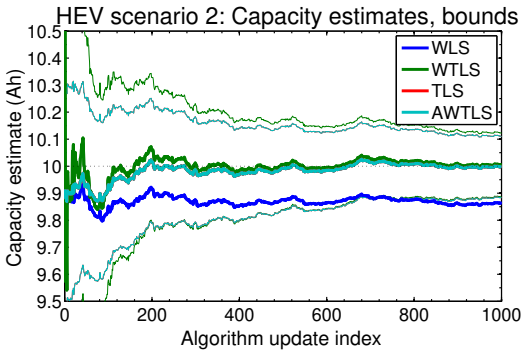
HEV application, scenario 2

- HEV scenario 2 identical to first, but parameters of recursive methods initialized before measurements received
- In this case, methods were initialized with “nominal” capacity estimate of 9.9 Ah (true total capacity was still 10.0 Ah)

```
Q0 = 10;            % actual new-cell capacity of cell
maxI = 30*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 = 0.2; xmin = -xmax; % range of the x(i) variables
m = 300;            % 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 = 'HEV Scenario 2';
runScenario
```


Results for HEV scenario 2

- Results for HEV scenario 2 presented to the right
- TLS and AWTLS give identical results for their estimates, error bounds
- WTLS cannot be calculated recursively, so estimate cannot be initialized—its results are same as for scenario 1
- Again, WLS inferior to other methods
- TLS and AWTLS give best results because of tighter error bounds



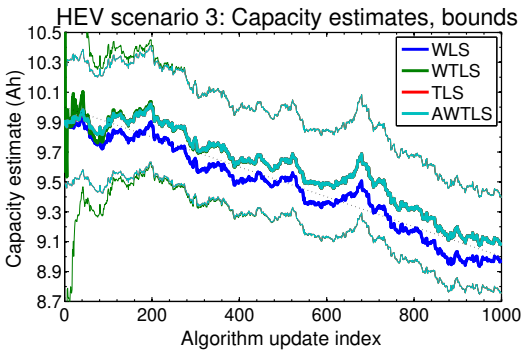
HEV application, scenario 3

- HEV scenario 3 identical to HEV scenario 2, but explores algorithms’ ability to track fading total capacity
- True total capacity changes -0.001 Ah per measurement update; fading memory forgetting factor of $\gamma = 0.99$ is used for all methods

```
Q0 = 10;            % actual new-cell capacity of cell
maxI = 30*Q0;       % must be able to measure current up to +/- maxI
precisionI = 1024; % 10-bit precision on current sensor
slope = -0.001;     % ** change in capacity per iteration
Qnom = 0.99*Q0;     % nominal capacity, used for init. of recursive methods
xmax = 0.2; xmin = -xmax; % range of the x(i) variables
m = 300;            % number of samples between updates
theCase = 1;        % fixed interval between updates
socnoise = sqrt(2)*0.01; % standard deviation of x(i)
Gamma = 0.99;       % ** forgetting factor
plotTitle = 'HEV Scenario 3';
runScenario
```

Results for HEV scenario 3

- In HEV scenario 3 results, true total capacity is dotted line
- WLS method *appears* to give good results, but its error bounds are unreasonably tight, almost never surround true value of total capacity
- WTLS, TLS, and AWTLS able to track moving value of total capacity
- TLS and AWTLS give the best results due to ability to initialize with a reasonable initial value, yielding narrower error bounds



Summary

- Have now seen results for three different HEV scenarios
- In all cases, WLS fails, since its error bounds are too tight, and since results are often biased away from true total capacity
- WTLS gives good results, but cannot be initialized with total-capacity guess, which is a disadvantage
- For all scenarios seen to date, TLS and AWTLS results indistinguishable
- Next step is to look at some BEV scenarios