Simple MoM Software in MATLAB


- RWG basis functions

\[
\bar{J}(\vec{r}) = \sum_{n=1}^{N} x_n \bar{j}_n(\vec{r})
\]
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\[ \bar{j}_n(r) = \begin{cases} \frac{l_n}{2A_n^+} \bar{\rho}_n^+, & \bar{r} \in T_n^+ \\ \frac{l_n}{2A_n^-} \bar{\rho}_n^-, & \bar{r} \in T_n^- \\ 0, & \text{otherwise}, \end{cases} \]

- Galerkin’s method
  \[ \bar{t}_m(\bar{r}) = \bar{j}_n(\bar{r}) \]
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- View the shapes of receiving antennas
  - viewer plate coarse
  - viewer plate fine
  - viewer dipole
  - viewer slot

- Built-in mesh generator of the MATLAB PDE toolbox, `pdetool`.

- **Code sequence**
  - `rwg1.m`--- the edge elements are created.
  - `rwg2.m`--- output the *subtriangle’s midpoints* for each triangle patch.
  - `rwg3.m`--- contains $f$, $\varepsilon_0$, and $\mu_0$. `impmet` is called to output `impedance.mat`. 
Antenna mesh from subdirectory mesh

- mesh1.mat
- mesh2.mat
- impedance.mat
- current.mat

- rwg1.m
- rwg2.m
- rwg3.m
- rwg4.m
- rwg5.m

- Creates RWG edge elements
- Computes impedance matrix
- Determines excitation voltage and solves MoM equations
- Determines and visualizes surface currents

Figure 2.2. Flowchart of the scattering algorithm of Matlab’s directory of Chapter 2.
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Figure 2.5. Barycentric subdivision of the primary triangle. The triangle’s midpoint is shown by a white circle.
Figure 2.7. Incident field geometry for the plate.
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- **rwg4.m**--- determines the excitation vector; solves the system of equations to produce `current.mat`.
- **rwg5.m**--- calculates and plots the resulting surface current density on the surface.
- **rwg6.m**--- supplementary.

1. Given surface current distribution \rightarrow \text{radiated electromagnetic field}

![Flowchart of Matlab scripts of chapter 3](image)

Figure 3.3. Flowchart of the Matlab scripts of chapter 3.
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- ef i el d1. m--- ObservationPoint = [5; 0; 0];
- ef i el d3. m--- ObservationPoint = [0 y z]';

1. The surface current distribution due to an applied voltage in the antenna feed. Code sequence.

- Fig. 4.5

\[
V_{m=n} = \int_{T_n^+ + T_n^-} E \cdot \hat{f}_n dS = V \int_{T_n^+ + T_n^-} \delta(y) \hat{y} \cdot \hat{f}_n dS = l_n V \quad \text{for edge element } m = n
\]

\[
V_m = \int_{T_n^+ + T_n^-} 0 \cdot \hat{f}_m dS = 0 \quad \text{otherwise}
\]

- rwg4. m--- FeedPoint = [0; 0; 0];
Figure 4.2. Flowchart of the complete radiation algorithm.
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Figure 4.5. Feeding edge model. Black arrows show the electric field direction in the antenna gap. White arrows show the direction of the surface current on the antenna surface.
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Figure 4.9. (a) Monopole antenna structure after execution monopole.m. (b) Surface current distribution at 75 MHz; the white color corresponds to larger magnitudes. (c) Model of the base-driven monopole.