UCL Department of Computer Science
CS M038/GZ06: Mobile and Cloud Computing
2010–2011, Term 2
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One-pager: SourceSync: A Distributed Wireless Architecture for Exploiting Sender Diversity (Rahul *et al.*, 2010)
Due: Start of lecture, 23rd March 2011

Instructions: ***in your own words,*** *answer the following questions as* **succinctly** *as possible (in 200–500 words total, but shorter answers within this range are encouraged). Quoting figures or text from the assigned reading or from any other source is specifically prohibited.*

Let's investigate the Alamouti code Rahul *et al.* allude to in Section 6 of the paper. Recall that the two senders don't know the channel to the (one) receiver, because of residual frequency offset errors.

The Alamouti scheme works over two consecutive timeslots, during which we will assume the channel from transmitter 1 to receiver (h_1) and the channel from transmitter 2 to receiver (h_2) are both unchanging. During these two timeslots, the senders will transmit two symbols, s_1 and s_2. Let's further assume there are no other noise sources or transmitters around.

In timeslot 1, sender 1 transmits s_1 and sender 2 transmits s_2.

In timeslot 2, sender 1 transmits $-s_2^*$ and sender 2 transmits s_1^*, where $(\cdot)^*$ is the complex conjugate operator.

Let's denote the signal the receiver gets in timeslot 1 as y_1 and the signal the receiver gets in timeslot 2 as y_2.

1. Show that the receiver can recover s_1 by computing $h_1^* y_1 + h_2 y_2^*$.
2. Suggest a method whereby the receiver can recover s_2 and show it works.
3. Rahul *et al.* mention the scenario where $h_1 = -h_2$. Why does this method work in that case?