
Time Synchronization in Wireless Sensor Networks using Bluetooth

Roberto Casas¹, Héctor J. Gracia², Álvaro Marco², Jorge L. Falcó²

¹ Castelldefels School of Technology,
Technical University of Catalonia, Barcelona, Spain
rcasas@eel.upc.edu

² Superior Polytechnic Centre,
University of Zaragoza, Zaragoza, Spain
{hgracia,amarco,jfalco}@unizar.es

Introduction

- Wireless Sensor Networks
 - Data acquiring – *Nodes*
 - Synchronization: Time stamp or scheduling
 - Data Fusion
 - ***BSB method – Broadcast Synchronization over Bluetooth***
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Previous work

- Synchronization
 - Traditional methods not appropriated
 - Off-Line Synchronization: free running clock, corrections when measured finished.
 - On-Line Synchronization: regular time corrections.
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Suitability of Bluetooth

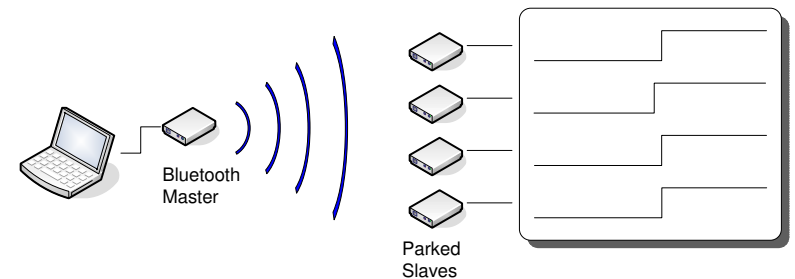
- Infrequent data transfer at high baud-rates.
 - ACL Connections with parked slaves
 - Low energy consumption.
 - High connectivity.
 - Suitable performance for certain applications.
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Broadcast Synchronization over Bluetooth

- Bluetooth piconet synchronization not accessible outside Bluetooth modules.
- Get rid of variable delays.
- Broadcast reception used to synchronization.

BSB Experiment

- PC sends HCI commands to Master BT module.
- Slaves BT modules controlled by a microcontroller.
- Broadcast processing difference visualization.



BSB Results

- Several test scenarios: active, park (3 different parking intervals), noise.
 - Accuracy does not depends on parking interval.
 - Good noise robustness.

	Active	Park (20 ms)	Park (620 ms)	Park (2.5 s)	Noise
Average error (in μs)	3.70	6.13	5.74	2.67	6.30
Standard deviation (in μs)	2.30	3.63	4.28	1.73	4.23
Worst case error (in μs)	9.60	13.10	17.40	6.90	17.30
Percentage of samples with error below 10 μs	100%	80%	83%	100%	80%

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