Observations and Challenges – “GPS is less accurate in urban areas”

GPS is less accurate in urban areas

Periodic duty-cycling is not good enough

Accelerometer and Bluetooth consume less energy than GPS, if used cleverly

Cell-tower and RSS data cannot reliably measure user movement, but can detect GPS unavailability

Design and Evaluation – “RAPS: Rate-Adaptive Positioning System”

Design and Approach

• Movement Detection
  • Use duty-cycled accelerometer with onset detection algorithm to efficiently measure the activity ratio of the user.
• Velocity Estimation
  • Use space-time history of the past user movements along with their associated activity ratio to estimate current user velocity.
• Unavailability Detection
  • Use celltower-RSS blacklisting to detect GPS unavailability (e.g. indoors) and avoid turning on GPS in these places.
• Position Synchronization
  • Utilize Bluetooth-based position synchronization to communicate and reduce position uncertainty among neighboring devices.

Evaluation Results – promising!!

RAPS reduced energy consumption by 48% over fixed duty-cycles with comparable accuracy

Cell-tower-RSS blacklisting and activity ratio scheme contributes to energy saving

Bluetooth synchronization has potential benefits (43% in this example)