setwd('C:/Users/Jose/OneDrive/SC-Ramsey/')

library(spatstat)

# Camera data

obs<- read.csv("foxdet\_march2014.csv",header=T)

obs<- as.matrix(obs)

colnames(obs)<- 1:dim(obs)[2]

fox.obs<- obs

n<- rowSums(fox.obs,na.rm=T)

K<- apply(fox.obs,1,function(x) length(x[!is.na(x)]))

# camera locations

locs<- read.csv("camlocs\_march2014.csv",header=T)

locs<- locs/1000

xlim<- range(locs[,1])

ylim<- range(locs[,2])

buffer<- 2

xlim[1]<- xlim[1] - buffer

xlim[2]<- xlim[2] + buffer

ylim[1]<- ylim[1] - buffer

ylim[2]<- ylim[2] + buffer

area<- (xlim[2]-xlim[1]) \* (ylim[2]-ylim[1])

X<- as.matrix(locs)

M=200

J<- nrow(locs)

library(nimble)

## define the model

code <- nimbleCode({

sigma ~ dgamma(18,30)

g0 ~ dbeta(1,1)

psi ~ dbeta(1,1)

for(i in 1:M) {

w[i] ~ dbern(psi)

S[i,1] ~ dunif(xlim[1],xlim[2])

S[i,2] ~ dunif(ylim[1],ylim[2])

d2[i,1:J]<- (S[i,1] - X[1:J,1])^2 + (S[i,2] - X[1:J,2])^2

for(j in 1:J) {

prob[i,j]<- g0 \* exp(-d2[i,j]/2/sigma^2) \* w[i]

}

}

for(j in 1:J) {

Ptrap[j]<- 1-prod(1-prob[1:M,j])

n[j] ~ dbin(Ptrap[j],K[j])

}

N<- sum(w[1:M])

})

data<- list(n=n, X=X, xlim=xlim, ylim=ylim)

constants<-list(M=M, J=J, K=K)

S<-cbind(runif(M,xlim[1],xlim[2]),runif(M,ylim[1],ylim[2]))

inits<- list(S=S,sigma=runif(1,0.2,1),g0=runif(1,0.1,0.5),psi=0.5,w=rbinom(200,1,0.5))

params<- c("N","g0","sigma")

Rmodel <- nimbleModel(code=code, constants=constants, data=data, inits=inits)

Cmodel <- compileNimble(Rmodel)

###########################################

##### MCMC configuration and building #####

###########################################

mcmcspec<-configureMCMC(Rmodel, monitors=params)

pumpMCMC <- buildMCMC(mcmcspec)

CpumpMCMC <- compileNimble(pumpMCMC, project = Rmodel)

CpumpMCMC$run(5000)

samples <- as.matrix(CpumpMCMC$mvSamples)