Fire Dynamics Introduction

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Objectives

- Introduction
- Understanding the big picture of fire dynamics course

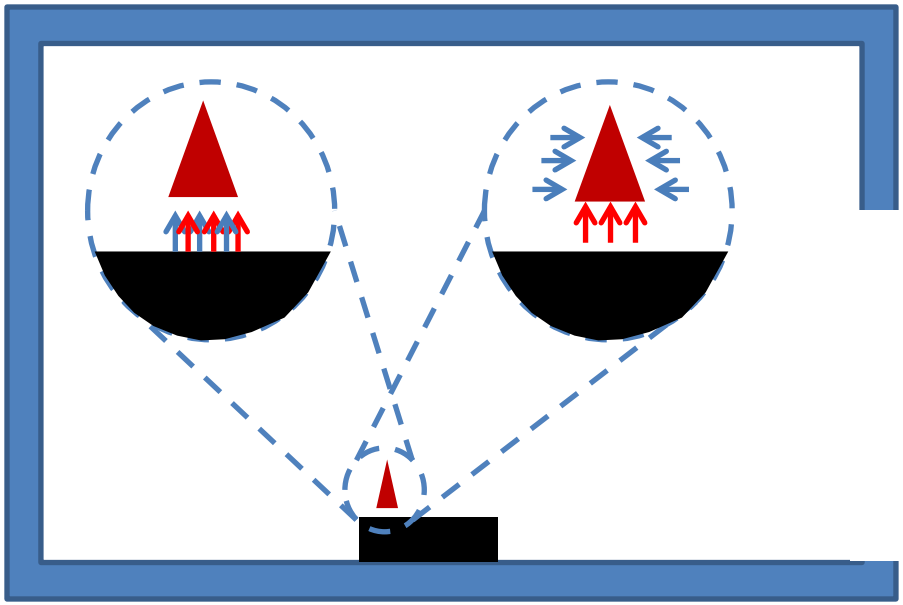
Introduction

- Instructor: Prof. Haejun Park
  - BS: Architectural Engineering
  - MS & PhD: Fire Protection Engineering
  - Fire consulting in Australia
  - Fire research in New Zealand
- Introduction of students
- Syllabus overview

1. Flame

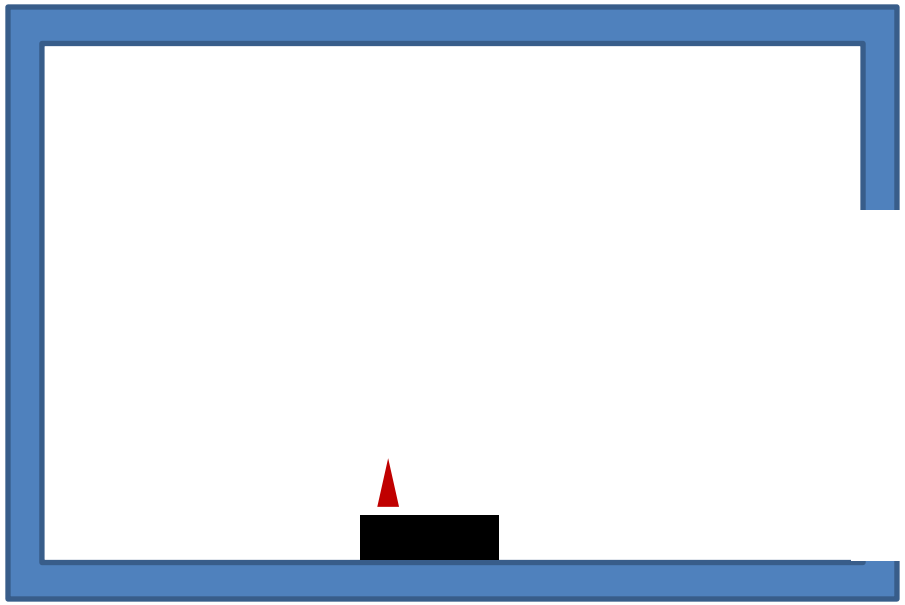
- https://www.youtube.com/watch?v=tMDKeBaLWDw

1. Flame



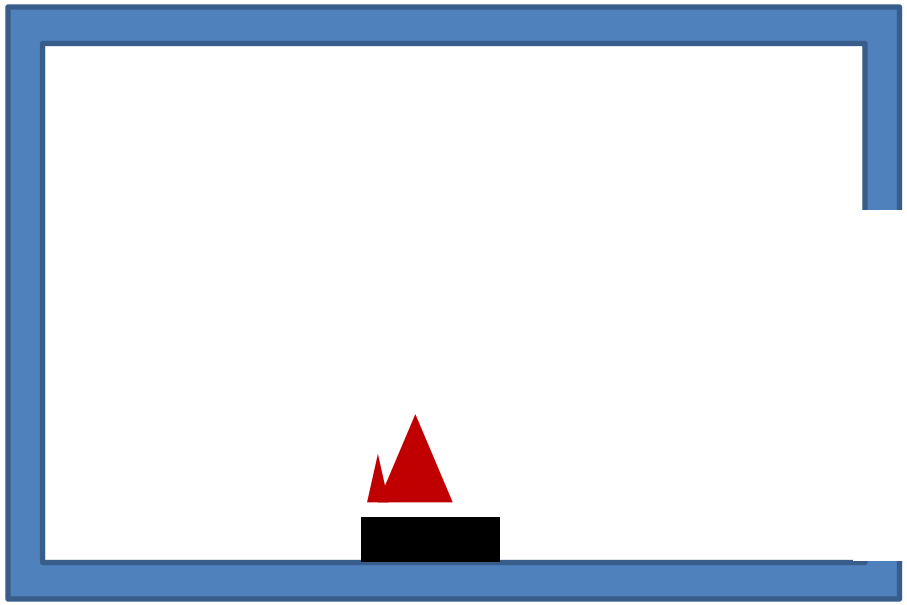
- Pre-mixed flame
  - LFL and UFL
  - Burning velocity
- Diffusion flame
  - Candle flame structure
  - Flame location

2. Ignition



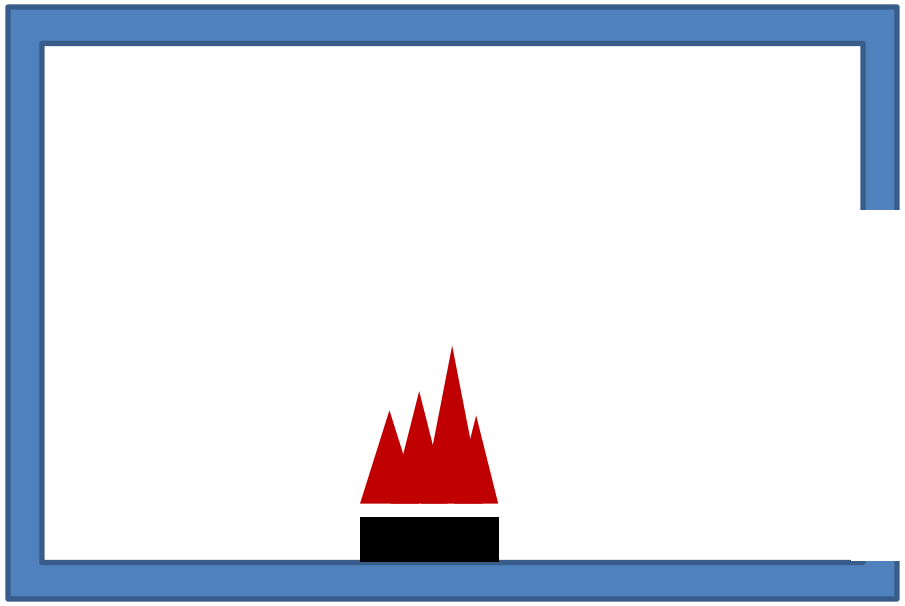
- Liquid
  - Flashpoint, firepoint, autoignition Temp.
- Solid
  - Thermally thin and thermally thick
- Spontaneous ignition (self-ignition)

3. Flame spread



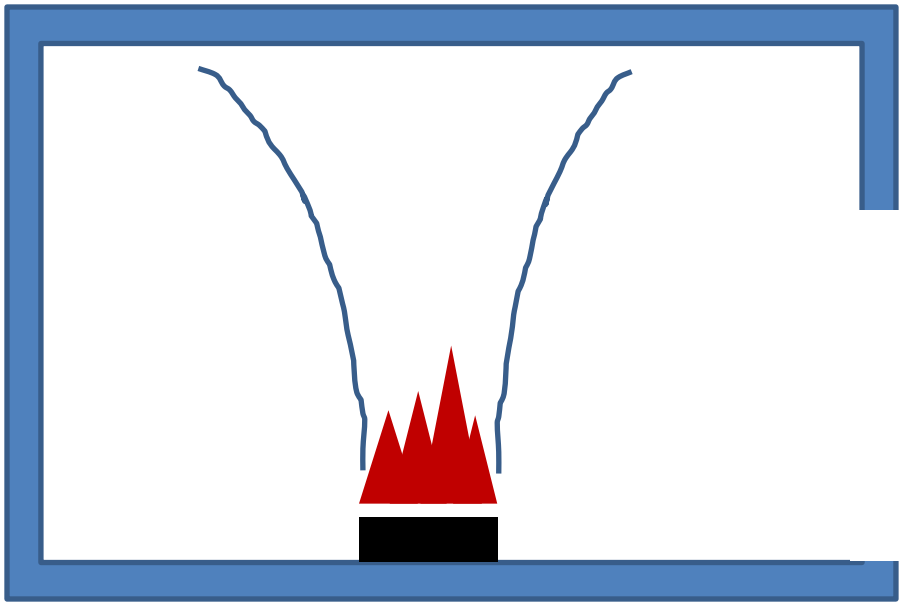
- Continuous ignition with preheating
- Thermally thin and thermally thick
- Wind-aided and opposed flow
- Object orientation
  - Roof, wall, ceiling, floor

4. Steady burning



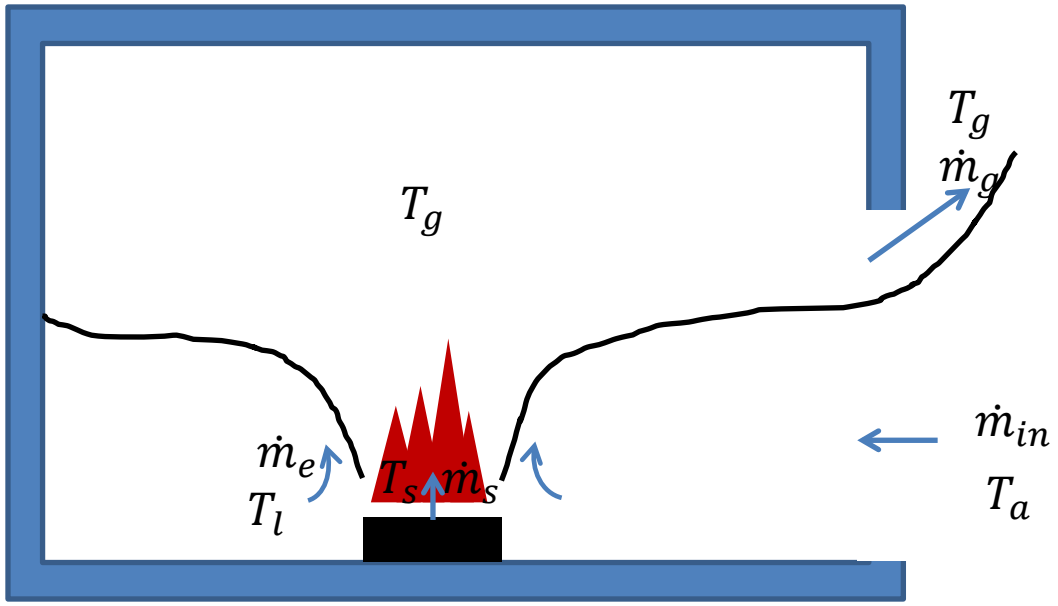
- Liquid burning
  - Evaporation rate
- Solid burning
  - Pyrolysis
- Burning rate
  - Burning rate, mass loss rate

5. Fire plume



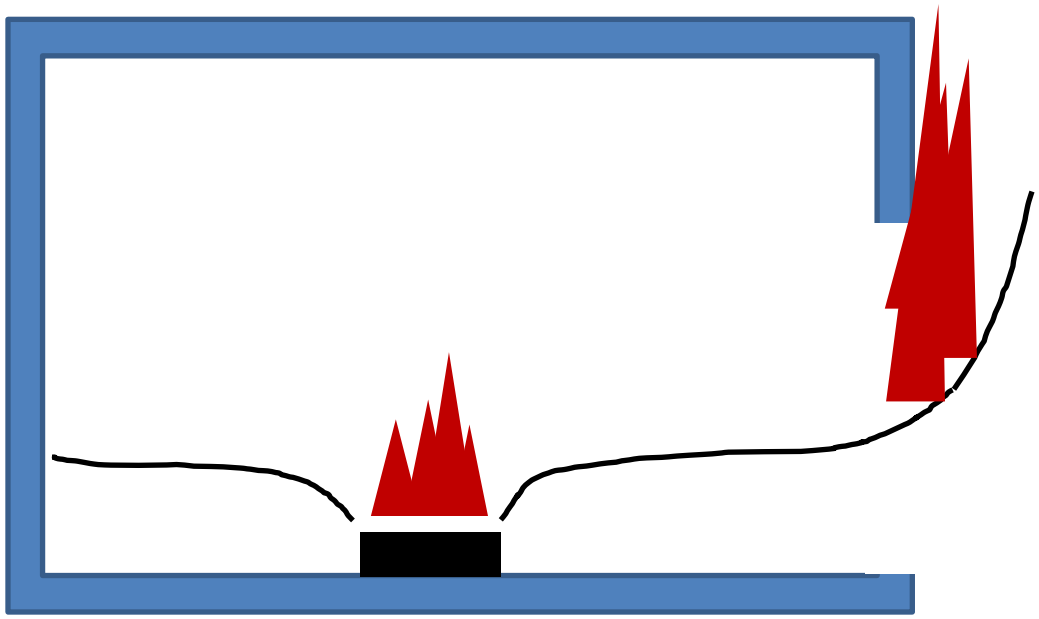
- Combusting plume
- Buoyant plume
- Plume correlations
  - Flame height
  - Entrainment rate
  - Plume temperature
  - Plume centerline velocity
- Ceiling jet

6. Pre-flashover



- Vent flows
- Heat transfer in compartment fire
- Zone fire modelling
  - Mass and energy conservation

7. Flashover / post-flashover



- Flashover
- Post-flashover phenomena
- Structural response
- Projected flames, external wall fire

0. Fundamentals

- Units and conversion
- Non-dimensional number
- Thermochemistry
  - Fire chemistry, adiabatic flame Temp.
- Heat transfer
  - Conduction, convection, radiation
- Bernoulli Equation
- Conservation laws
  - Rate of storage = rate of (gain – loss + generation)