t} \cos\left(\frac{1}{10}\sqrt{429}t\right) - C2 \right. && (10) \\
 & \left. + \frac{1}{43}C2\sqrt{429}e^{-\frac{1}{10}t} \sin\left(\frac{1}{10}\sqrt{429}t\right) - \frac{20}{43}t + C4 \right]
 \end{aligned}$$