

COMNUM

Advanced Communication Systems Group

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Context: digital transmission over wired and wireless channels

We are looking for **optimized transmission schemes**, which are:

- ✓ highly reliable and spectrally-efficient,
- ✓ accounting for **physical channel constraints**, complexity and user preferences.

Two main application domains:

High-speed data rate communication networks

Multicarrier wired Transmissions (PLC, xDSL)

Optical communications

Communication and localization for terrestrial transports

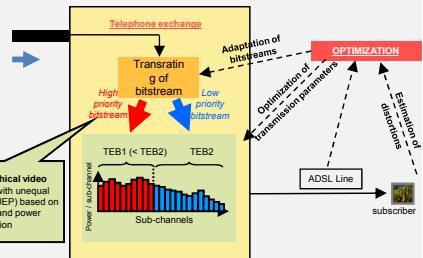
Tunnels (uwb, cdma)

High-speed mobility

OPTIMIZATION OF DIGITAL VIDEO DELIVERY OVER ADSL

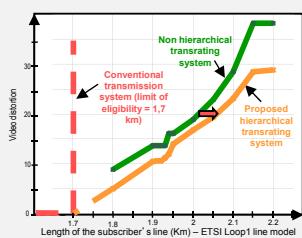
Problem: how to adapt to xDSL residential eligibility ?

We propose:



We obtain:

Received video distortion vs subscriber's line length

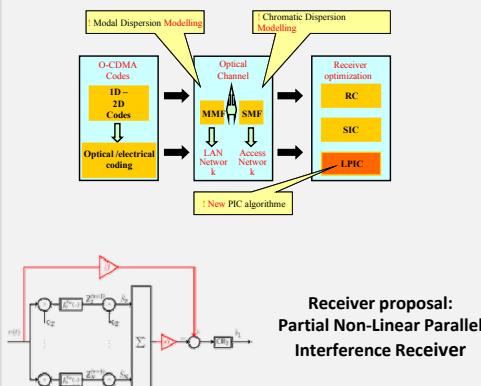


Coverage area gain of about 12% compared to a non hierarchical transrating system

"Extended coverage for DSL video distribution using a quality-oriented JSCC architecture", IEEE Trans. On Broadcasting, VOL.54, NO.3, pp.525-531, Sept. 2008

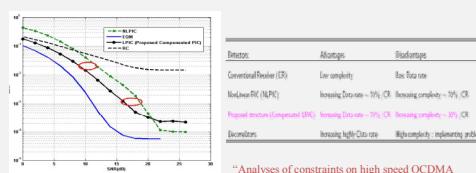
OPTIC AND HYBRID RADIO-OPTIC COMMUNICATIONS: MULTI-ACCESS TECHNIQUES & RECEIVER OPTIMIZATION

Problem: To propose multi-standard (wireless, wired) simultaneous communication over a single optical fibre (MMF: LAN, SMF: Access Networks)



Performance enhancement

- 3dB gain over existing implementations
- Complexity lowered by 25%



"Analyses of constraints on high speed OCDMA link parameters due to fiber optic chromatic dispersion", Journal Opt. Commun., VOL.281, pp.1030-1036, Mar. 2008

COOPERATIVE RADAR FOR SIMULTANEOUS LOCATION AND COMMUNICATION

Problem: To precisely detect position of preceding trains and to provide high data rate communication (range 1km)

CODIREP solution

FPGA/hardware Platform

Original multiplexing coding techniques

technique	Data rate	SNR to get BER = 10 ⁻⁴	Implementation Complexity
Monocode	97Kb/s	-14 dB	*
ESS2	1,6Mb/s	-3 dB	**
CPM	5,4Mb/s	0 dB	***
2xM	8 Mb/s	1,2 dB	***
ESS2+Multicode	4,8 Mb/s	NC	****
ESS2+Xorit	3,2 Mb/s	NC	****
CPM+Multicode	7,5 Mb/s	NC	*****
CPM+Xorit	10,8 Mb/s	NC	*****
2xM+multicode	11,27 Mb/s	NC	*****
2xM+Xorit	16 Mb/s	NC	*****
2xM+Xorit+multicode	22,54 Mb/s	NC	*****

Performances

Communication

Location

- Range: up to 800m inside tunnels and 700m in free space
- Precision: better than 3m
- Measurement frequency: up to 50000 meas./s

"Embedded localization and communication system designed for intelligent guided transports", EURASIP J. Embedded Systems, 2007 (7) 79095-1-8

Research projects: IRT Railenum, ANR CORRIDOR, ANR PASNI, ANR TOSCANE, ANR PRIMA-CARE, NoE EURNEX, INTERREG EXTRACTT, CPER 2007-2013 CISIT, DVBINTRAIN

Academic and industrial collaborations: IFSTTAR, IRCICA, ENSIL, Supelec, LIEN, University of Kent (UK), University of Concordia (CA), University of Detroit (USA), SUPCOM, EPT, ENIT (TU), InnerWireless (USA), INRS (CA), Alstom, Thales Communications, Thomson Grass Valley