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Connected Bicycles for Smart Mobility

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Ad Hoc Communication in Bicycles

Question: what applications could harness ad hoc communication between bicycles?

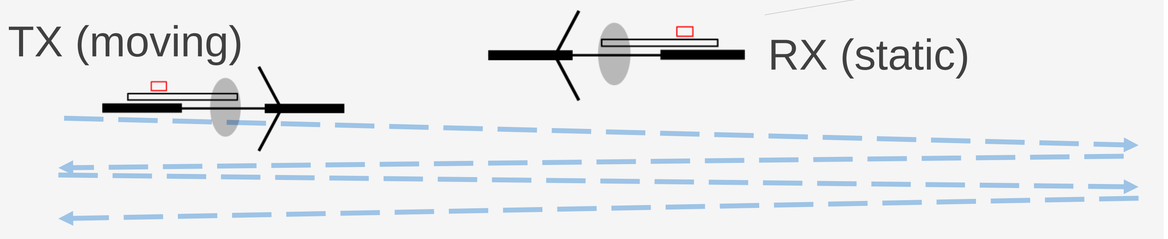
Question: how do existing **wireless technologies** perform in ***bicycle-to-bicycle*** (Bi2Bi) links?

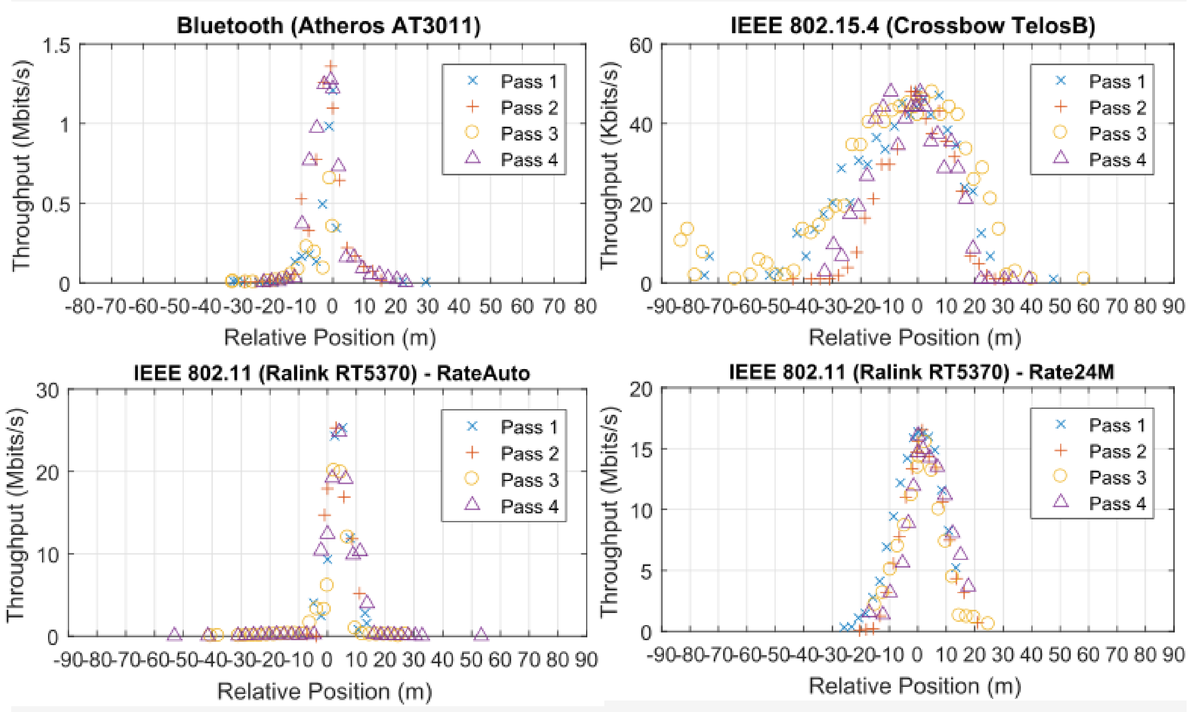
Evaluation of Wireless Technologies

- Options: **WiFi, Bluetooth, IEEE 802.15.4**
- **Range and throughput measured in real conditions**

Methodology

- Transmitter (TX) passes by receiver (RX) that is stopped, several times
- Data transfer fills channel; GPS at both bicycles allows to obtain distance.





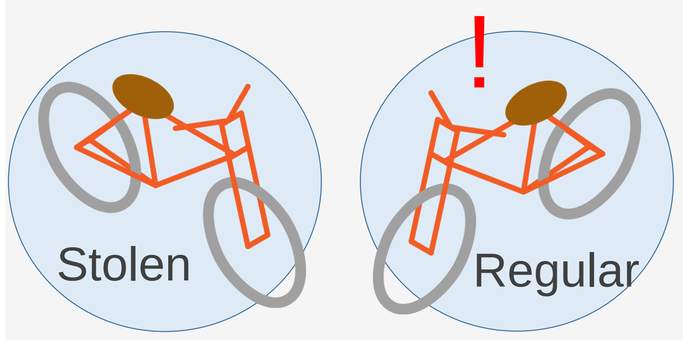
Main Results

	Peak Thru.	Dist. 10% thru
WiFi - Auto	25 Mbit/s	10 m
WiFi - 24M	17 Mbit/s	15m
WiFi - 1M	800 kbit/s	40m
BT	1.4 Mbit/s	10m
ZigBee	50 kbit/s	30m

Application and Implementations

Connected bicycles can support services for safety, social networks, and fleet management.

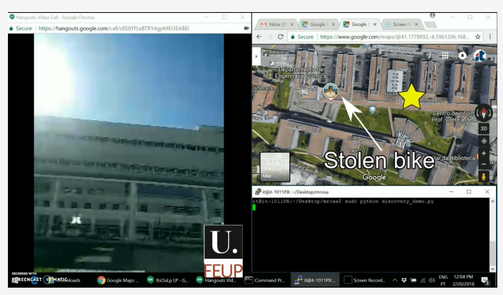
Stolen Bicycle Detection – For Fleet Management



- When passing by, stolen bicycles can be detected and reported.
- Small packets (only location required).

We implemented the system with embedded Bluetooth.

1.



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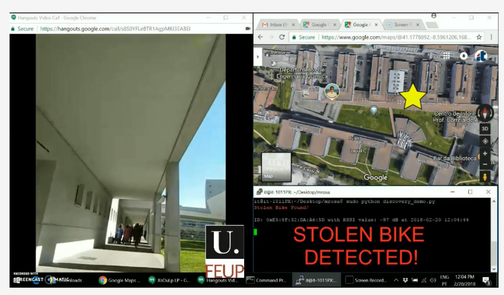
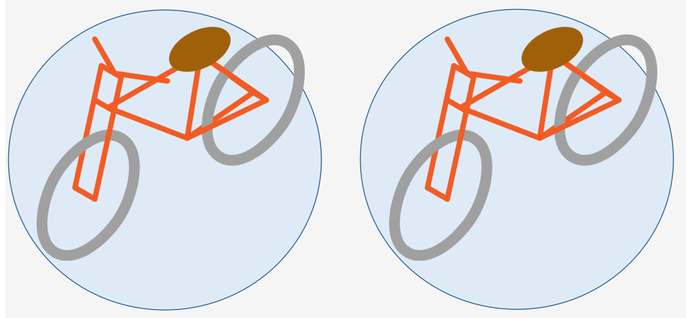
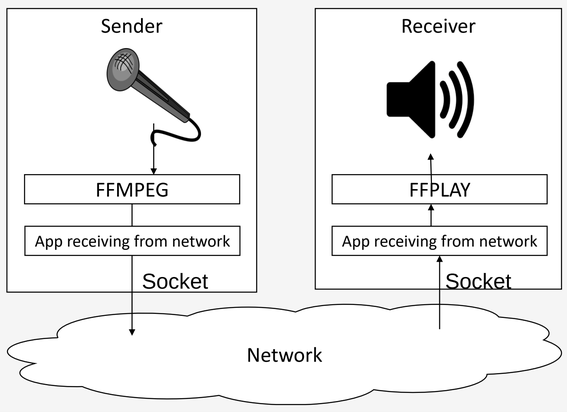


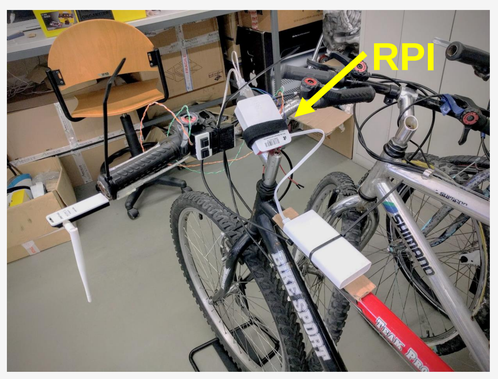
Audio in Platoon – Ad hoc Communication



- Platoons often span for hundreds of meters.
- WiFi could support ad hoc audio messages.

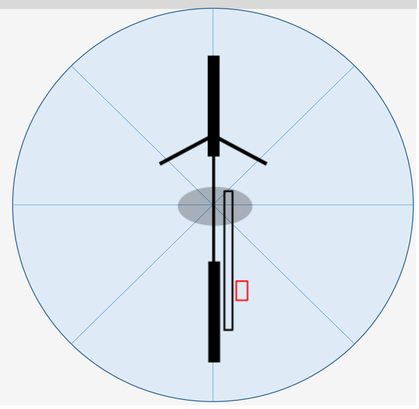
We are currently carrying out field trials with RPis.





Ongoing/Future Work

- Characterize attenuation induced by bicycle in EM signal, ***per angle***
- Develop generic model of bicycle attenuation on EM signal
- Future: evaluate human shadowing



Acknowledgements

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