

Most people are familiar with bats and how they use echolocation to navigate and locate prey when hunting, a technique based on emitting high-frequency sounds and waiting for their reflection. The bat can perceive from what direction the reflected sound comes by comparing when its right versus left ear hears the sound, and by measuring the time between making the sound and hearing it again the bat can estimate the distance to some reflective object. Amazingly using this technique the bat can hunt prey the size of a mosquito in pitch-black environments.

However, what most people probably not have thought about is how a bat can make out the difference between a reflected sound emitted by itself, and a sound emitted by another bat.

Many range and location measuring techniques such as sonar, radar and LiDAR work similarly, by transmitting some signal and waiting for its return. This means that, as in the case of this thesis, a radar will also face the same challenge of differing between a reflection and receiving the signal emitted from another radar transmitting the same signal. Both bats and radars can make out the difference by using slightly different frequencies and paces of emitting the signals. However, varying the transmitted signal in the radar case is not always a possible option. Another way of handling the problem, which is to make the bats or radars talk one at a time. In the radar case this means that the units takes turns of transmitting their signals. This means that some information will be lost when the radars are silent, and how much information is lost is governed by the order in which the radar take their turns of transmitting their signals. In essence this is a scheduling problem, which this thesis tries to solve by using an optimization method called Simulated Annealing. The method finds transmit codes according to which the radars do not interfere with each other while keeping as much information as possible.