ET4394: Wireless networking
Paper summary

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The paper which will be reviewed is named Drone Relays for Battery-Free Networks and is written by Yunfei Ma, Nicholas Selby, Fadel Adib from Massachusetts Institute of Technology. Firstly, a short summary is given including the problem statement and the proposed solution. Finally, some critical remarks are given.

The paper is focused on RFID sensor networks. Their inherent challenge at this time is the limited operating range. The proposed solution is to use drones as relays, so called RFly. Two main innovations come with RFly: a full-duplex relay for RFID and a RF-localization algorithm that can work with a mobile relay.

RFID systems are widely used for identifying and tracking objects. Their limited range however, prevents large scale implementation in e.g. warehouses. Due to huge signal attenuation caused by interfering items or tag miss alignment, it is not possible to perform fast and reliable measurements. Other systems being tested at this moment are focused on visual identification, which requires line of sight. In huge warehouse environments this is an undesirable trait. The researchers believe solving the challenges with RFID gives the solution.

By implementing a relay on a drone, it can fly through a warehouse and tackle the problem of blind spots and tag miss alignment. The drone also maintains phase and timing characteristics and forwards it to the reader, enabling localization of the RFID tags. Compared to other solutions, e.g. mounting a RFID reader on a drone, this solution provides a light weight implementation which enable the drones to be small and fly indoors and close to people.

A few critical notes can be placed. The paper discusses an implementation of the drone, and provides a simple schematic of the hardware layout. However, since the exact hardware components and software is not available, the experiment can't be reproduced.

Furthermore, the paper states light drones can be used, since the hardware is very light. The extra hardware uses 5.8 Watt, which for a light drone could possibly be very significant since battery capacity is relatively low due to weight constraints and power usage very high.

The paper also states that if the reader uses frequency hoping, the system can identify the center frequency at any point in time and lock onto the same hopping pattern. When looking at the source of this statement, one is pointed to a German website `http://www.imping-dienstleistungen.de/` where there is no information supporting this statement. Even if the website has changed, there is no mention stating when the website was viewed. When looking for papers regarding the subject, figuring out the precise pattern may take multiple seconds. This delay is not dealt with in the paper in question.

The traditional analog relay used in paragraph 7.1 has no source, it only states that it achieves isolation by antenna separation. How the figures for this traditional analog relay are calculated is not mentioned in the paper which makes it impossible to reproduce.

The paper claims that RFLY's design can extend to multiple relays which may be daisy chained, but says the support of this statement is outside the scope of this paper. Furthermore, there are no references or sources on this statement, which brings the question whether it is actually true.

Finally, the experimental trails in section 7.2 are "throughout two floors our research facility building" and "span three floors of our research facility", which is it?