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Ideal Badminton Serves

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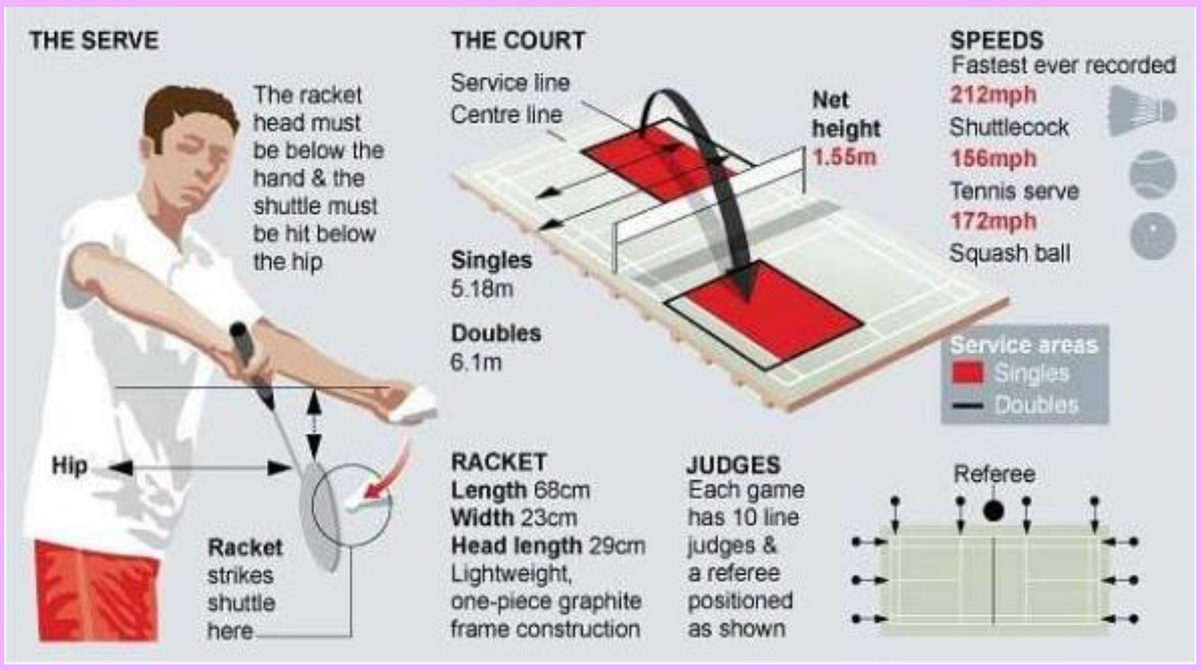
GitHub Repository

Serving Conditions



Source: BadmintonCentral

Goal: Find the ideal angles to launch a shuttlecock into the corners of your opponent's field of play.

Equations of Motion

From J.M.A. Danby, we can find the ODEs to be:

$$\ddot{x} = -k_D * \sqrt{\dot{x}^2 + \dot{y}^2 + \dot{z}^2} * \dot{x}$$

$$\ddot{y} = -k_D * \sqrt{\dot{x}^2 + \dot{y}^2 + \dot{z}^2} * \dot{y}$$

$$\ddot{z} = -k_D * \sqrt{\dot{x}^2 + \dot{y}^2 + \dot{z}^2} * \dot{z} - g$$

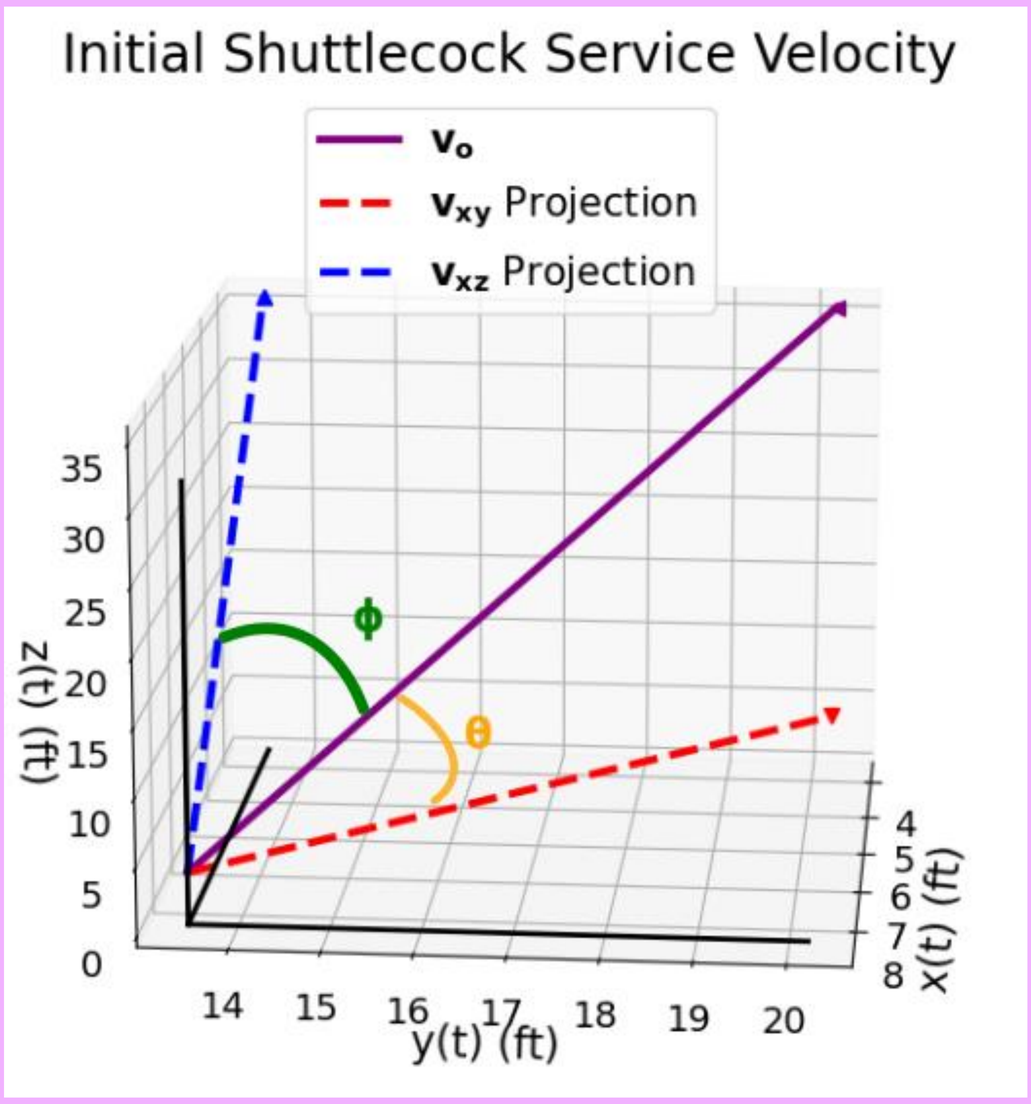


Figure 1: Initial launch velocity for the Front Left Service, where θ and ϕ are measured up and to the left from the "floor" and "midline" of the court, respectively

Results

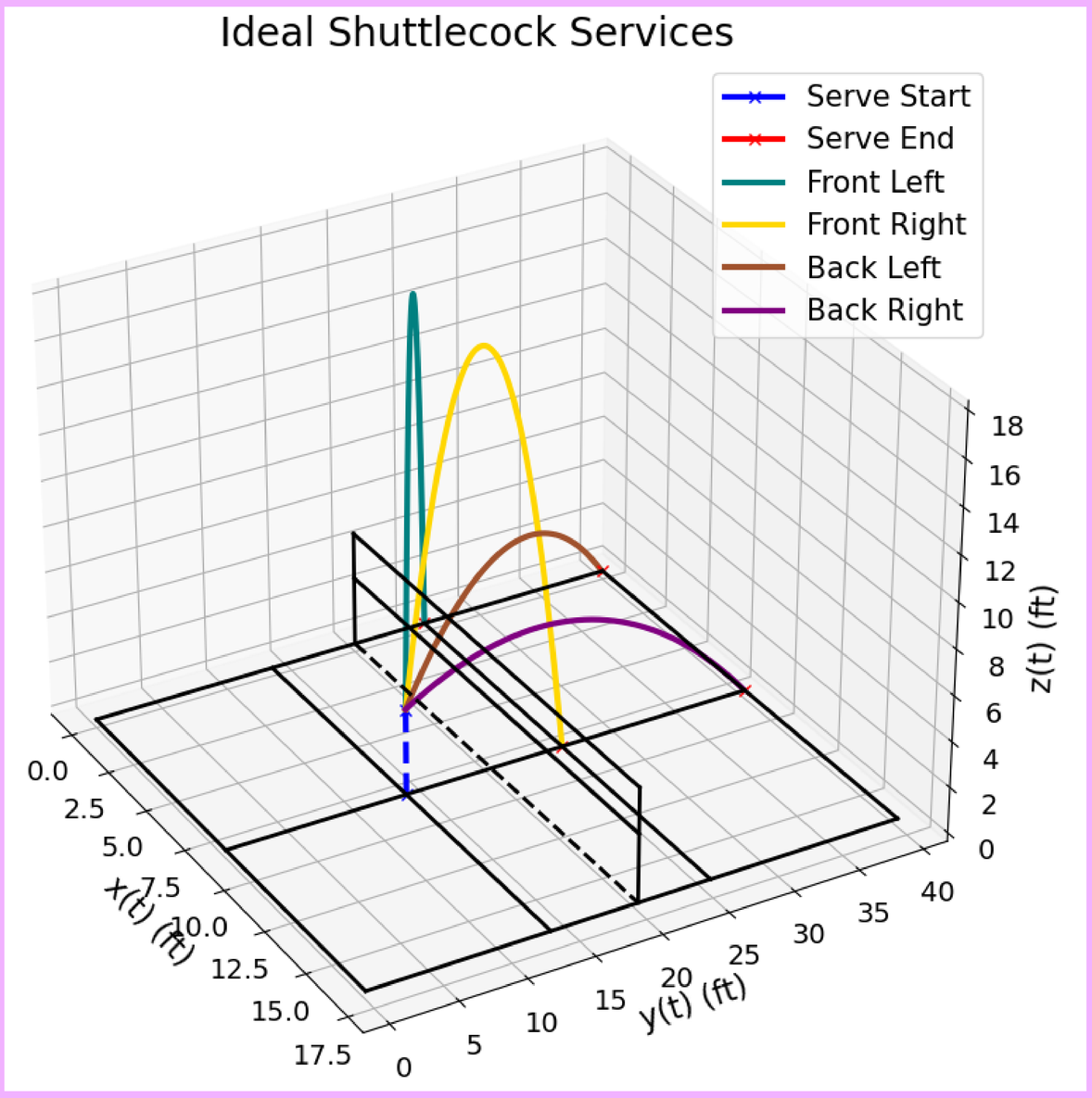


Figure 2: Ideal Shuttlecock Services; initial velocity of 10 ft/s

	Fr. L.	Fr. R.	Bk. L.	Bk. R.
θ	$78.07°$	$78.35°$	$23.72°$	$19.96°$
ϕ	$8.32°$	$0.01°$	$16.40°$	$0.01°$

Table 1: Listed are the angles for ideal serves for both θ and ϕ

Conclusion

If a beginner makes one of the four most ideal badminton services whilst throwing off their opponent, the shuttlecock will land within bounds, scoring a point!

References

See https://github.com/NGurAryeh/Shuttlecock for full references and other related items (see above).

Acknowledgments

I would like to thank Dr. Colleen Countryman for all her guidance and help on this project, alongside my previous professors for building my coding knowledge, skills, and resources.
Additionally, I would like to thank Jupyter and Spyder IDEs for their ease of use and functionalities.