Abstract of the thesis

Realization of QoS for Wireless Mobile Networks Using Fuzzy Logic

Quality of Service (QoS) in communication networks is the ability of network to have some level of assurance that its traffic and service requirements can be satisfied, which could mean high signal strength, high bandwidth, low packet loss, small delay etc., and the adequate amount of all these parameters require proper handoffs at proper time. Unless a suitable handoff mechanism is in place to maintain service continuity, user mobility can disrupt an ongoing connection.

Handoff is the process in which a mobile user switches its connection from one base station to another base station to maintain service continuity. Handoff is often initiated either by cell boundary crossing or poor link quality in the current connection. A call in progress could be forced to abort during handoff if sufficient resources cannot be allocated in the new wireless cell. A properly designed handoff algorithm is essential in reducing the switching load of the system while maintaining the quality of service. The longer delay in handoffs result in deep penetration of mobile station into another cell causing interference in the system and high probability of calls being dropped. Since smaller cells are used and traffic in a cell increases during peak hours and
decreases toward end of the day, the handoffs must be designed to provide service for both the conditions of traffic. The handoff processing must not only provide service continuity to the mobile user but must also ensure the service to the new originating calls and must reduce the interference level. This is only possible when efficient handoffs take place.

This thesis concentrates on acquiring Quality of Service (QoS) in handoffs using fuzzy logic technique, the fast and timely handoffs to avoid loss of calls are taken due care of. In this thesis, we examine the issues of the problem of handoffs and performing them quicker in cellular communication networks using fuzzy realization of QoS.

Chapter first presents the introduction about thesis and basics about fuzzy logic.

In chapter two we attempted to obtain decentralization control of handoff, which is suitable for micro and pico cellular systems and handoffs due to corner effects where signal strength fades quickly and needs quicker handoffs to take place.

In chapter three we attempted to modify hysteresis value so that a suitable handoff is initiated with corresponding density of traffic in cell and the velocity of the mobile user.

In chapter four we demonstrated the variable guard channels in accordance with traffic density to incorporate more traffic with different
threshold values. The assignment of desired flexible channels for accommodating more traffic is also presented.

Chapter five is about the path codification technique for proper handoffs. The neighborhood of the mobile station forms symbols of the code string and the repetition of symbols decides the handoff.

Chapter six deals with dwell time of mobile station for optimizing handoffs between two tiers.

The techniques employed to solve these problems are briefly summarized below:

1. **Slope ratio of actual and expected received signals:** Magnitude of slope gives the nature of decaying signal so the ratio of slopes of expected signal and the actual signal gives us the necessary condition for handoff. The decentralization of control is achieved and certainly improves the fast handoff process and is suitably fit for the handoffs due to corner effects in microcellular system.

2. **Variable Hysteresis:** Based on information of traffic density and mobile velocity a variable hysteresis value is obtained for efficient handoffs. The variable hysteresis value impinges a sort of intelligence into the system and helps in accommodating more traffic at peak hours.

3. **Channel Assignment:** Enables the network to tackle the high density traffic to prevent data losses. The selected guard channels on demand basis
encourage the handoffs of ongoing calls and accommodating the incoming traffic with high probability.

4. **Path tracking:** Enables efficient handoffs of mobile stations by path codification technique. The high repeatability of codes in the code string or the occurrence of latest codes just before handoff in case of equal number of some codes in the string is used for the decision of handoff.

5. **Dwell time measurements:** On the basis of dwell time of mobile station the bidirectional flow of handoffs from microcell to macrocell and vice versa is used in controlling high density of traffic during peak hours.

This thesis describes the design, implementation and evaluation of these techniques suitable for efficient, fast and timely handoffs with lesser drop call probabilities thus enhancing quality of service to the user.