"Drone Relays for Battery-Free Networks"

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The chosen paper proposes RFly, a system that makes use of drone-mounted relays to extend the range of commercially available RFIDs systems from a few meters to tens of meters. In addition, it also introduces the first full-duplex relay for battery-free networks, and it proposes the first RF-localization algorithm that can operate through a mobile relay.
The aim of this publication is to come up with a solution to the issue of passive RFID technology being only reliable at distances of few meters. The paper specifically focuses on scenarios like retail warehouses in which the tags are buried one under the other, usually not even in the line of sight, hence, making it even more difficult to perform long-distance measurements. The relay is designed to satisfy three key properties: it must be bidirectional full-duplex to enable backscatter communication, it has to preserve phase and timing to enable localization, and it must be compact to be able to mount the PCB on any commercial low-range drone. To overcome these challenges, RFly proposes a mirrored architecture built on a 10 x 7.5 cm PCB that comprises two major components. The first performs analog self-interference cancellation to enable bidirectionally full-duplex communication, and the second one compensates for the offset of the first stage, thus, preserving the phase required for the localization algorithm.

We have identified different drawbacks to the solution proposed in this paper, such as: the lack of an RF-based navigation required for the localization system to work properly without other aids, the focus of the study on the utilization of only one drone, and the market limitations in finding an RFID reader with accurate 360 phase measuring capabilities. In addition, not enough detail on the actual architecture implementation, other than the idea behind it is given. It is left unclear exactly how was the design implemented at hardware and/or software level. This clearly represents a difficulty for anybody that might be willing to reproduce this results to dig in deeper on this line of research. Instead, all this information is omitted, and just a vague approximation of the power consumption is given. Also, no testing under different load conditions is mentioned. Furthermore, even if the reported power consumption can be believed, the Bebop Parrot has a reported flight time of 5 to 7 minutes, which represents a major drawback for the type of applications that the paper describes. Even if the system can be mounted on high-end drones, the power consumption should be considered and researched further to minimize the impact on the overall performance of the system. Nevertheless, given the range improvement, and the relatively simple and versatile implementation, we think that the proposed setup can serve as the baseline to future work where these drawbacks can be assessed and even more robust implementations can be proposed.

Paper Reference: http://www.mit.edu/ fadel/papers/RFly-paper.pdf