# 융합이란?

빅데이터 분석

# Computer-animated Film

# Computer-animated Film
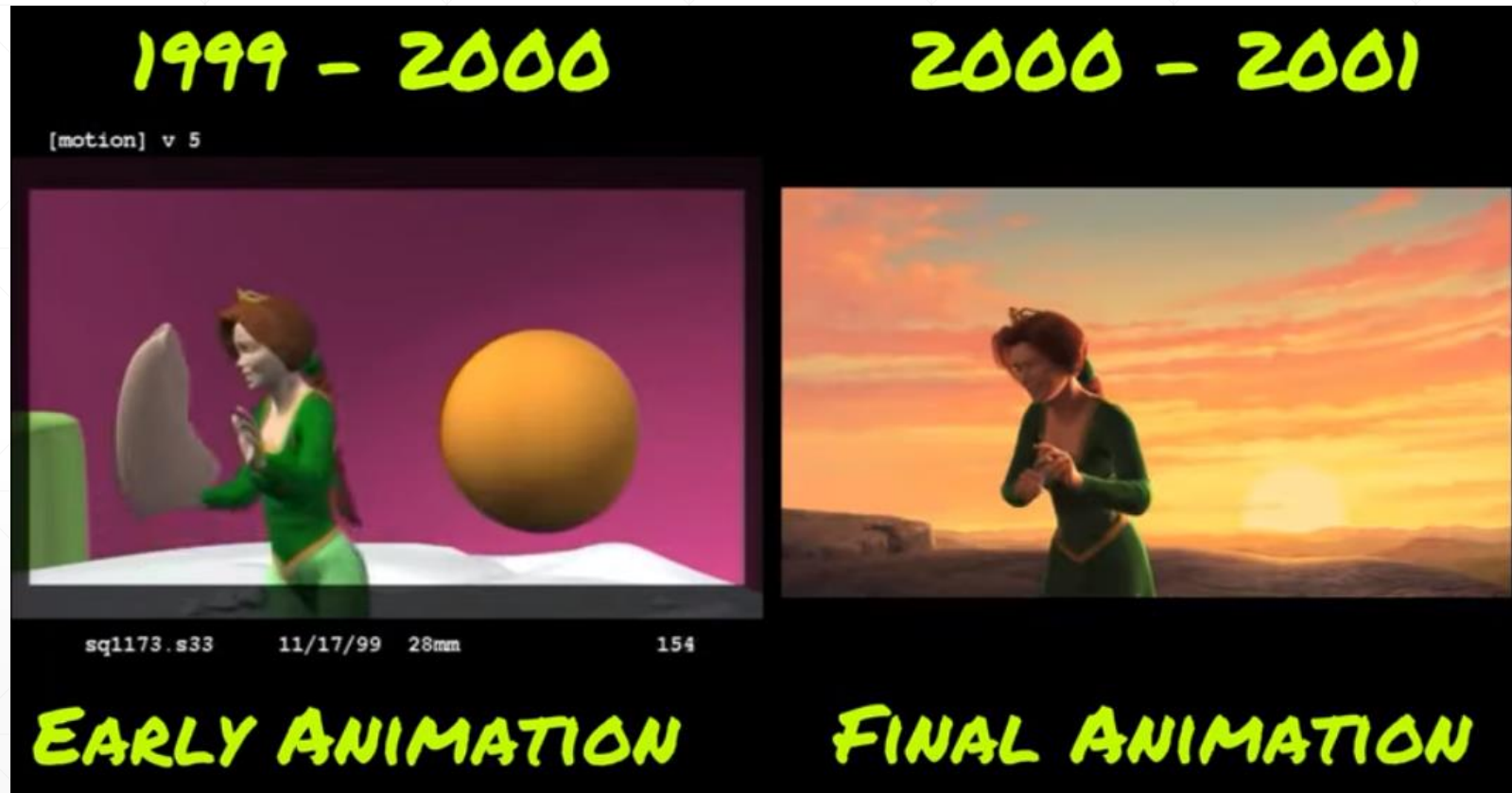


**Shrek (2001)**

**Frozen (2013)**

# Shrek (2001)



**Shrek (2001) Technical Goofs Early Animation and Final Animation Comparison**
( https://www.youtube.com/watch?v=DOY8h8krUTY )

# Shrek (2004)



**Shrek 2 (2004) Technical Goofs Early Animation and Final Animation Comparison**
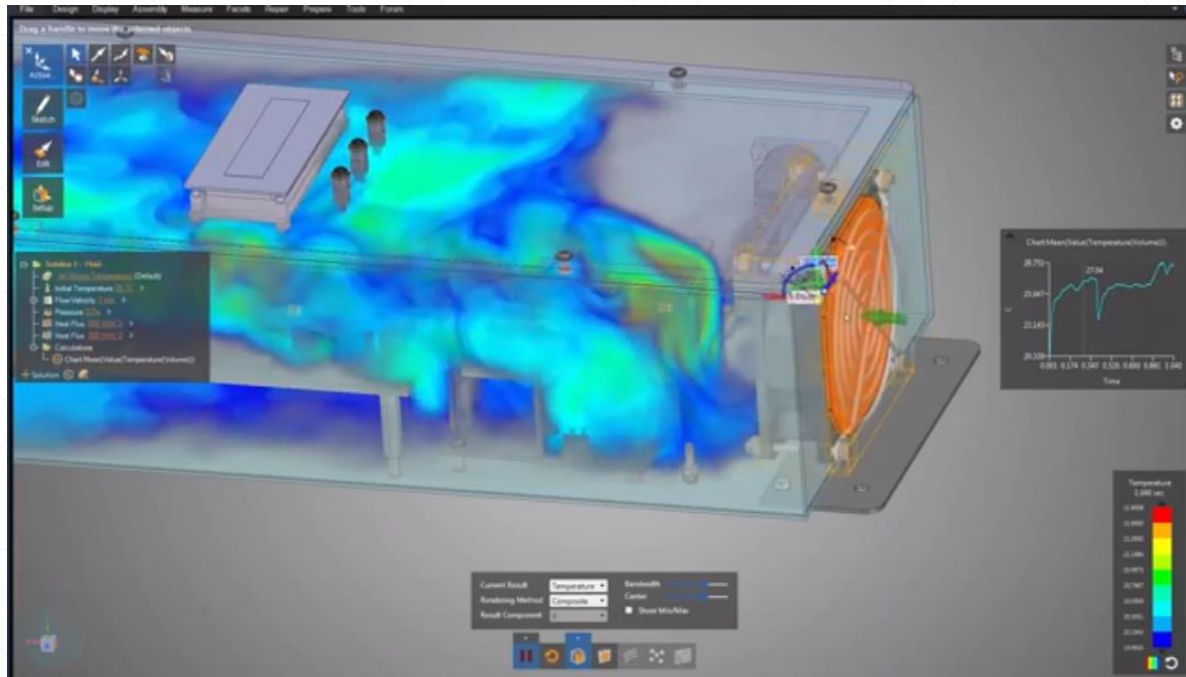( https://www.youtube.com/watch?v=EPSoNbLqx0c )
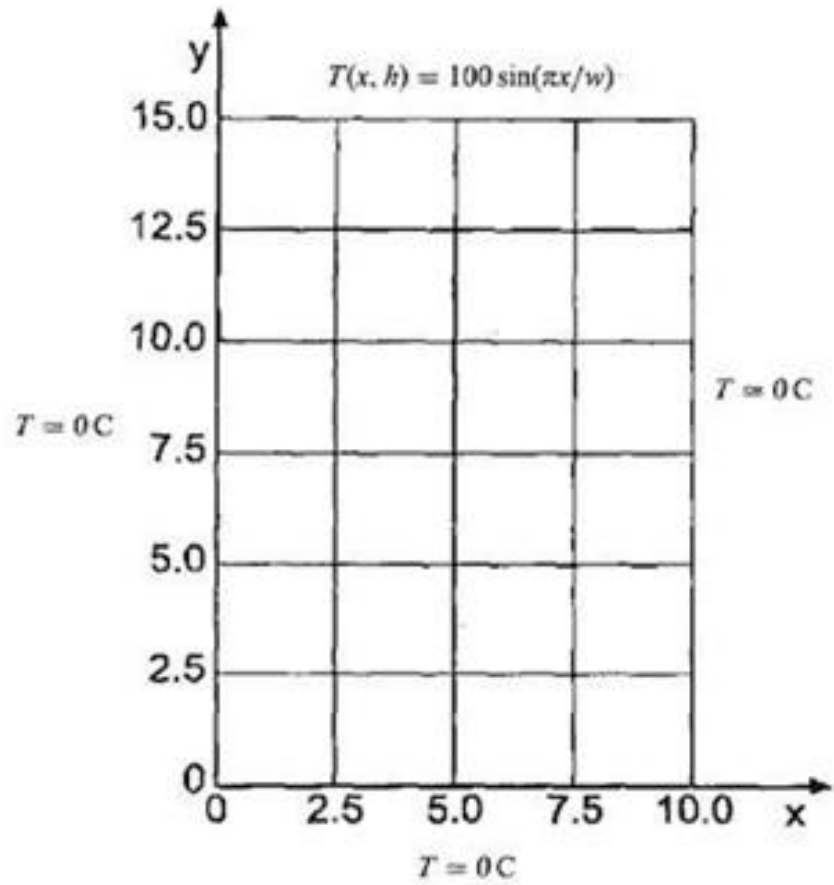
# Computational Fluid Dynamics

# Computational Fluid Dynamics





What is CFD used for?

Industry application for Computational Fluid Dynamic

Industry applications for Computational Fluid Dynamics ( https://www.youtube.com/watch?v=ygOcv4ynZ8A )
ANSYS Discovery Live Applications and Use Cases ( https://www.youtube.com/watch?v=YkOTPWd34OY )
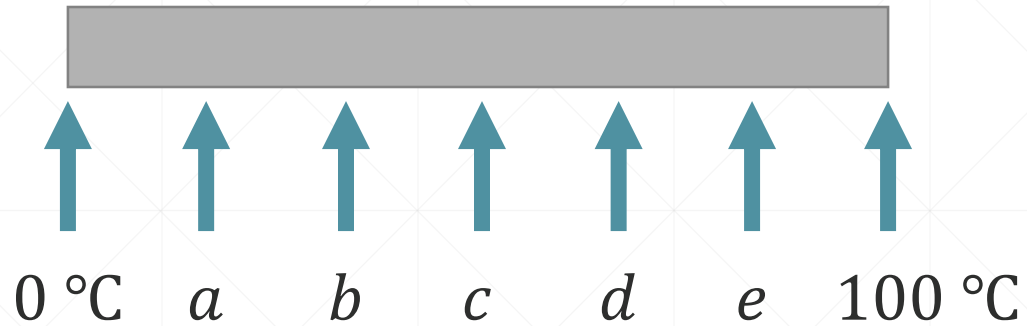
# Heat equation



$$\frac{\partial u}{\partial t} = \kappa \left( \frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} \right) \qquad \text{in } \Omega$$

$$u(x, y, 0) = g(x, y) \qquad \text{in } \Omega$$

$$u(x, y, t) = h(x, y) \qquad \text{for } (x, y) \in \partial\Omega$$

# Simple model



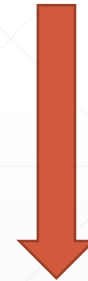$0\,°C \quad a \quad b \quad c \quad d \quad e \quad 100\,°C$

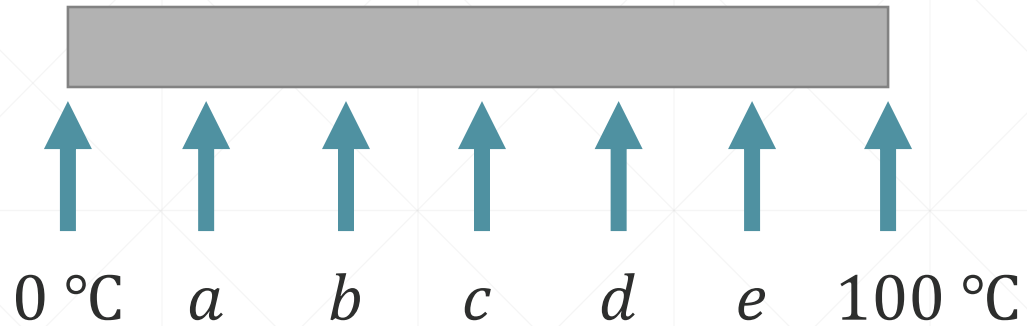$$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$$

Steady state

$$\frac{d^2 u}{dx^2} = 0$$

Discretization

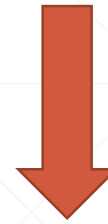$$\frac{u(x + \Delta x) - 2u(x) + u(x - \Delta x)}{(\Delta x)^2} = 0$$

# Simple model (cont'd)



$0\,°C \quad a \quad b \quad c \quad d \quad e \quad 100\,°C$

$$\frac{u(x + \Delta x) - 2u(x) + u(x - \Delta x)}{(\Delta x)^2} = 0$$

$$b - 2a + 0 = 0$$
$$c - 2b + a = 0$$
$$d - 2c + b = 0$$
$$e - 2d + c = 0$$
$$100 - 2e + d = 0$$

# Thank you !