Topics for Today:

- Questions from last lectures?

- Questions/Comments on Assignment #7
  - Counting flops (floating point operations)
  - Reordering, solving, "un-reordering"

- Topics for Today:
  - Constrained optimization: Method of Lagrangian Multiplier
  - Optimal Dispatch in "lossless" system

- Assignment #8 (coming up)
  - Lagrangian multiplier
  - Optimal dispatch (lossless)
  - Optimal dispatch (including line losses)
  - Run Aspen tutorial (manuals in lab)
flops (0) % reset counter

Build [Y]
Build Mismatch
Build [F]
Iterate

Done Converged

→ Num Flops = flops

⇒ help flops

Ref No: 84,000

EE5200 – Advanced Methods in Power Systems  Tape#  Page#2

MichiganTech  Instructor:  Bruce Mork  Phone (906) 487-2857 Email: bamork@mtu.edu
Approach: (Reorder rows/columns in \( A \))

- Careful of main diagonal zeros.
- Reduce fills.

Desire: Reduce fills

\[
[A]^{-1}[x] = [B], \text{ solve for } [x]
\]

General Approach:

**Proof Reading:**

3

EE5200 - Advanced Methods in Power Systems

\( u^* \text{-Reorder} \) to retrieve \( x \)

2 solve for \( (x) \)
EE5200 - Advanced Methods in Power Systems

Page 34:

Compare \([V]\)

Unrounded \([V]\) \(\rightarrow\) Rounded

Test: Solve

\[ [I] = [v] [I] \]

Solve Krowns

Solve Krowns

Krowns

Krowns
end

end

y[i](j) = y(Record[j](i), Record[j](j))

for j = 1: length (Record)

T[i] = I (Record[i](i))

for i = 1: length (Record)

Record[i] = [3 7 5 1 2 ... 11]

Record[i] = Column end (y)

\[ \text{Mathlab: Column, etc.} \]

\[ \text{flops (0)} \]
Reordering solution vector.
2) Find all partial derivatives

\[ \left[ \begin{array}{c} x' \rule{0pt}{2.5ex} \\ \vdots \\ x^n' \rule{0pt}{2.5ex} \end{array} \right] = \begin{array}{c} \frac{\partial f}{\partial x_1} \\ \vdots \\ \frac{\partial f}{\partial x_n} \end{array} \]

3) Solve for \((x_1', x_2', \ldots, x_n', \ldots)\)

and set to zero

4) Is \(\text{soh} a \text{ min/max/saddle point?}\)

Form the Lagrangian:

\[ \lambda (x_1', x_2', \ldots, x_n') = f(x_1, x_2, \ldots, x_n) - \lambda \left( \frac{\partial f}{\partial x_1} \right) \]
EE5200 - Advanced Methods in Power Systems

Diagram:

- Global min
- Local min
- Global max
- Local max
- Inflection point
- Optimization in "N-space"
- N = 1 + n
- Where n = no. of gens.
If $H$ is positive definite, then

\[ \begin{bmatrix} \frac{\partial^2 L}{\partial x^2} & \frac{\partial^2 L}{\partial x \partial y} & \frac{\partial^2 L}{\partial y^2} \\ \frac{\partial^2 L}{\partial x \partial y} & \frac{\partial^2 L}{\partial x^2} & \frac{\partial^2 L}{\partial y \partial x} \\ \frac{\partial^2 L}{\partial y \partial x} & \frac{\partial^2 L}{\partial y^2} & \frac{\partial^2 L}{\partial x \partial y} \end{bmatrix} = H \]

After solving for $(x_1, x_2, \ldots, x_n)$

Evaluate Hessian

Key: Advanced Methods in Power Systems
\[ f = 2x^2y - 3\sqrt{x^2 + 6xy} - 4z^2 \]

\[ 0 = 2(x^2 + 2x^2 + 2y) \]

\[ \text{Constraint:} \]

\[ g = 2x^2y \]

\[ \text{Max Volume} \]

\[ \text{For } S = 432 \text{ cm}^2 \]

\[ \text{Ex: Box } x-y-z \]
\[ 2(x^2 + 2x^2 + 2x^2) - 432 = 0 \]

\[ 2x^2 - 6x + 7 = 0 \]

\[ 4x^2 - 8x^2 + 6x^2 = 0 \]