

Modeling of a Humanoid and Multi-agent System (MAS)

EE 382C.9 Embedded Software Systems Spring 2004

Literature Survey Briefing

by

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MAS Project

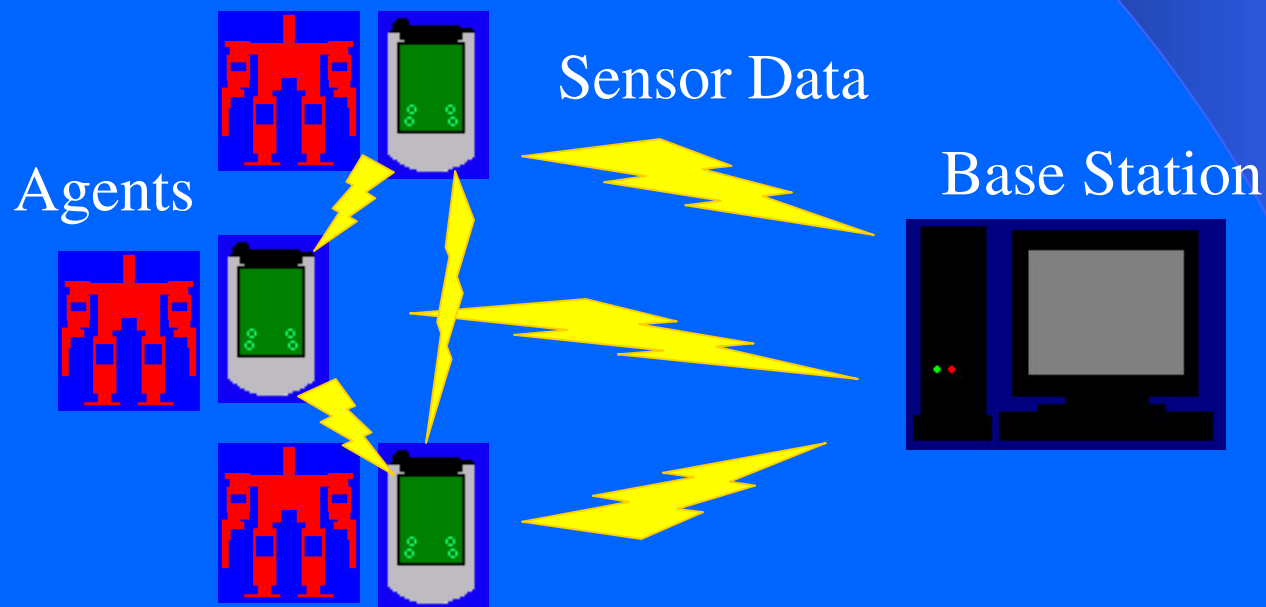
- Objective
 - Develop MAS for research and educational purpose, e.g. RoboCup
 - Agents: humanoid
 - Base station
- Subgoal: Wireless network
 - Between agents and station
 - Video Transmission



H: 1feet; W: 4.2 pounds

MAS Project

Original Focus of the Project: Simulate and evaluate performance of different physical modulation of UWB in video transmission.



Ultra-wide Band (UWB)

- Definition and Characteristics [Cramer et al, 2002]
 - Radio signal with fraction bandwidth larger than 25% over center frequency
 - Modulate information using series of low-power pulses
- Advantages
 - Low cost
 - High data rate and large bandwidth
 - Low power consumption
- Disadvantages
 - Standard is not yet converged
 - Consumer products are not yet available

UWB Physical Layer

- Analysis [Durisi and Benedetto, 2003] [Hu, 2003] [Molisch et al, 2003]
 - Analysis of bit-error-rate
 - Time-hopping
 - Pulse position modulation
 - Direct sequence
 - Phase shift keying
 - Orthogonal frequency division multiplexing (modern modulation)
 - Research results not available
 - Based on probability density function
 - Evaluation of UWB for home entertainment system

Video Transmission with UWB

- Quality of Service (QoS)
 - Prioritization and Resource Reservation
- Media Access Control (MAC) Protocol (source: XtremeSpectrum)
 - IEEE P802.15.3 (USA), HiperLAN2 DM (Europe), and MMAC HisWAN(Japanese)
 - Optimum MAC/PHY combo for multimedia consumer applications
- Network for Video Transmission [Aiello et al, 2003]
 - Combo of UWB and HiperLAN1 DM
 - Home Entertainment

Evaluation 802.15

Comparing different MAC protocols for Video Transmission

Service	Payload Rate	Latency	Max BER allowed	Max Jitter
MPEG-4	100 kbps – 20 Mbps	100 ms	1e-10 to 1e-8	1 ms @ app. layer

	Cost	Data Rate	Power Consumption	Application
IEEE 802.15	Low	100 Mbps	Low	home PAN
IEEE 802.11a	High	54 Mbps	High	public area WAN
IEEE 802.11b	Medium	11 Mbps	High	public area WAN
Bluetooth	Low	1 Mbps	Medium	PAN
Home RF	N/A	11 Mbps	N/A	Limited Support
HiperLAN	High	54 Mbps	High	public area WAN

(source: XtremeSpectrum)

Change of Focus:

Simulate an ad-hoc **network** for video transmission among the agents and the base station and evaluate the performance at the network level using UWB and IEEE 802.15 or other substitutions

Summary and Plans

- Summary
 - Introduced MAS project
 - Analyzed and proposed UWB and IEEE 802.15 for wireless video transmission network
- Plans
 - More studies at network level [Qian, 99] [Yang, 2002]
 - Simulate video sensor network
 - Using OpNet or Network Simulator 2 (NS2)
 - Evaluate performance of different MAC protocol