Related works

Typically, information about HWC comes in different ways, including the zonal hotline

number reports to a given area's human-wildlife conflict response team (HWCRT). This

method is efficient because the residents immediately report spotted wildlife to the human-

wildlife response team. However the hotline system utilizes a reactive approach, hence the need for a cheaper and proactive approach. Reactive means the reports are made after the HWC has occurred.

Another way is by collaring large-body wildlife such as elephants and

rhinos to monitor and track their movements to geo-fence them. For instance, the current

Ngorongoro conservation area system uses collaring of animals such as elephants for

geofencing alerts. This system is installed on animals that tend to cause crop-raiding sprees.

Although it is an effective method, some animals may go astray and raid crops. However, continuous monitoring of wildlife using collaring has proven expensive to install and operate due to its networking requirements and the initial cost of equipment, especially in remote areas with poor network coverage and low population density. However, the problem with

this system is that it tracks only collared wild animals. Therefore, it is expensive to use in

tracking all wildlife. It is also challenging to implement the system on large and aggressive

wild animals such as elephants and carnivores such as lions and leopards. The system is not

also suitable for small-bodied wildlife such as wild dogs or wildlife which live in water, such

as crocodiles.

The Maasai around Ngorongoro has enclosed fences around manyattas but sometimes wildlife breaks these fences and raids the crops.

A study of electric fences effectiveness using collar data

and camera traps to determine wildlife behaviours around the fences and proved to be effective

(Branco et al., 2020). However, due to the cost of power and breakage of fences by elephants

using their tusk which does not conduct electricity (Massey et al., 2014), different strategies to

minimize cost have been used. For instance, activating power when a collared animal is near

the fence using collaring data but its’ use is limited due to the high subscription fee to transmit

data and the challenges of capturing and collaring animals.

The other option is erecting a barrier using beehives to scare away wild animals such as

elephants (O'Connell-Rodwell et al., 2000). This system also benefits the local community

because it provides a source of income through honey harvest. However, this option is

cumbersome and laborious since it needs the installation and regular repairs after becoming

operational.

The available solution is using ultrasonic repellent to scare away wild animals after sensing them.

Kumar et al. (2021) developed a system using passive infrared (PIR) sensors and motion

detector to detect wildlife moving to the human habited area. The system could notify the

registered residents using the mobile app. It also included a loudspeaker system to chase the

wild animals away using loud noise.

Giordano et al. (2018) developed a crop protection system using a PIR sensor to detect wild

animals and an ultrasonic speaker to chase away the wildlife. This system used a low-power

RIOT operating system and a tailored microcontroller. As a result, the system can detect

wildlife but cannot identify each species.

Fazil et al. (2018) designed a system that uses a seismic sensor to detect groundwaves of

elephants’ feet trumping the ground and then alert people using the SMS and speakers. The

only drawback of this system was that it could only detect wildlife, generating ground

vibrations such as elephants.

Ronoh et al. (2023) developed an EWS based on camera traps and short message service (SMS) to detect and alert park warders on wildlife escaping the Tarangire National Park and communities living adjacent to the park.

Drawbacks

The system is designed tomonitor wildlife in only one area facing a single direction, which means that it may not be suitable for use in more extensive or complex areas.

the wild animals detected by

the system are determined by the trained model used, which means that it may not identify

other wildlife not included in the training.

the system is also susceptible to the effects of strong winds and heavy rain, which can

damage the equipment and affect the quality of the images captured.

how do this camera detect animals at night? Do they have flashlights?

The accuracy of a sensor distance was just about a hundred metres

within line of sight.

The battery used for the system was a simple recharge battery that works short period of a few

days.

Uses internet (modem) and network access to transfer images to cloud and location (gps tracker) and send sms alerts. Is this method efficient for remote areas with limited or no network access? The modem for internet requires a way to renew subscription and hence frequent checkups?

Man has to coexist with wildlife, how does this system help pastrolists? Lets say the community gets an alert, how do they react? Do they go to exact position as shown on the sent map? Lets say its at night, is the camera able to take a pitcture? Is the alert made? Is the person getting the sms able to respond in time?