

## Simulating the trajectory and court impact of a soccer ball

In this project the soccer ball will be investigated with CFD model in the software STAR-CCM+. The physics investigated will be the drag force (air resistance), the Magnus force (spin effect) and the contact of the soccer ball with court surface. Hopefully, the output of the project can give estimated values or suggestions of e.g. the drag coefficient and Magnus coefficient to a simpler finite difference model. Different famous kicks could be investigated as Roberto Carlos shot in 1997 shown in Fig. 1. The project will be done in cooperation with DTU compute and veo (veo.co) who makes camera system for soccer.



Figur 1: The beautiful free kick of Roberto Carlos for Brazil in 1997 for a 1-1 tie against France in the opening game of the 1997 Tournoi de France.

An example of the streamlines from a CFD simulation of tennis ball is shown in Figure 2, this was a practical application of the commercial CFD package STAR-CCM+.

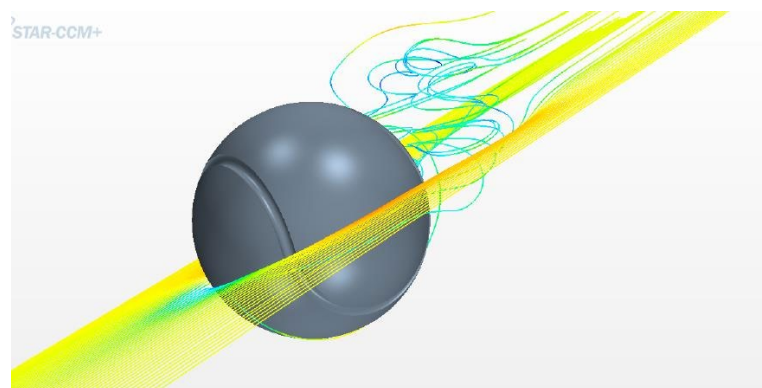


Figure 2: A simulation of a tennis ball was accomplished in the DTU course called Applied CFD (41315)

## Project description

1. Finding the drag coefficient and Magnus force for a soccer ball in literature
2. Simulating these values and compare to the literature
3. Investigating the contact mechanics of the soccer ball with the court in literature
4. Simulating the contact mechanics with different velocities and spins at impact

## What veo do in general

Vevo creates a complete and affordable solution that help football clubs, both big and small, record and analyse their matches and training sessions, eliminating the need for a cameraman. The veo camera is shown in Fig. 3.



Figure 3: Capture everything in one shot with the veo camera.