Battery electric vehicle application, scenario 1

- The next scenarios that we consider are typical of battery electric vehicle and plug-in hybrid electric vehicle operation
- These are different from HEV application in several respects:
  - Total capacity is larger
  - Relative rate of energy usage is lower
  - Range of SOC used by the vehicle is larger
  - Battery is sometimes fully charged to a known set point
- In all BEV simulation cases, $Q_{\text{nom}} = 100\,\text{Ah}$, maximum rate of $\pm 5 Q_{\text{nom}}$, 10-bit current sensor, or $q = 10 Q_{\text{nom}}/1024$ and $\sigma_{y_i}^2 = q^2 m_i/(12 \times 3600^2)$

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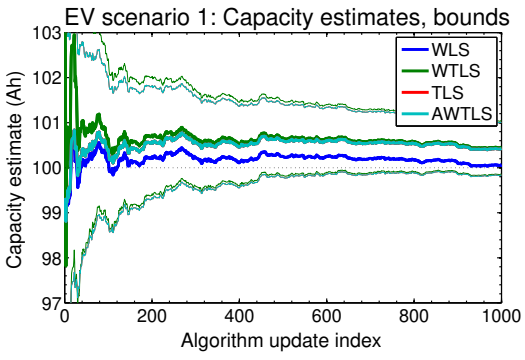
- For BEV scenario 1, total capacity estimate updated on regular basis, with $m_i = 7200\,\text{s}$ (*i.e.,* 2 h or about 120 mi)
- Assume cell SOC can change by $\pm 40\,\%$ in that interval, so the true value of x_i is chosen to be uniform random variable between -0.4 and $+0.4$
- Noise on x_i Gaussian with $\sigma_{x_i}^2 = 2(0.01)^2$; recursive methods initialized to 99 Ah

```
Q0 = 100;           % ** actual new-cell capacity of cell
maxI = 5*Q0;        % ** must be able to measure current up to +/- maxI
precisionI = 1024; % 10-bit precision on current sensor
slope = 0;
Qnom = 0.99*Q0;     % ** nominal capacity, used for init. of recursive methods
xmax = 0.4; xmin = -xmax; % ** range of the x(i) variables
m = 7200;           % ** number of samples between updates
theCase = 1;        % fixed interval between updates
socnoise = sqrt(2)*0.01; % standard deviation of x(i)
Gamma = 1;          % forgetting factor
plotTitle = 'EV Scenario 1';
runScenario
```


Results for BEV scenario 1

- Representative results of this scenario presented below
- Very similar in most respects to HEV scenario 2 results
- WLS fails because its error bounds are far too tight
- WTLS, TLS, and AWTLS all give good results
- TLS and AWTLS give best results due to lower error bounds because of possibility of initialization



Summary

- BEV scenarios differ from HEV scenarios in several respects:
  - Total capacity is larger
  - Relative rate of energy usage is lower
  - Range of SOC used by the vehicle is larger
  - Battery is sometimes fully charged to a known set point
- Results from BEV scenario 1 demonstrate:
  - WLS fails because its error bounds are far too tight
  - WTLS, TLS, and AWTLS all give good results
  - TLS and AWTLS give best results due to lower error bounds because of possibility of initialization