Systems and Networks 1 - Group 2 - Alex Lindemann and Nathan Moore

Project 3 - Lizards and Cats
Synchronization

Introduction

There are lizards that must cross a driveway from their home to get to their food source. There are cats that enjoy sleeping on the warm cement of the driveway where the lizards must cross at. If the cats see too many lizards crossing the driveway the cats will eat the lizards. This is a problem for the lizards, not so much for the cats. However, since we love the lizards and wish for them to remain alive, we must design a way for them to cross the driveway safely.

Code Changes

Locks (semaphores and mutexes) were added to the code with global scope. A “driveway” semaphore was needed to control the number of lizards crossing at a time. Mutexes were needed for the global variables of numCrossingMonkey2Sago and numCrossingSago2Monkey because they have write access, and we do not want a thread to read from them while another thread is writing to them. Another mutex was needed for spawning the cat and lizard threads because they required a unique ID. When a lizard needs to cross the driveway, he waits on the driveway semaphore. When he has finished crossing the driveway, the semaphore is posted, signaling to the other lizards that it is safe to cross.

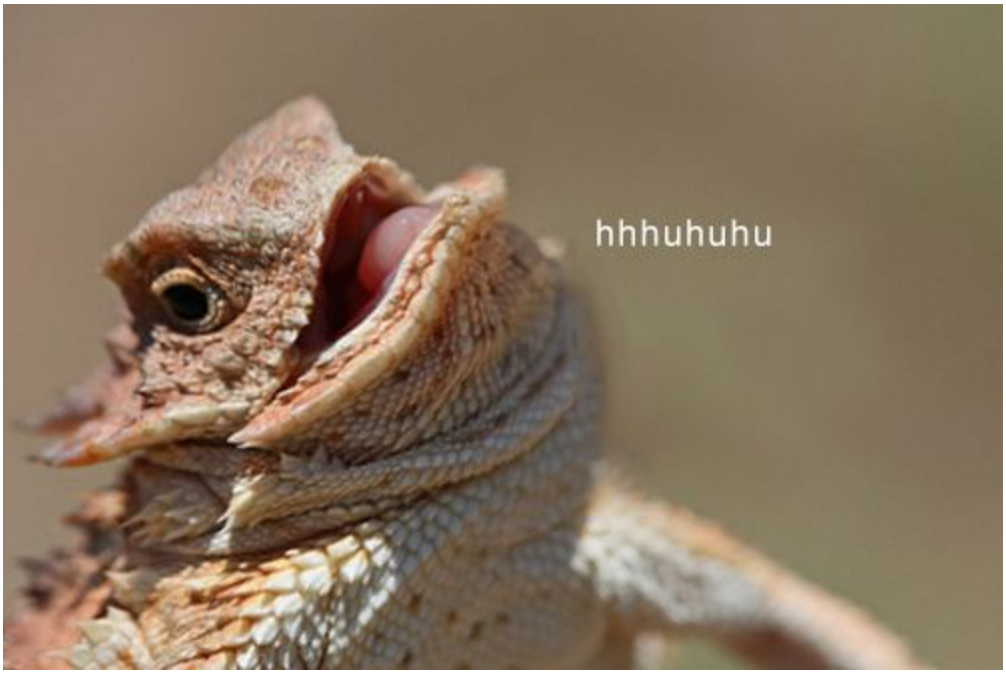
Issues

When spawning threads, creating a unique ID was confusing initially. One might think to initially lock, create thread, and then unlock in the loop; however, this does not guarantee that the thread will run to assign its thread num to the ID from the loop. So, each thread needs to unlock the lock individually once they run, and after they assign their ID to what value it is that’s passed in.

Another issue was using different locks for numCrossingSago and numCrossingMonkey. Initially a single locked was used. However, doing so would block all other lizard threads from continuing until a previous lizard was done, even if the driveway was clear. Thus, two locks were required, one for each.

Results

WORLDEND (s)	Max number of lizards crossing	Max cat sleep	Lizards safe?
30	4	3	Yes
160	2	3	Yes
160	2	1	Yes
240	2	1	Yes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