Karlsruhe Institute of Technology

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Context-Aware Handover Protocols to Minimize Signaling Overhead

Master's Thesis

Project

Handover (HO) protocols in mobile networks are designed to provide users with seamless connectivity. Frequent and unnecessary HOs generate signal overhead, particularly through the transmission of measurement reports from the end user equipment (UE) to the network. These reports, sent every 120 to 480 ms, provide information about signal quality but contribute to network load. Conventional HO protocols are based on static thresholds that are the same for all end devices in the cell and cannot adapt to changing conditions. New, context-aware HO protocols are designed to reduce unnecessary signaling while maintaining consistent service quality.

In this thesis, an adaptive HO protocol should be developed that minimizes signaling overhead (measurement reports) by intelligently predicting the HOs and adjusting measurement report transmission intervals based on user context, e.g., speed, trajectory, and historical connection quality. Therefore a reinforcement learning agent (e.g., PPO) should be integrated into a mobile network simulation. The agent that makes HO decisions should perform similarly to traditional methods.

Tasks

1. Comprehensive literature review on existing HO protocols, measurement report mechanism, signaling overhead
2. Familiarization with reinforcement learning, e.g., PPO
3. Implementation of an RL agent into an existing mobile network simulation
4. Training user-specific protocols for adaptive HO parameter adjustments
5. Validation of new protocols through simulations and statistical methods

Requirements

- ✔ Basic knowledge in machine learning & reinforcement learning
- ✔ Programming skills (Python and familiar with PyTorch)
- ✔ Knowledge of mobile communications

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