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Distributed Energy-Saving Cellular Network Management Using Message-Passing

–Sang Hyun Lee and Illsoo Sohn

Goal: Allow a subset of BSs to enter the energy saving state. Compensate for the coverage holes so created by switching the users to other BSs which can handle extra traffic.

Approach:

- Group handover strategy
- Compensating BS should have sufficient capacity to support new users

$$\min \sum_{(i,j)} P_{ij} x_{ij} + \sum_{i} P_i x_i$$

$$s.t. \sum_{j \in R(i)} x_{ij} + x_i = 1 \quad \forall i; \quad \sum_{i \in N(j)} L_i x_{ij} \leq C_j x_j \quad \forall j \quad \text{and} \quad x_{ij}, x_i \in \{0, 1\}$$

Use exchange of real numbered messages iteratively between the BSs.
$\mathcal{X}_i = \{x_{ik} : k \in R(i)\} \cup \{x_i\}$ and $\chi_j = \{x_{kj} : k \in N_j\}$

$$\max \sum_{(i,j)} S_{ij}(x_{ij}) + \sum_{i} S_i(x_i) + \sum_{i} Q_i(\mathcal{X}_i) + \sum_{j} R_j(\chi_j)$$

$$S_{ij}(x_{ij}) = -P_{ij} x_{ij}; \quad S_i(x_i) = -P_i x_i$$

$$Q_i(\mathcal{X}_i) = -\infty \quad if \quad \sum_{j \in R(i)} x_{ij} + x_i \neq 1$$

$$R_j(\chi_j) = -\infty \quad if \quad \sum_{i \in N(j)} L_i x_{ij} > C_j x_j$$

A Femto-Aided Location Tracking Algorithm in LTE-A Heterogeneous Networks

–Po-Hsuan Tseng and Ke-Ting Lee

Goal: To locate a mobile station with the help known locations of mBS and user deployed fBS and neighbouring MS or D2D nodes.
Approach: TDOA measurement between MS j w.r.t fBS h and the serving BS, S is represented by

$$d_{h,j}^{(t)} = \left(\parallel x_{F_h} - x_j^{(t)} \parallel - \parallel x_S - x_j^{(t)} \parallel \right) + \left[w_{F_{h,j}}(\rho_{F_{h,j}}^{(t)}) - w_{S_j}(\rho_{S_j}^{(t)}) \right] \;\; \forall \;\; h = 1 \ldots H \;\; \text{and} \;\; F_h \neq S$$

Similarly, measurements are obtained from the mBS and neighbouring MS/D2D.
Position state update is given by $x_j^{(t)} = x_j^{(j-1)} + T_s v_j^{(t)}$.
Position vector $Z_j^{(t)} = \{r_j^{(t)}, d_j^{(t)}, z_j^{(t)}\}$. Sight condition $S_j^{(t)} = \{\zeta_j^{(t)}, \rho_j^{(t)}, \eta_j^{(t)}\}$.
Posterior PDF of MS j is recursively updated through the following Bayes' rule.

$$P(x_j^{(t)}, S_j^{(t)} | Z_j^{(1:t)}) = \frac{P\left(Z_j^{(t)} | x_j^{(t)}, S_j^{(t)}\right).P\left(x_j^{(t)}, S_j^{(t)} | Z_j^{(1:t-1)}\right)}{P(Z_j^{(t)} | Z_j^{(1:t-1)})}$$

- Update factored out to calculate the position first and then the corresponding channel condition based on the position update
- Beliefs of the positions of fBSs and neighbour MSs are exchanged for likelihood calculation

CSI-Based Fingerprinting for Indoor Localization: A Deep Learning Approach

–Xuyu Wang, Lingjun Gao, Shiwen Mao and Santosh Pandey

Goal: Indoor localization based on CSI instead of measuring received signal strength. **Approach:**

- Offline training phase and online localization phase
- Greedy learning algorithm to train the weights layer by layer
- Number of neurons decrease with the depth of the layers
- Parameters of first layer are frozen and the obtained samples are used to train the second-layer RBM

Aposteriori probability of the mobile device being found at reference location i is given by

$$Pr(L_i|v) = \frac{Pr(L_i)Pr(v|L_i)}{\sum_{i=1}^{N} Pr(L_i)Pr(v|L_i)}.$$

Based on the deep network model, $Pr(v|L_i) = \frac{1}{n}\sum_{i=1}^{n} \exp(-\frac{\|v-\tilde{v}\|}{\lambda\sigma})$.

Location estimate, $\tilde{L} = \sum_{i=1}^{N} Pr(L_i|v)L_i$.

Sharing It My Way: Efficient M2M Access in LTE/LTE-A Networks

–Jelena Misic, Vojislav B.Misic and Nargis Khan

Goal: Build an efficient scheme for concurrent M2M and H2H access on PRACH

- Separate resources for M2M and H2H access at the level of preamble codes
- Use CSMA/CA with the designated preamble codes
- Performance analysis of M2M and H2H traffic
- Come up with design parameters

Approach:

- Poisson arrivals of access requests on PRACH
- Construct preambles by applying DFT to Zadoff-Chu sequences
- Find collision probability, overload probability and evaluate mutual interference of H2H and M2M layers

Other interesting papers

- Yanyan Han, Hongyi Wu, Zhipeng Yang and Deshi Li,“A New Data Transmission Strategy in Mobile D2D Networks-Deterministic, Greedy, or Planned Opportunistic Routing?“
- Manolis Ploumidis, Nikolaos Pappas and Apostolos Traganitis, “Flow Allocation for Maximum Throughput and Bounded Delay on Multiple Disjoint Paths forRandom Access Wireless Multihop Networks“
- Long Sun, Hangguan Shan, Aiping Huang and Lin Cai, “Channel Allocation for Adaptive Video Streaming in Vehicular Networks“
- Yuyang Peng, Fawaz Al-Hazemi, Heejae Kim and Chan-Hyun Youn, “Design and Optimization for Energy-Efficient Cooperative MIMO Transmission in Ad Hoc Networks“