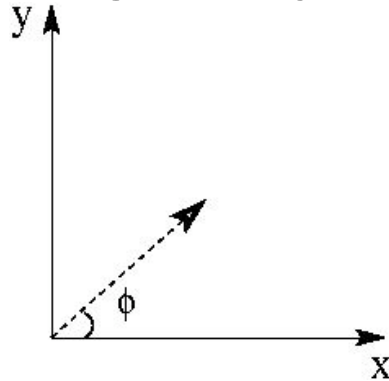


Project 1 - How hard can I kick that ball?

Consider launching a projectile/ball etc into the air.



If you include realistic effect such as air resistance, spin, wind, altitude - how long distance, R , will the ball go? And, given R , what was the initial velocity of your projectile, i.e. how hard did you kick that ball?

In this project, you will combine numerical simulation with experiments in, for instance, the parks of Lund to figure out with what velocity and angle ϕ that ball/projectile left your foot or hand. You may also ask yourself: given an initial velocity what is the optimal ϕ ?

The project report should contain:

- Description of the problem you have chosen to study.
- Describe and motivate the algorithm(s) you use. Estimate numerical errors.
- Results of simulations & experiments.
- Conclusions
- Prove that the range, R , of a projectile in the absence of air resistance is given by (useful test of your code!):

$$R = \frac{v_0^2 \sin(2\phi)}{2g} \left[1 + \left(1 + \frac{2gh}{v_0^2 \sin^2 \phi} \right)^{1/2} \right]$$

g is the gravitational constant, v_0 is the initial velocity,
 ϕ is the angle with respect to the horizontal axis, and h is the initial height.

- Appendix: Include a listing of your program,
Also, send your program by e-mail to tobias@thep.lu.se