

# Network coding

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June 17, 2014

# Outline

**Principles of Network coding**

**Relaying networks**

Compute-and-Forward

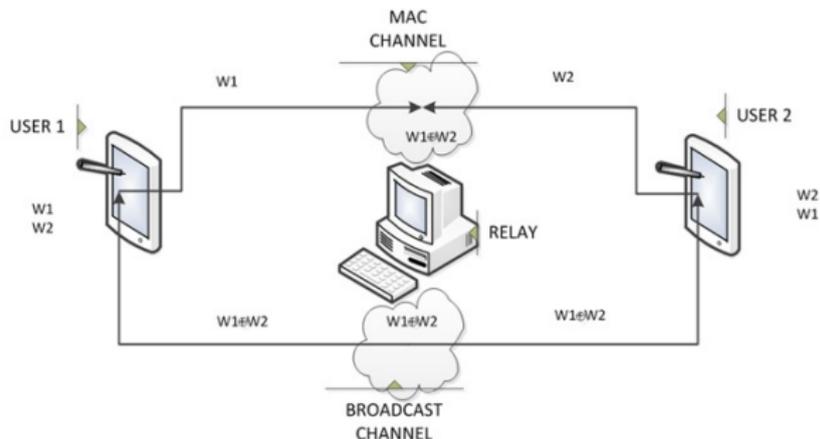
**Simulations**

**Implementation**

**Questions**

## Principles of Network coding

*Two way relay channel*



## Relaying networks

- Amplify-and-Forward
- Compress-and-Forward
- Decode-and-Forward
- Compute-and-Forward

## Compute-and-Forward

- Rate

$$\mathcal{R}(\mathbf{h}_m, \mathbf{a}_m) = \frac{1}{2} \log^+ \left( \left( \|\mathbf{a}_m\|^2 - \frac{P(\mathbf{h}_m^T \mathbf{a}_m)^2}{1 + P\|\mathbf{h}_m\|^2} \right)^{-1} \right). \quad (1)$$

- Desired Equations

$$\mathbf{u}_m = \bigoplus_{\ell=1}^L q_{m\ell} \mathbf{w}_\ell. \quad (2)$$

- Outage probability

$$\rho_{\text{OUT}}(R) = \Pr (R_{\text{SCHEME}}(\mathbf{H}) < R). \quad (3)$$

## Simulations

1. Probability of Un-recoverability
2. Outage Probability

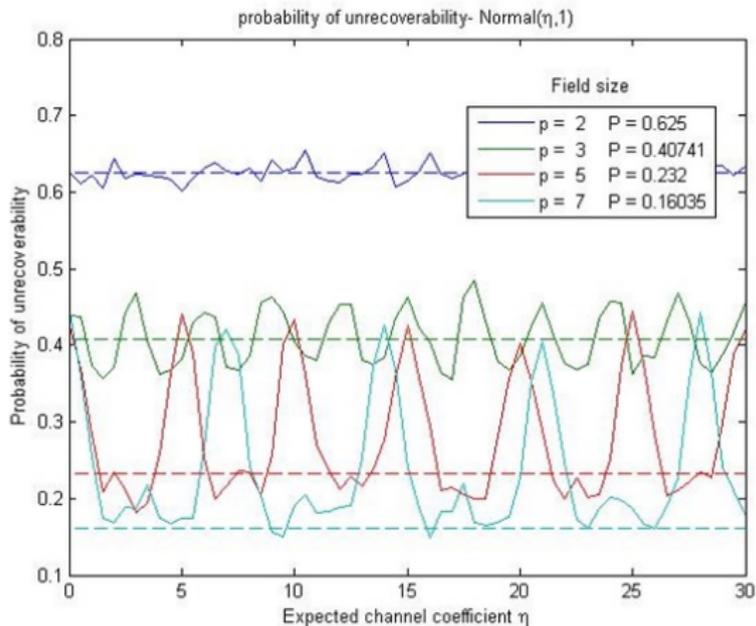


Figure 1: Probability of Un-recoverability

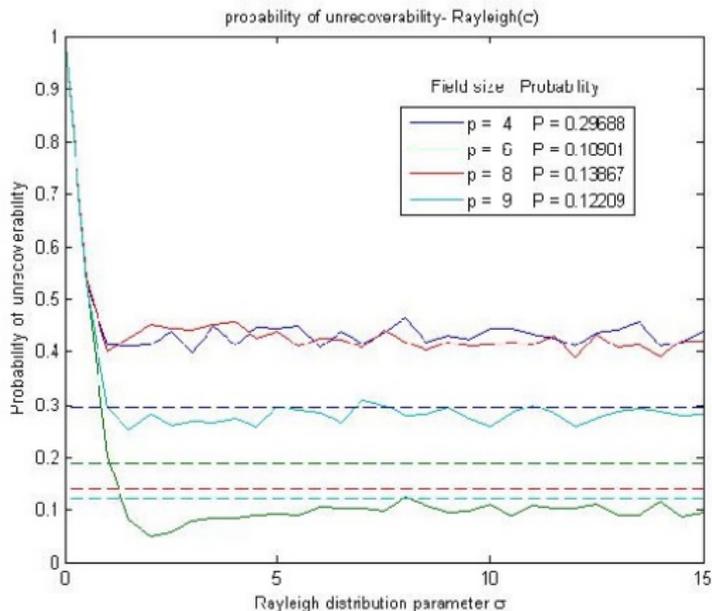


Figure 2: Probability of Un-recoverability

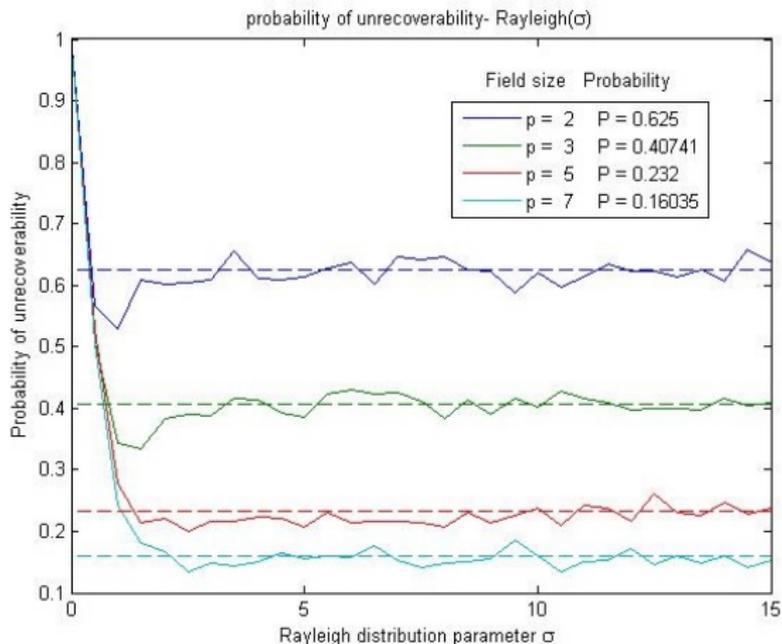


Figure 3: Probability of Un-recoverability

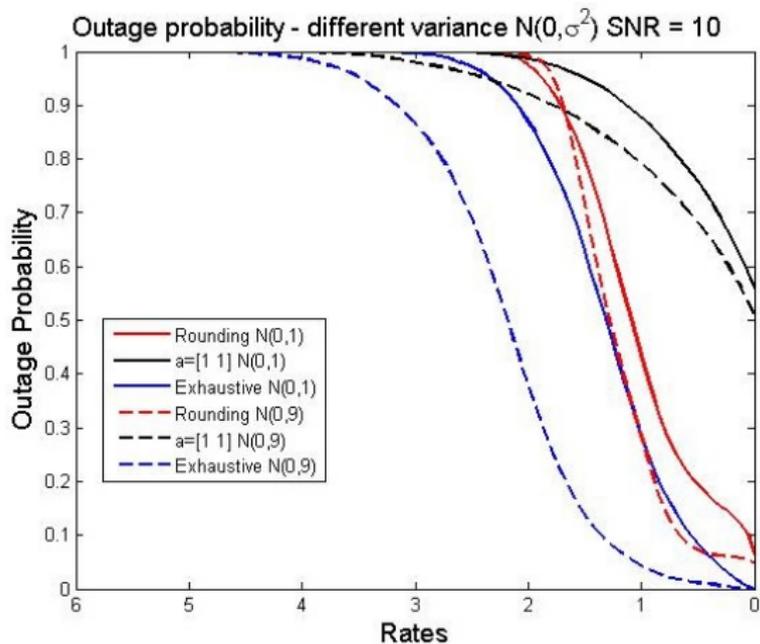


Figure 4: Outage Probability

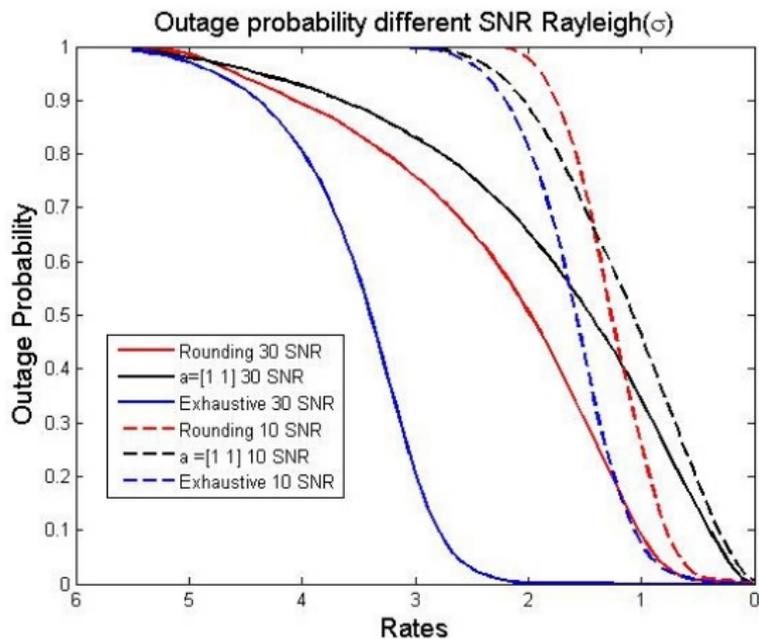
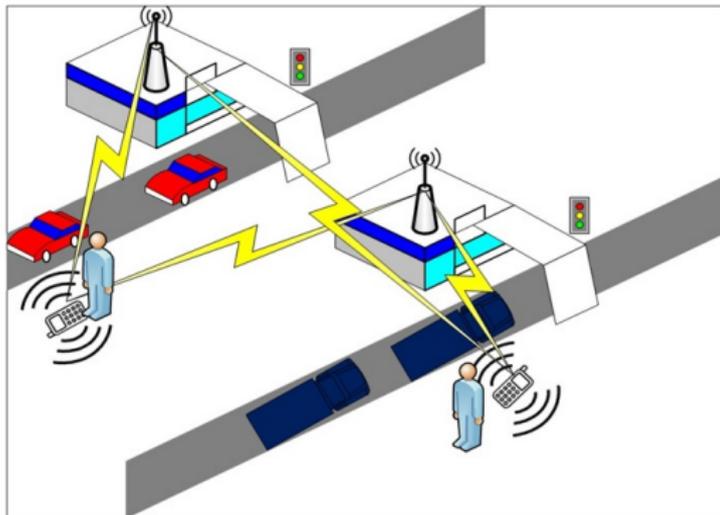


Figure 5: Outage Probability

## Implementation



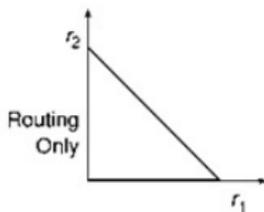
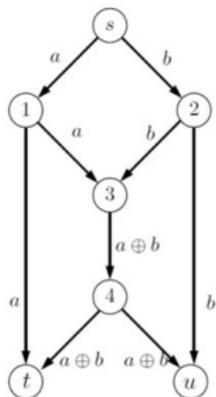
**Thank you**

**Marek Zacharda**

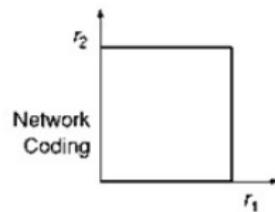
## Questions

### Remark

Vysvetlite presne matematicky ako suvisi siet typu motyl s obr. 2.



(a)



(b)

*Proof.* fdfs

