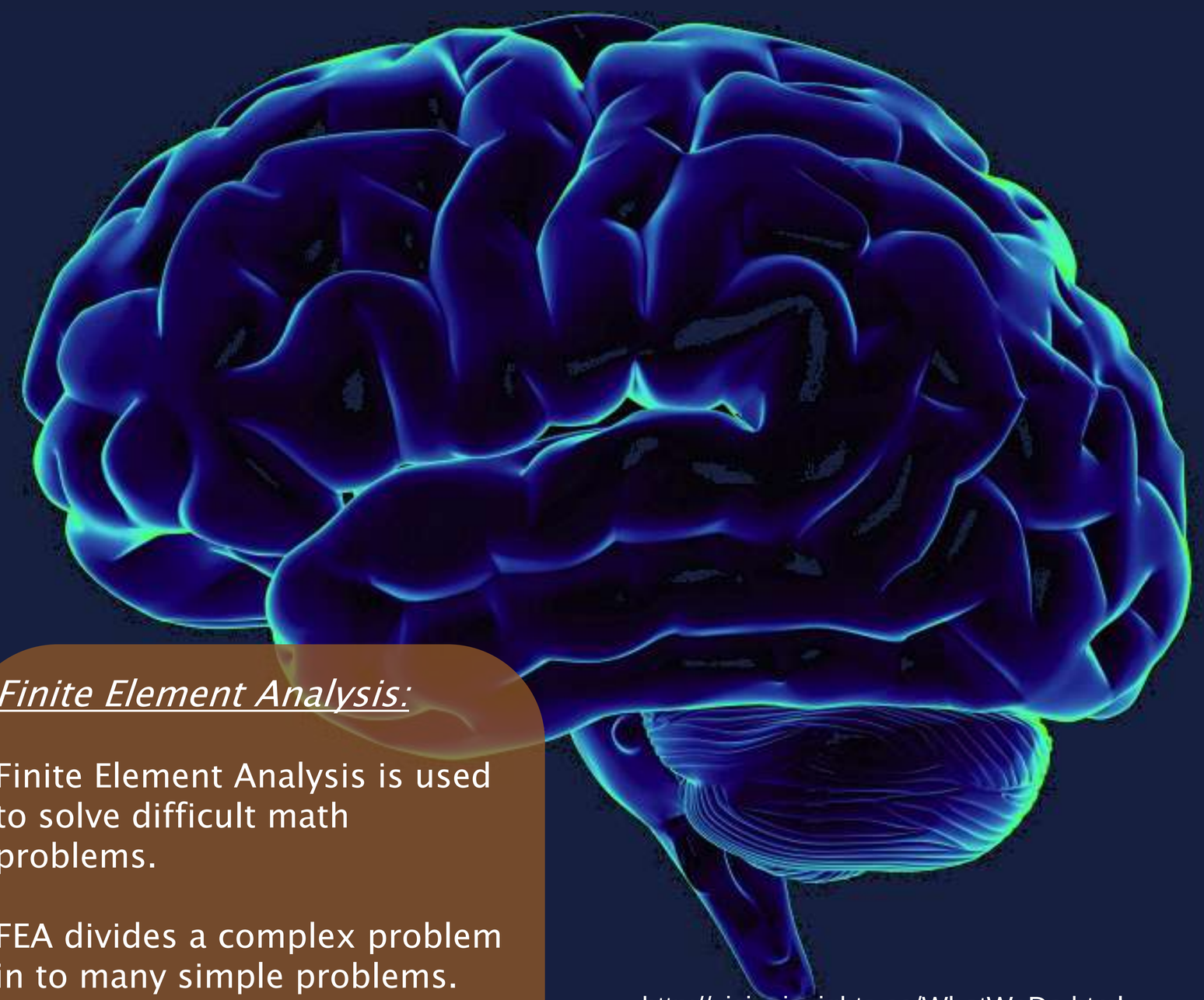
BYU applied biomechanics engineering laboratory

Head Injury Biomechanics

BRIGHAM YOUNG UNIVERSITY · FOUNDED BYU 1875 · PROVO, UTAH

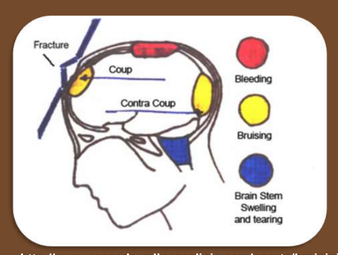


http://visioninsights.ca/WhatWeDo.html

What:

Traumatic brain injury (TBI) is defined as any blow or jolt to the head that decreases function of the brain.

•Concussion: a jarring injury to the brain.
•Brain Contusion: a bruise of the brain.
•Skull Fracture: skull cracks.
•Hematoma: bleeding in the brain that collects and clots, forming a bump.



http://www.cascadewellnessclinic.com/sports/braininjury.shtml

When:

28% falls
20% motor vehicle accidents
19% struck by or against objects
11% violence

Who:

1. 4 million annually in the United States

Prevention:

•Helmets
•Wearing a seatbelt prevents fatalities by as much as 40%

http://www1.dfrc.nasa.gov/gallery/photo/SR-71/HTML/EC94-42883-4.html

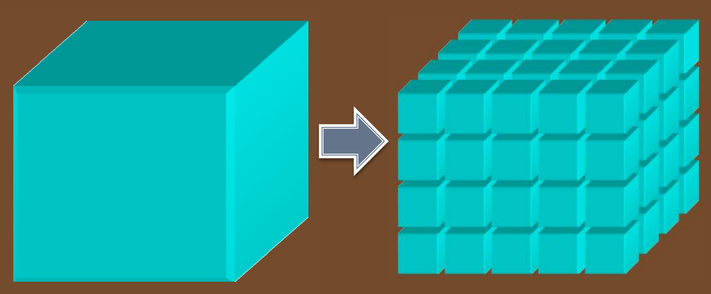
Professional Pilot – 6 g
Astronaut – 3.5 g
Airline passenger – 1.5 g

62 mph, stop in .2 sec, 14.2 g's

Finite Element Analysis:

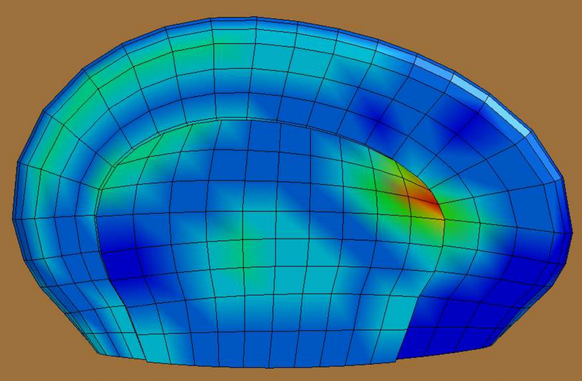
Finite Element Analysis is used to solve difficult math problems.

FEA divides a complex problem in to many simple problems.



Images Courtesy of Anton Bowden

Computers are used to solve the thousands of simple problems.

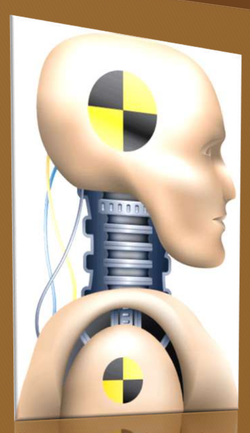


Original image courtesy of Greg Von Forell

Data Capture:

Sensors are used to collect data such as velocity and acceleration.

This data is used in the Finite Element models to calculate many things such as stress and strain.



http://www.uvamagazine.org/research_and_discovery/article/a_smarter_dummy/

As a result, many tests can be run without the large costs of experiments.