Electrostatic Method of Moments

E8-202 Class 4

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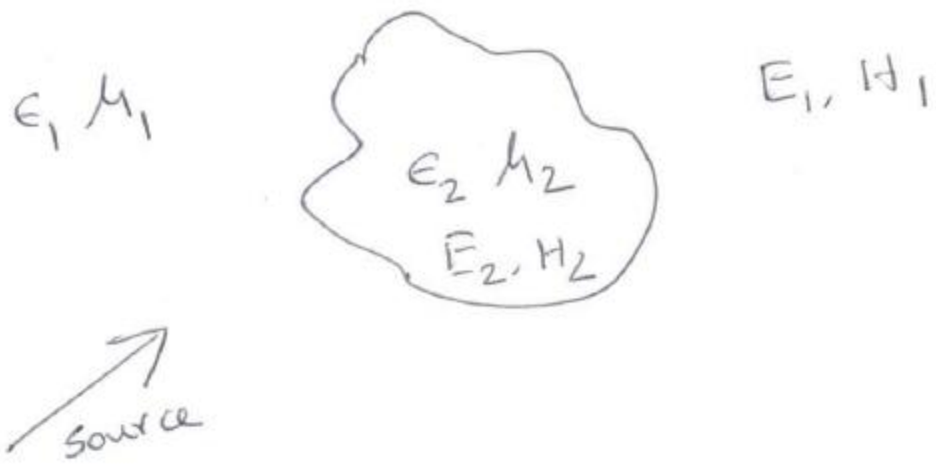
Module 2: Method of Moments

- 2D vs 2.5D vs. 3D Formulations
- Electrostatic Formulation: Capacitance matrix extraction
- Magnetostatic Formulation: Inductance matrix extraction
- Electric Field Integral Equation (EFIE): S-parameter extraction
- Partial Element Equivalent Circuit (PEEC) Method
- Magnetic Field Integral Equation (MFIE) and Combined Field Integral Equation (CFIE)
- PMCHWT Formulation: Dielectric modeling
- Parallelization techniques

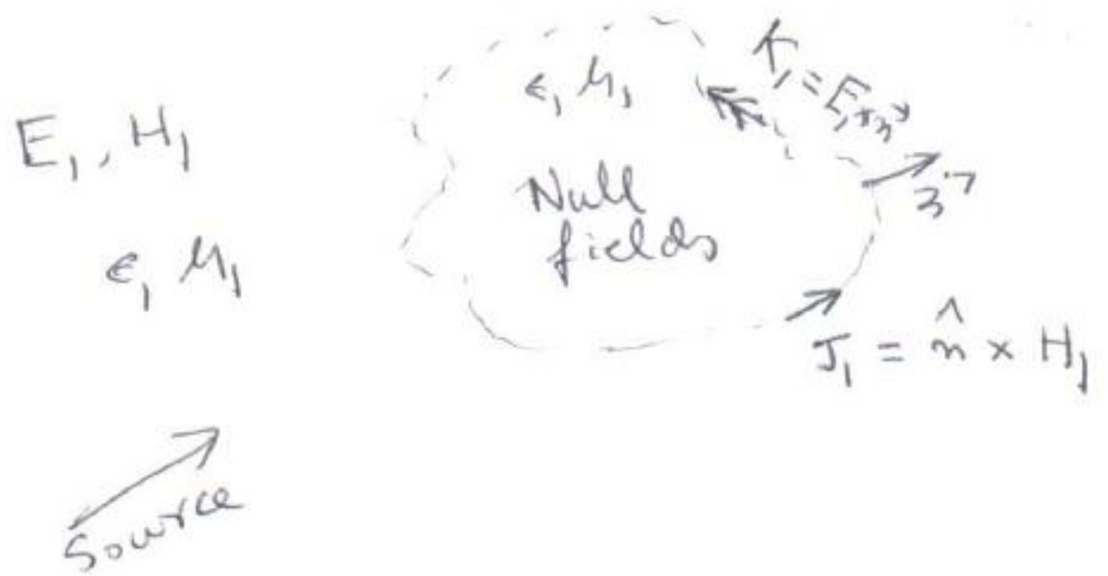
References

- Walton C. Gibson: The Method of Moments in Electromagnetics, 1st Ed., Chapman and Hall, Chapter 3
- Roger F. Harrington: Field Computation by Moment Methods, 1993, Wiley-IEEE Press, Chapter 2
- S. Rao, T.K. Sarkar and R.F. Harrington, "The Electrostatic Field of Conducting Bodies in Multiple Dielectric Media", *IEEE Transaction on Microwave Theory and Techniques*, vol. 32, issue 11, Nov 1984 pp. 1441-1448.

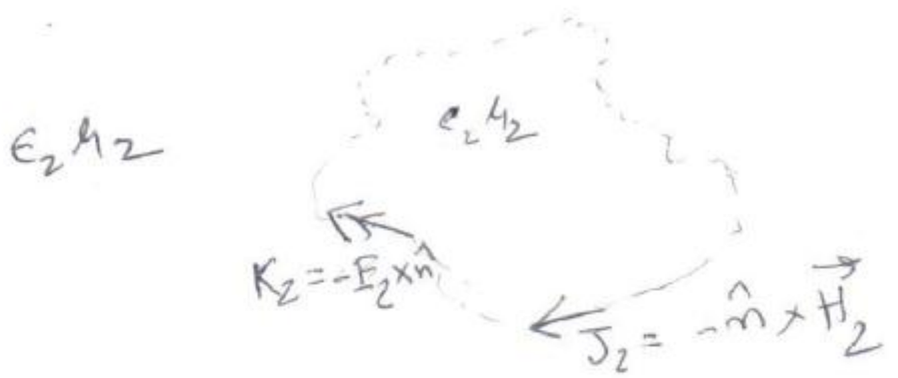
Surface Equivalence Principle



Surface Equivalence Principle



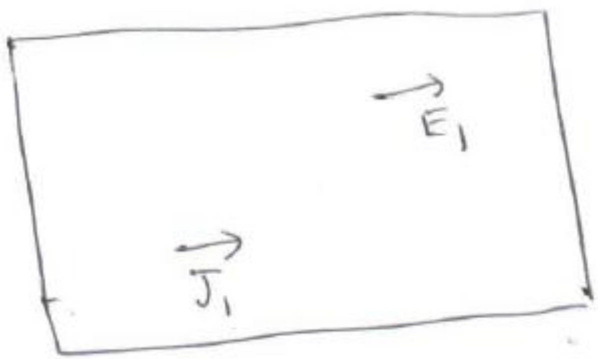
Surface Equivalence Principle

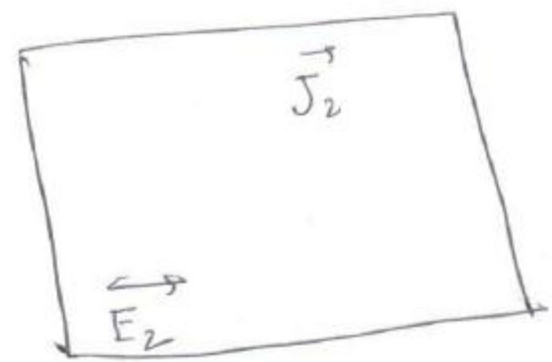


Null Fields

Reciprocity Theorem

Scenario 1

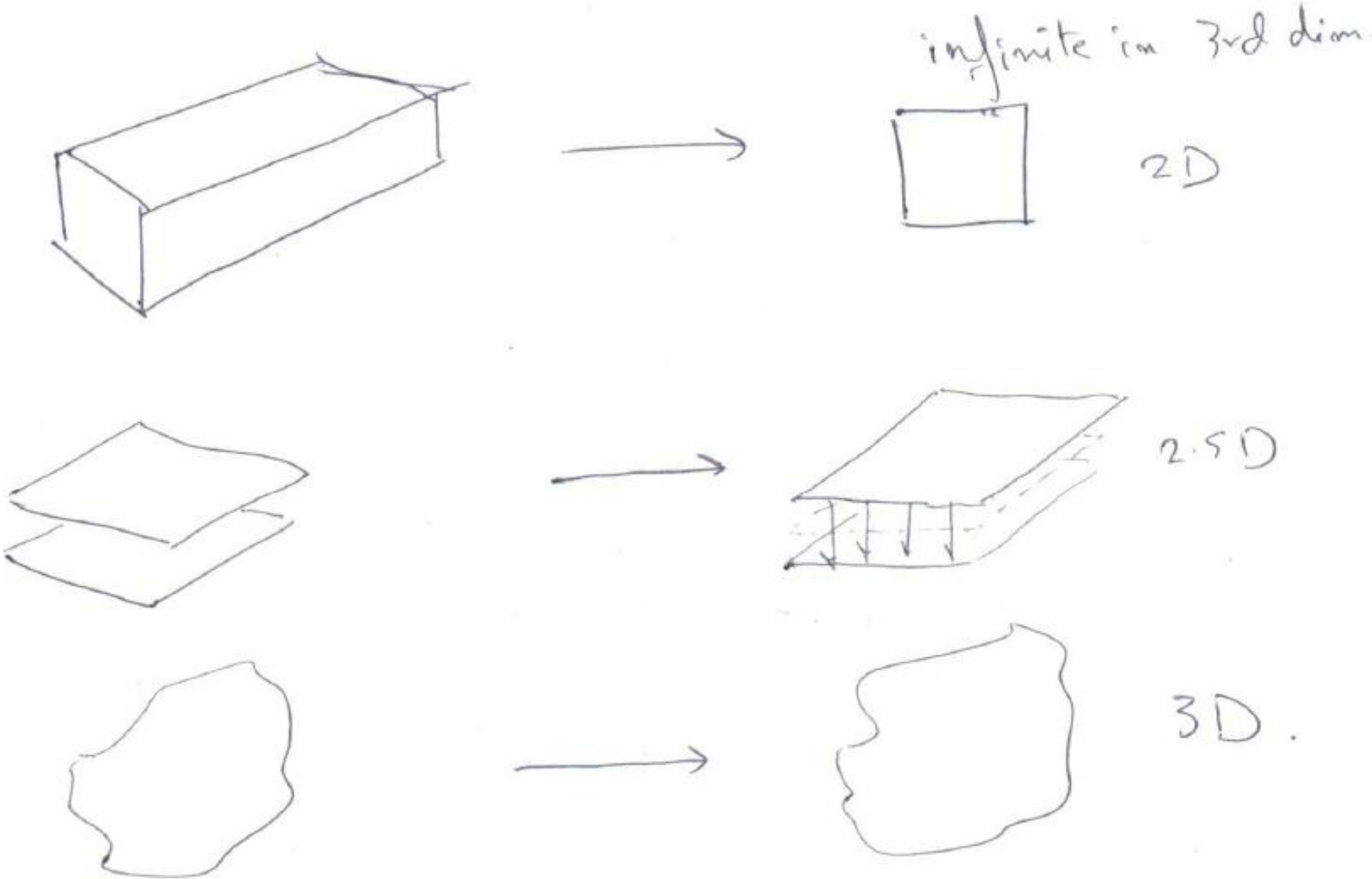




Scenario 2

$$\langle E_1, J_2 \rangle = \langle E_2, J_1 \rangle$$

2D vs 2.5D vs 3D



Electrostatic MoM: PEC only

- EM Equation
- Greens Function
- Boundary Condition
- CAD
- Mesh
- MoM matrix
- LHS vector
- RHS vector
- Solve
- Post Process

Integration

- Analytic Integration:

  Potential integrals for uniform and linear source distributions on polygonal and polyhedral domains
  Wilton, D.; Rao, S.; Glisson, A.; Schaubert, D.; Al-Bundak, O.; Butler, C.
  Antennas and Propagation, IEEE Transactions on
  Volume: 32 , Issue: 3 Publication Year: 1984 , Page(s): 276 - 281

- 7 point Gaussian Quadrature Integration:

weight=[0.225 0.13239415278851 0.13239415278851 0.13239415278851 0.12593918054483 0.12593918054483 0.12593918054483];
xsi=[0.3333333 0.0597158 0.470142 0.470142 0.7974269 0.1012865 0.1012865];
eta=[0.3333333 0.470142 0.0597158 0.470142 0.1012865 0.7974269 0.1012865];