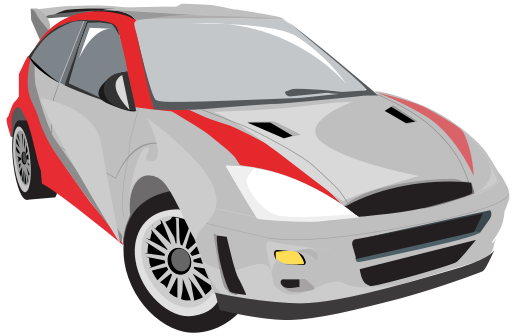
History of Optimization Techniques

History of finding optimal designs

Design experimentally

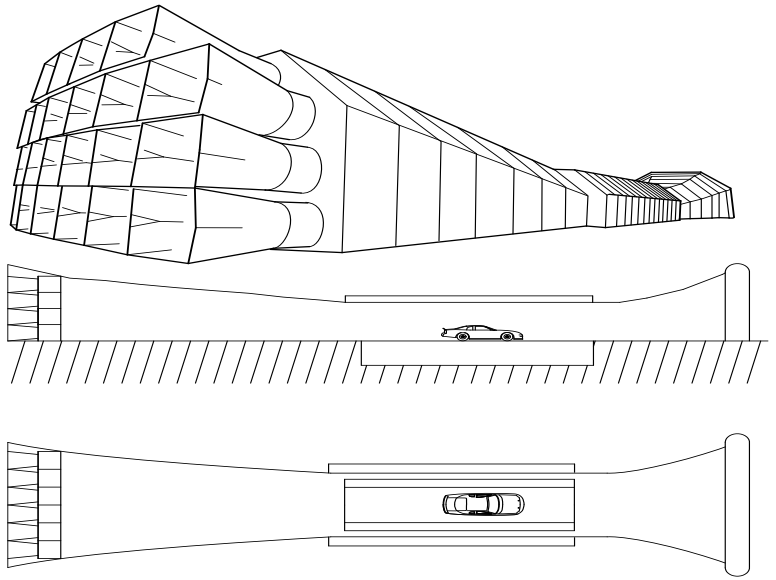
A car with efficient aerodynamics

Bob (Engineer)



Bob wants to design a car with minimum drag

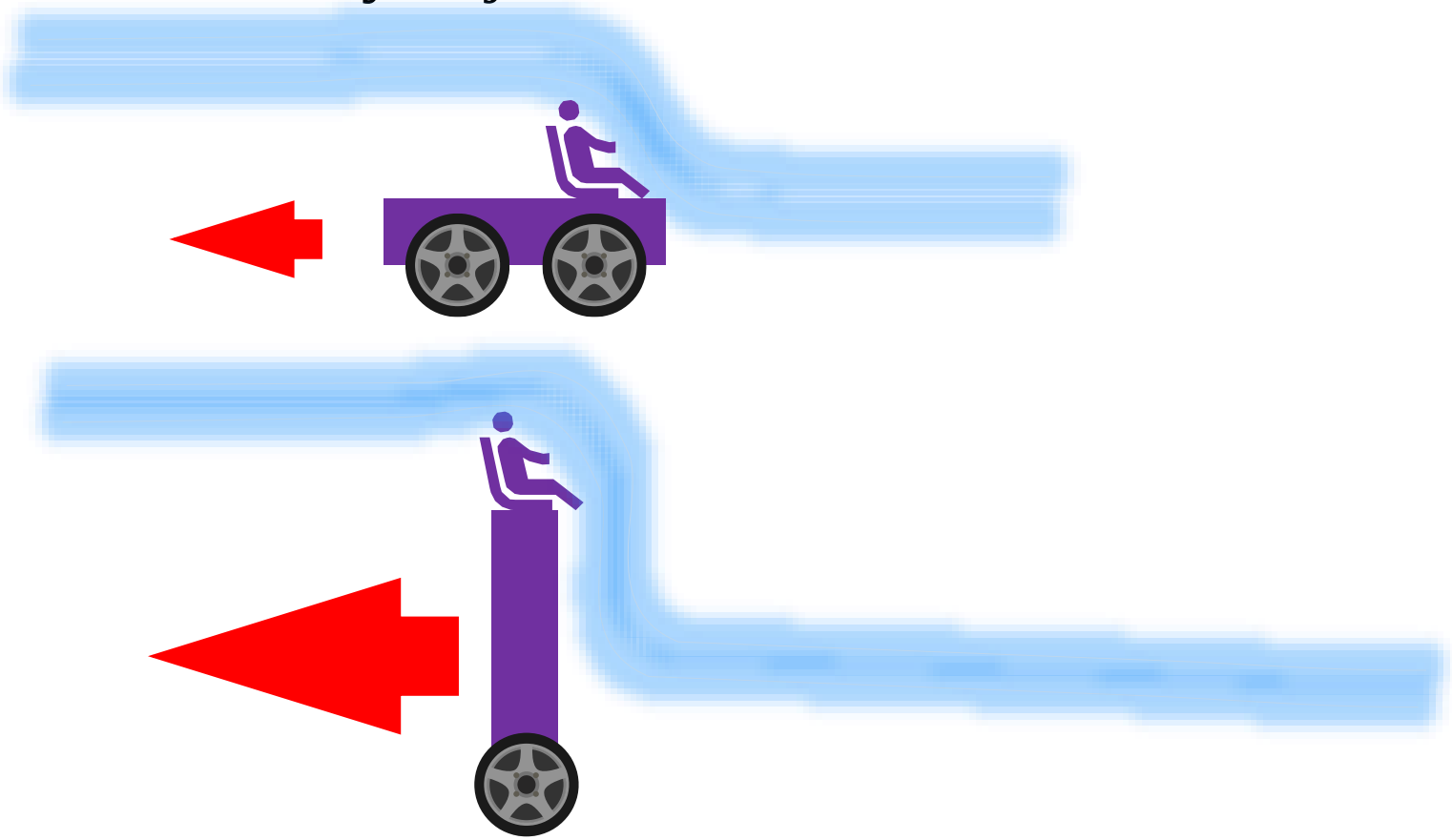
Wind tunnel to analyse aerodynamic forces (drag)

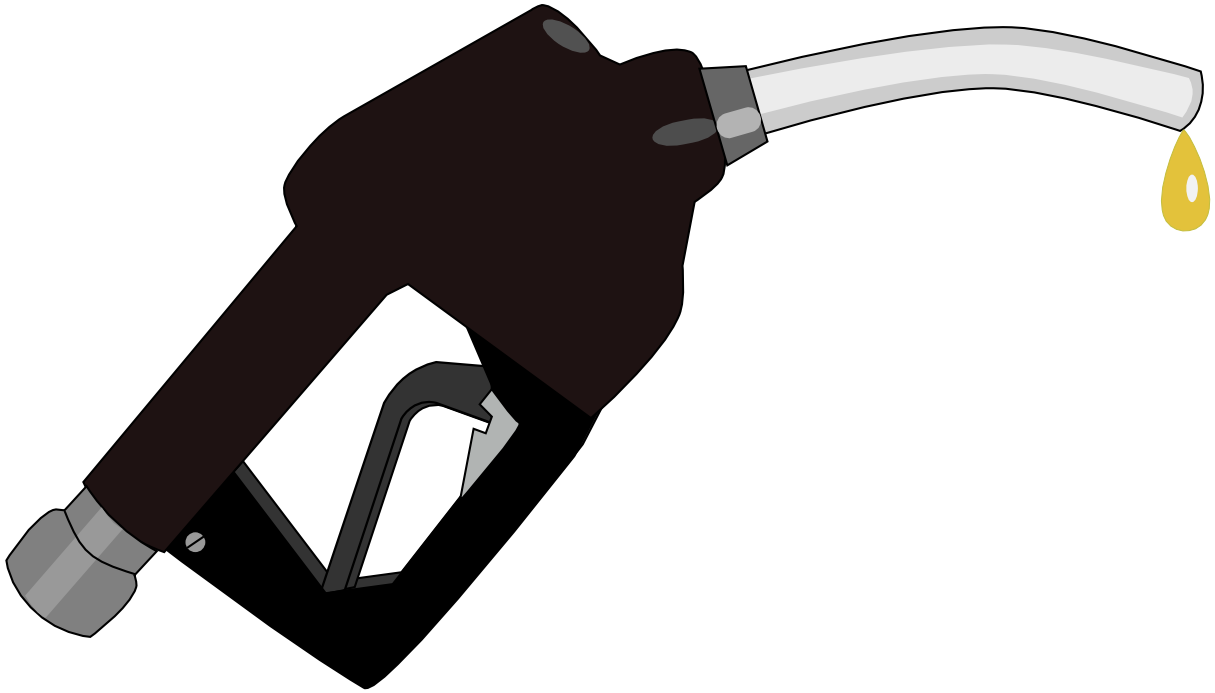


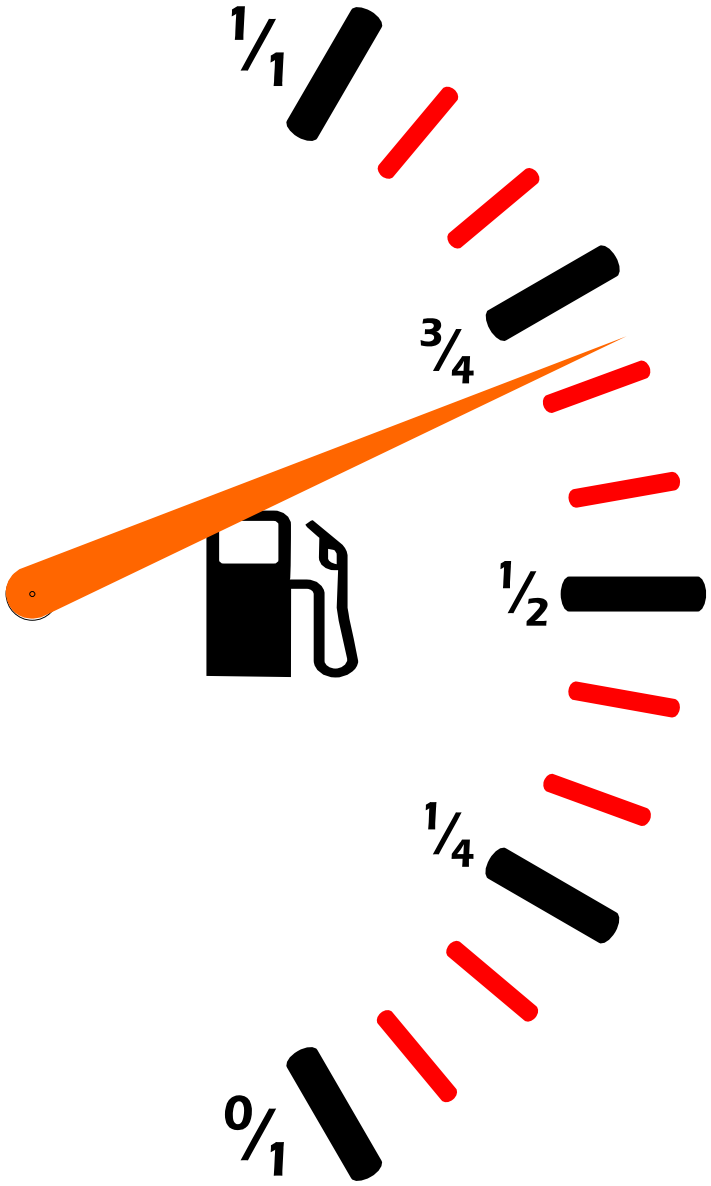
He needs to build prototypes and a wind tunnel to calculate drag

What is drag?

- Drag (air resistance) is an aerodynamic force acting opposite to the relative motion of any object.

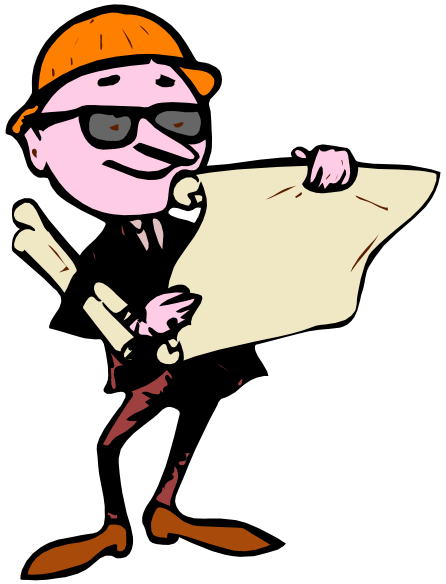


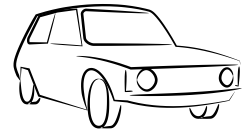


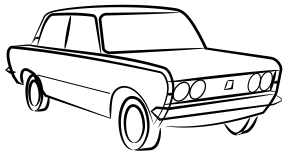

1/1
3/4
1/2
1/4
0/1

Design experimentally

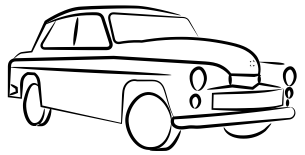
Coefficient of drag (Cg)

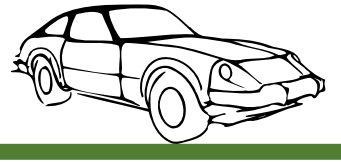


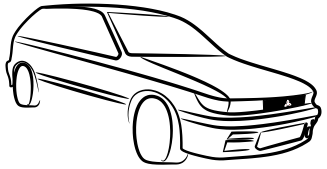
$C_g = 0.85$ 

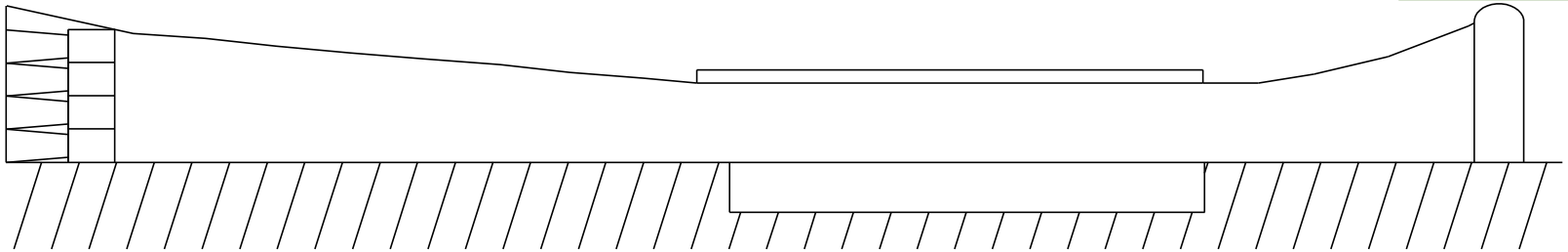
$C_g = 0.90$ 

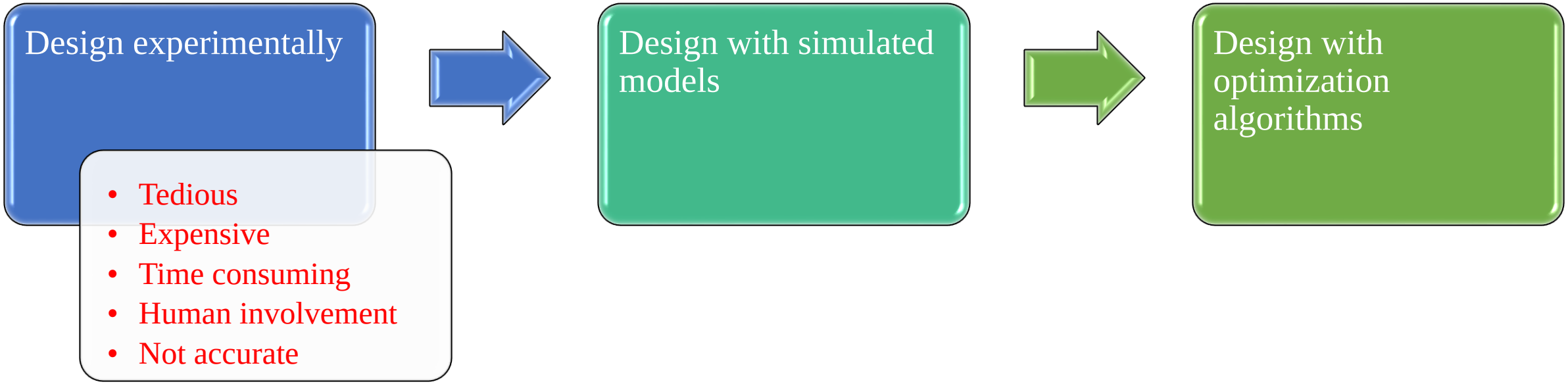
$C_g = 0.50$ 

$C_g = 0.45$ 

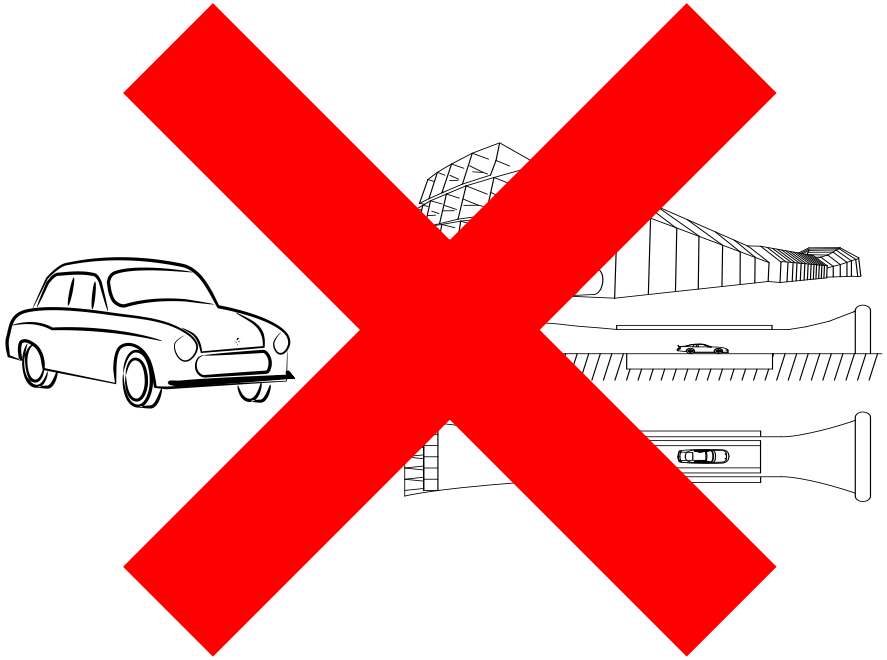
$C_g = 0.40$ 

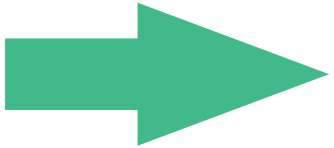
$C_g = 0.32$ 

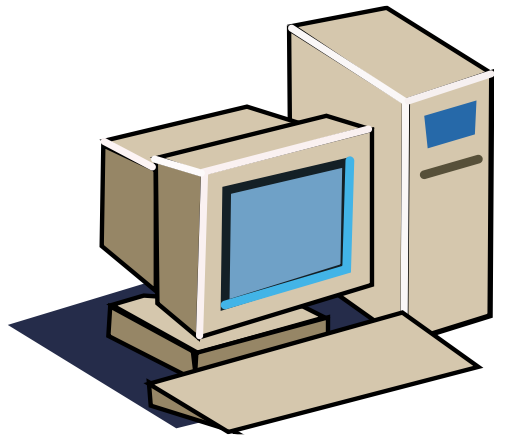



Design experimentally
Tedious
Expensive
Time consuming
Human involvement
Not accurate
Design with simulated models
Design with optimization algorithms

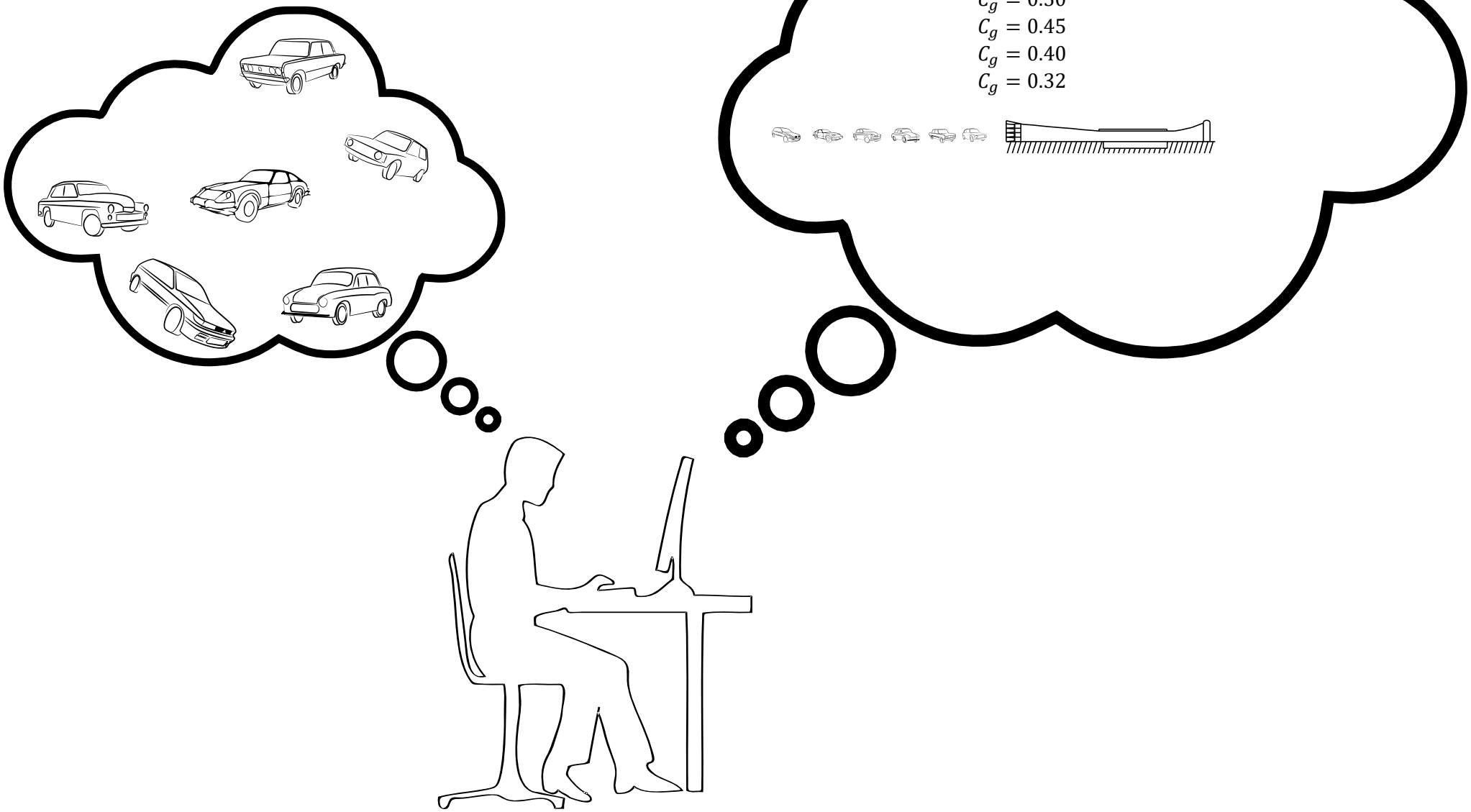
Design with simulated models

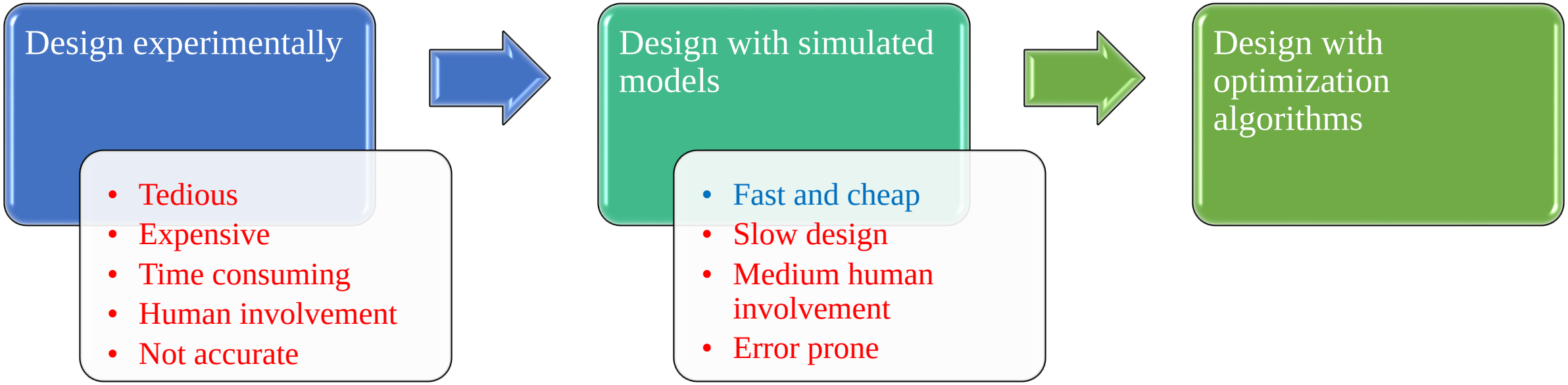




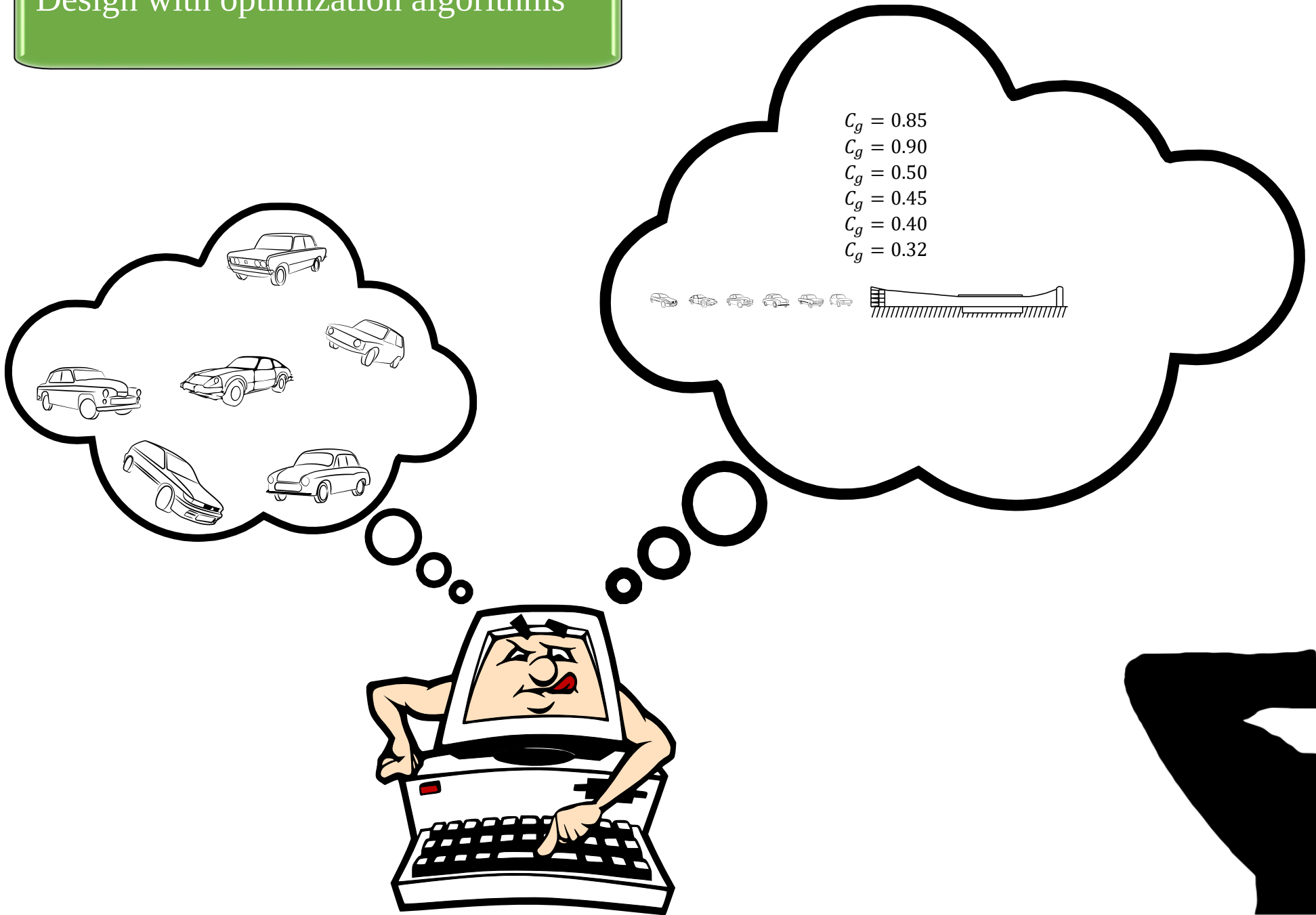


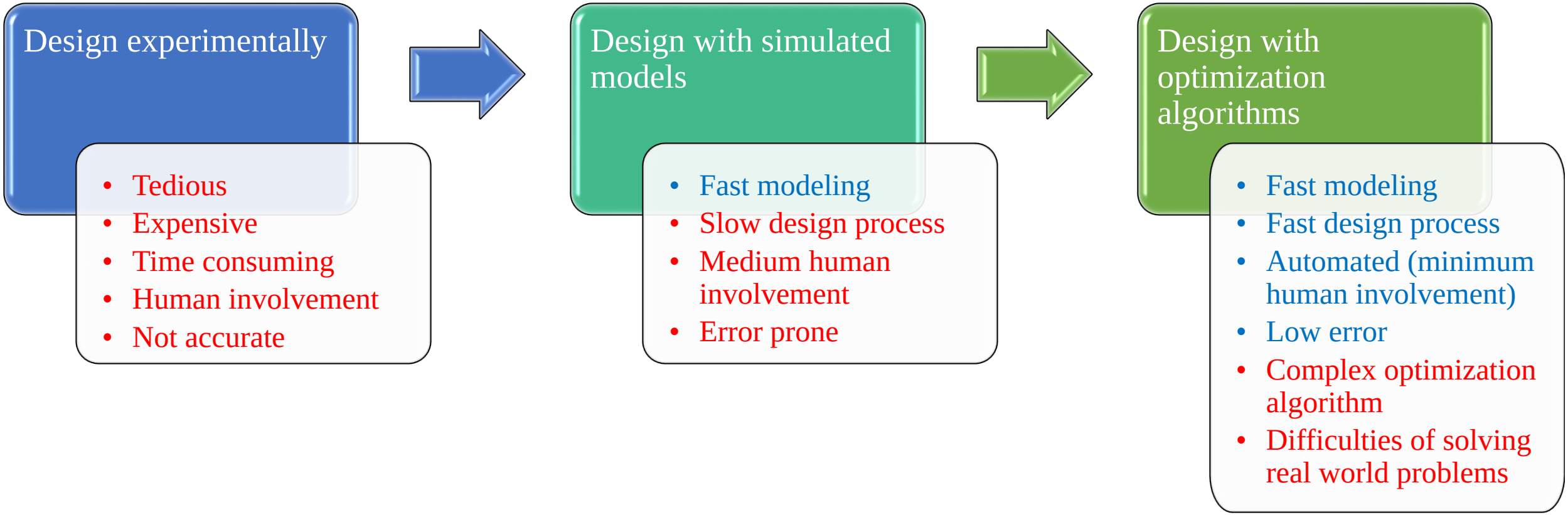
Design with simulated models




Design experimentally
Tedious
Expensive
Time consuming
Human involvement
Not accurate
Design with simulated models
Fast and cheap
Slow design
Medium human involvement
Error prone
Design with optimization algorithms

Design with optimization algorithms




Design experimentally
Tedious
Expensive
Time consuming
Human involvement
Not accurate
Design with simulated models
Fast modeling
Slow design process
Medium human involvement
Error prone
Design with optimization algorithms
Fast modeling
Fast design process
Automated (minimum human involvement)
Low error
Complex optimization algorithm
Difficulties of solving real world problems