Acoustic Tomography for Mobile Sensors

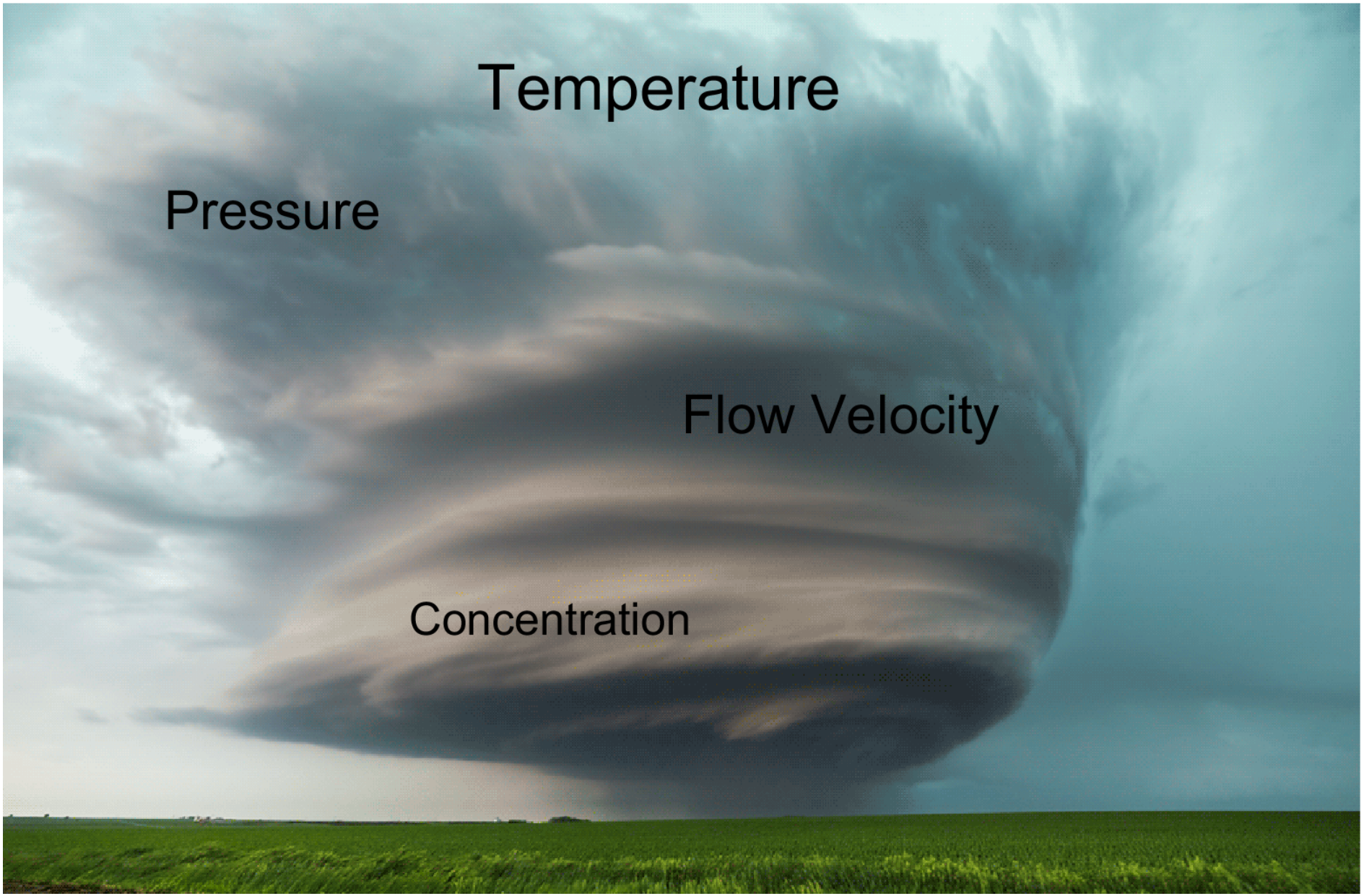
Maurice Filo

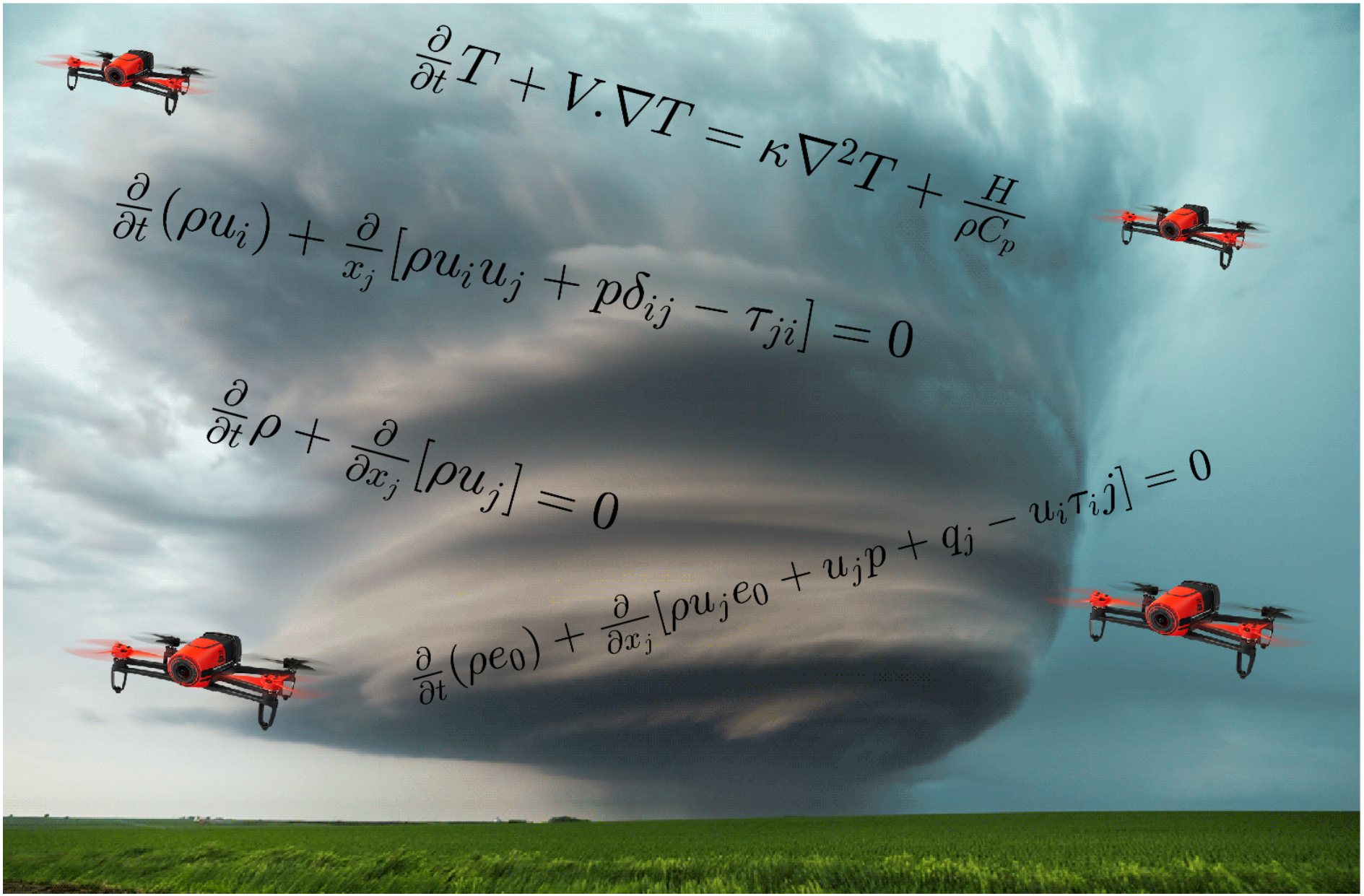
University of California, Santa Barbara
filo@umail.ucsb.edu

Advisor: Bassam Bamieh

ME Grad Slam

May 12, 2024


Temperature
Pressure
Flow Velocity
Concentration


$\frac{\partial}{\partial t}T + V.\nabla T = \kappa\nabla^2 T + \frac{H}{\rho C_p}$
$\frac{\partial}{\partial t}(\rho u_i) + \frac{\partial}{x_j}[\rho u_i u_j + p\delta_{ij} - \tau_{ji}] = 0$
$\frac{\partial}{\partial t}\rho + \frac{\partial}{\partial x_j}[\rho u_j] = 0$
$\frac{\partial}{\partial t}(\rho e_0) + \frac{\partial}{\partial x_j}[\rho u_j e_0 + u_j p + q_j - u_i \tau_i j] = 0$

Challenges

1. How many sensors?

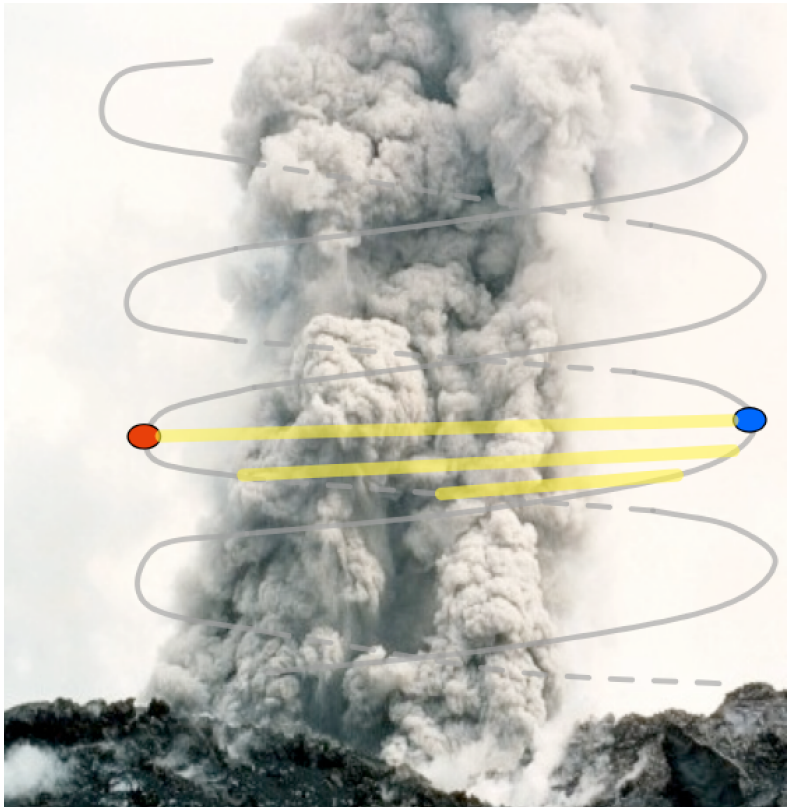
Challenges

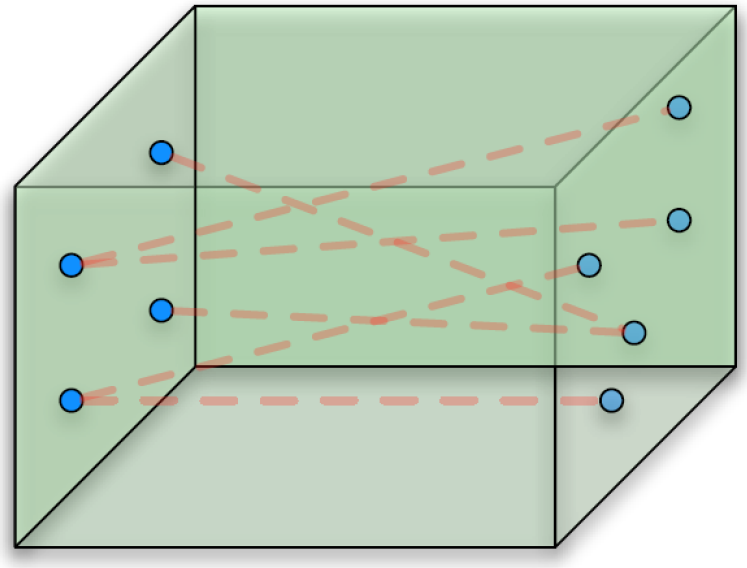
1. How many sensors?
2. Where are the best locations to deploy?

Challenges

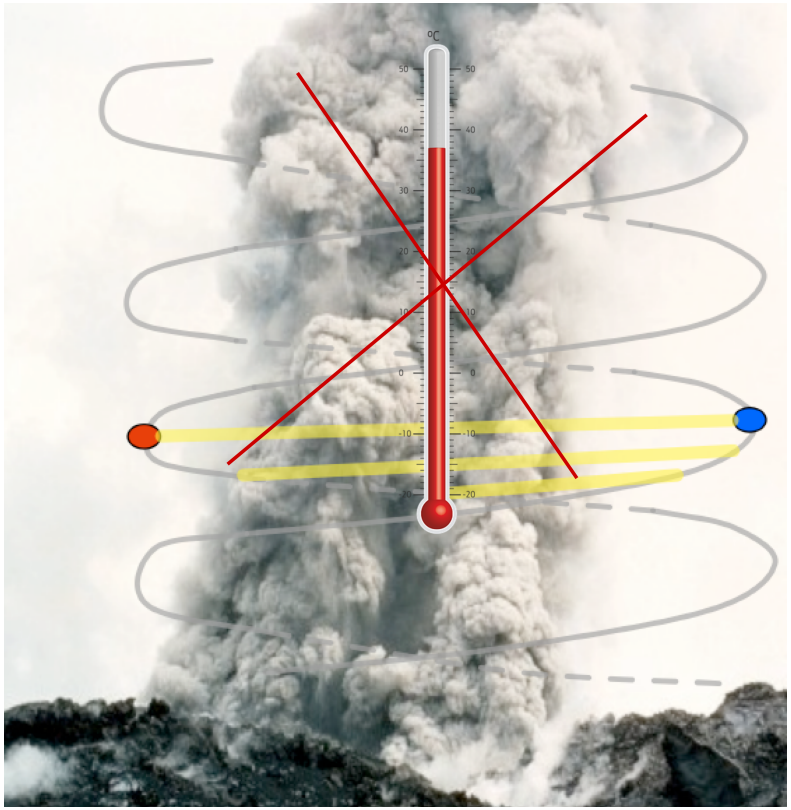
1. How many sensors?
2. Where are the best locations to deploy?
3. What is the best path to maximize our estimation accuracy?

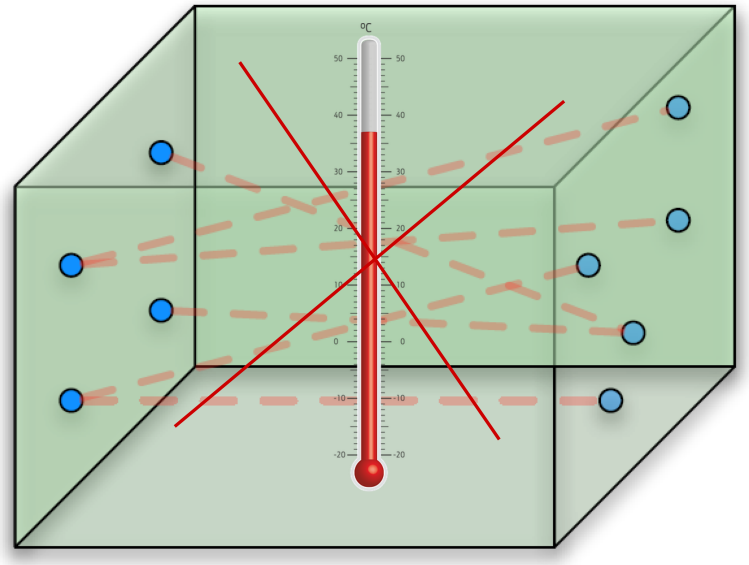
Acoustic Tomography



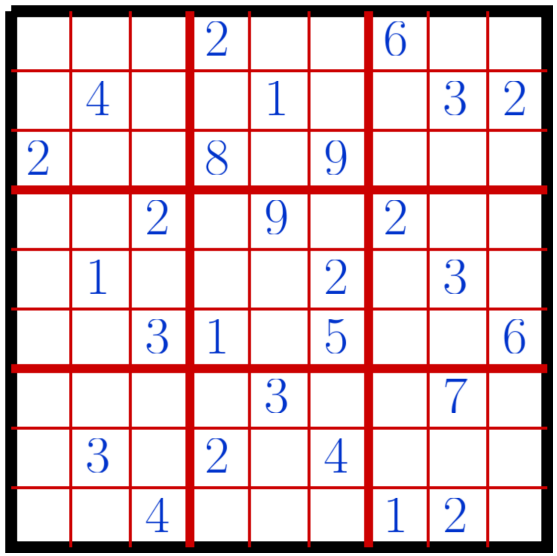


Acoustic Tomography

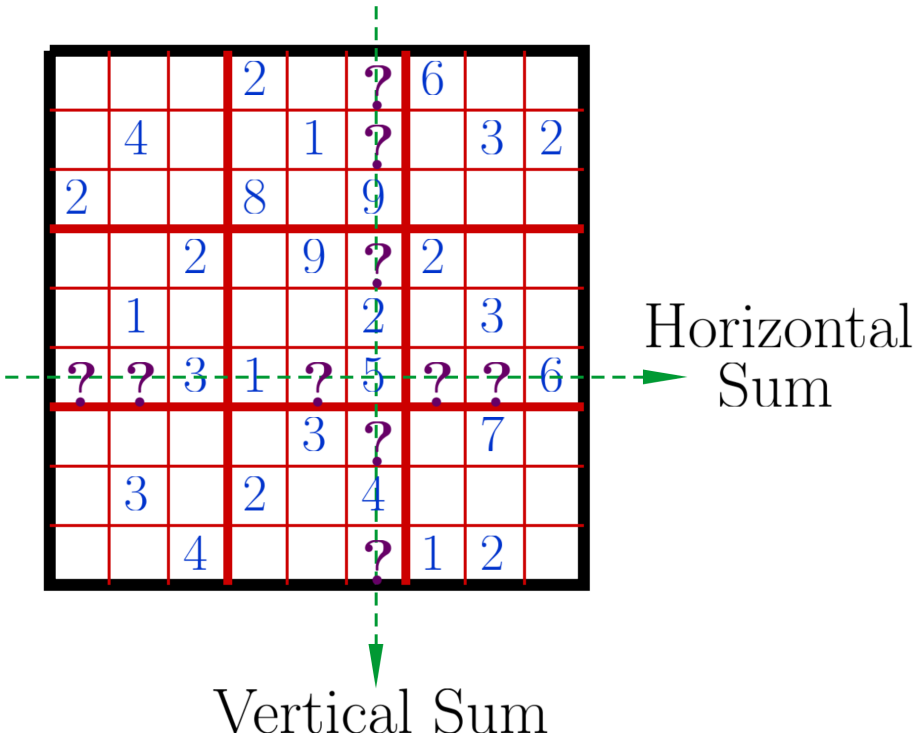




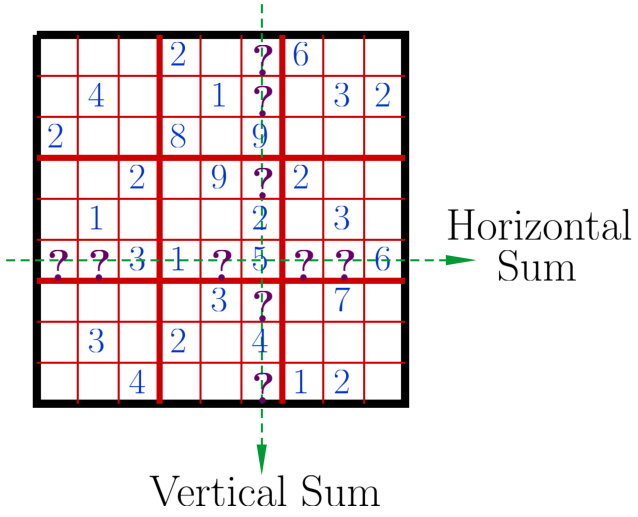
Tomography-Sudoku Analogy, Static

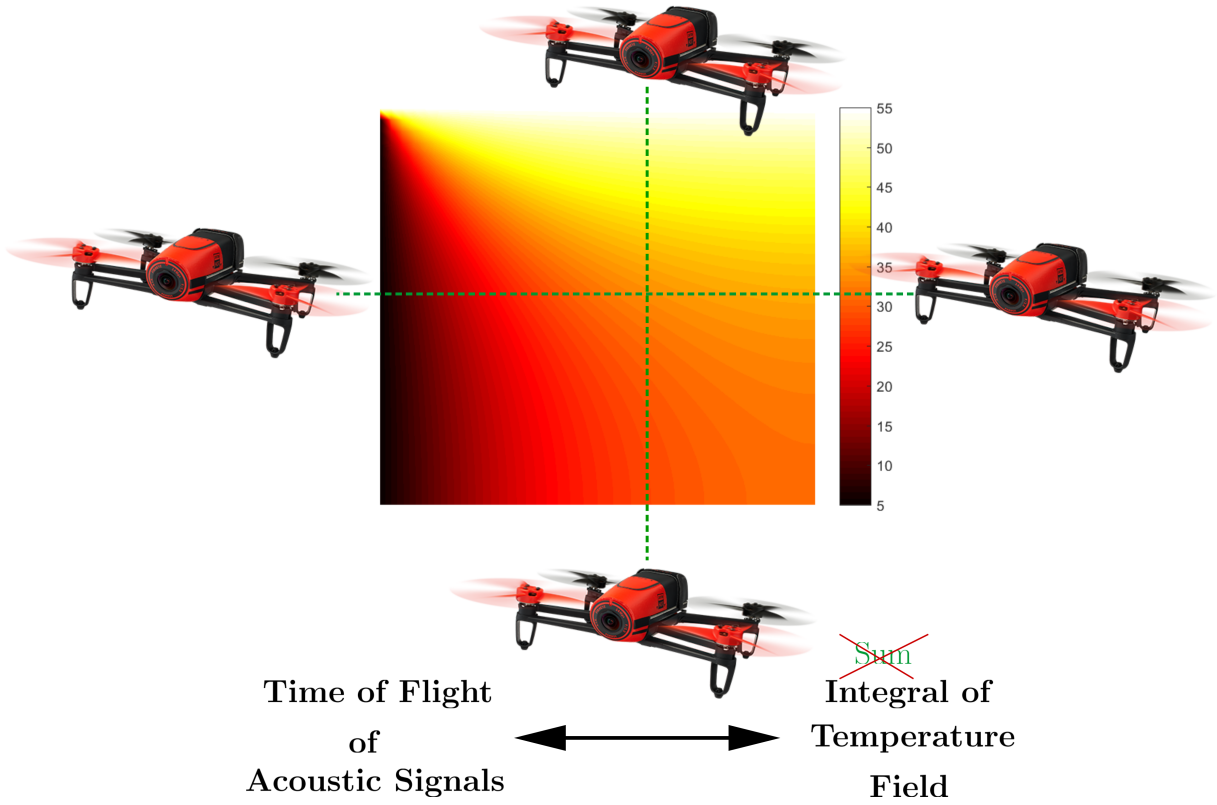


Tomography-Sudoku Analogy, Static

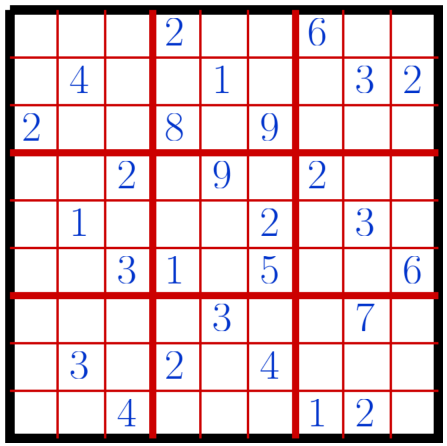


Tomography-Sudoku Analogy, Static





Tomography-Sudoku Analogy, Dynamic



Tomography-Sudoku Analogy, Dynamic

			2			6		
	4			1			3	2
2			8		9			
		2		9		2		
	1				2		3	
		3	1		5			6
				3			7	
	3		2		4			
		4				1	2