Battery Life Estimation of Mobile Embedded Systems

Objective::
To develop a fast and accurate battery model, and provide a framework for battery life estimation of Hardware/Software embedded systems.

Technique:

- A stochastic model of a battery is introduced, which can simultaneously model the two key phenomena affecting the battery life and the amount of energy that can be delivered by the battery: the Rate Capacity effect and the Recovery effect.
    - <u>Rate Capacity effect</u> is the effect in which the current being discharged is greater than the rated current of the battery, as a result there by decreasing the battery efficiency and decrease in battery lifetime.
    - <u>Recovery effect</u> is the effect of partial recovery of the lost battery capacity because of the high previous discharge times followed by relaxation or idle time.
- It is shown that the battery life and the energy delivered by the battery can be affected significantly by tradeoffs at the system level describing an example of TCP/IP network interface subsystem in which it is shown that the way of processing the packet will effect the battery lifetime and the energy delivered by the battery by considering two different processing methods.
- They describe the physical phenomena inside the battery effecting the battery times.As the current intesity increases the conc. of active species at the cathode decreases which in turn reduce the cell voltage implies if there are idle time slots between discharges, charge recovery can take place.
- A comparision between the battery model developed using PDE and the Stochastic Model which focuses on the Recovery effect. Mathematical expressions for the probability of recovering 1 charge unit in a time slot which depends on the recovery capability of the battery assuming Bernoulli arrival of the input current discharge demand.
- Later even the Rate Capacity effect is incorporated by looking up to a table which stores the relaionship between the demanded charge units and actual charge units.
- They decsribed the techniques to generate system current discharge profiles which are required as inputs to the battery models.

Results:

The results reported are obtained by applying the proposed battery life estimation methodology on three system implementations, of the TCP/IP network interface subsystem.