# ABSTRACT

Wireless communication is undoubtedly one of the most significant advancements by the mankind for improving quality of life. Information is transmitted from one point to another via electromagnetic waves. After Shannon's landmark paper ``A Mathematical Theory of Communication'' in 1948, significant advancements have occurred in providing reliable point to point wireless communication. With ever growing need for reliable high speed links, Cooperative communication and Network coding have emerged as viable technologies to bridge the gap.

In today's wireless network, different users have different demands for reliability based on their respective application. In this context, we propose flexible network coding scheme to adapt to user needs. We develop coding rules which achieve maximal diversity of the system, yet provide differentiated class of service to the users. The proposed scheme can be adjusted to accommodate the dynamic changes in quality of service (QoS) demand of users.

Second we consider the issue of security in multiple access relay network. Security has always been a primary concern in wireless networks due to it broadcast nature of transmission. The intermediate relay nodes in a wireless network could be modified by adversary to transmit corrupted information. We propose a novel iterative packet recycling methodology which gives performance improvement over traditional approach of discarding received corrupted packets at the destination.

Finally, we consider the problem of choosing relay for transmission. We propose a novel selection scheme which provides balanced relay utilization and reduces relay switching rate compared to the traditional selection algorithms. This cuts down energy wastage at the relay and improves the overall network lifetime.