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scient
Student Center for Innovation in Engineering and Technology

PRAGYAN HARDWARE HACKATHON

Energy and Environment

System for Tracking of Animals using Radar - STAR

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1. Project Abstract:

In the course of the last century alone, the planet witnessed the extinction of 18 species of animals. A multitude of wildlife sanctuaries have been established around the globe with the sole purpose of protecting and preserving wildlife in their natural habitat. Despite their efforts, acts of poaching and hunting continue to threaten the existence of many animal species. Locating and monitoring the movement and vitals of the animals in reserves are challenging. Existing methods involve use of cameras, which prove to be disadvantageous because of their limited field of vision and range, and poor performance in harsh weather conditions. While microchip implants that use may help track the different animals of the same species, it cannot actively locate or track the vitals of said animals. GPS devices are also not a feasible option as they are susceptible to damage and are too large to be

implanted into animals. The main objectives of this project are to

1. Detect and measure vital signs of animals.

2. Tracking both animal and human movements to prevent poaching and hunting in wildlife sanctuaries.

This project proposes the use of Ultra-Wide Band (UWB) radar to send and analyse signals to detect and estimate respiration and heartbeat frequencies. Being capable of measuring vital signs(through non-contact methods) and having a wider field, it is more advantageous than the existing alternatives. Through its implementation, detection of human activity and the vital signs of the animals in the reserves can be easily monitored.

***Keywords* — UWB Radar, Antenna, Algorithm development, poaching/hunting protection, heartbeat detection, signal processing.**

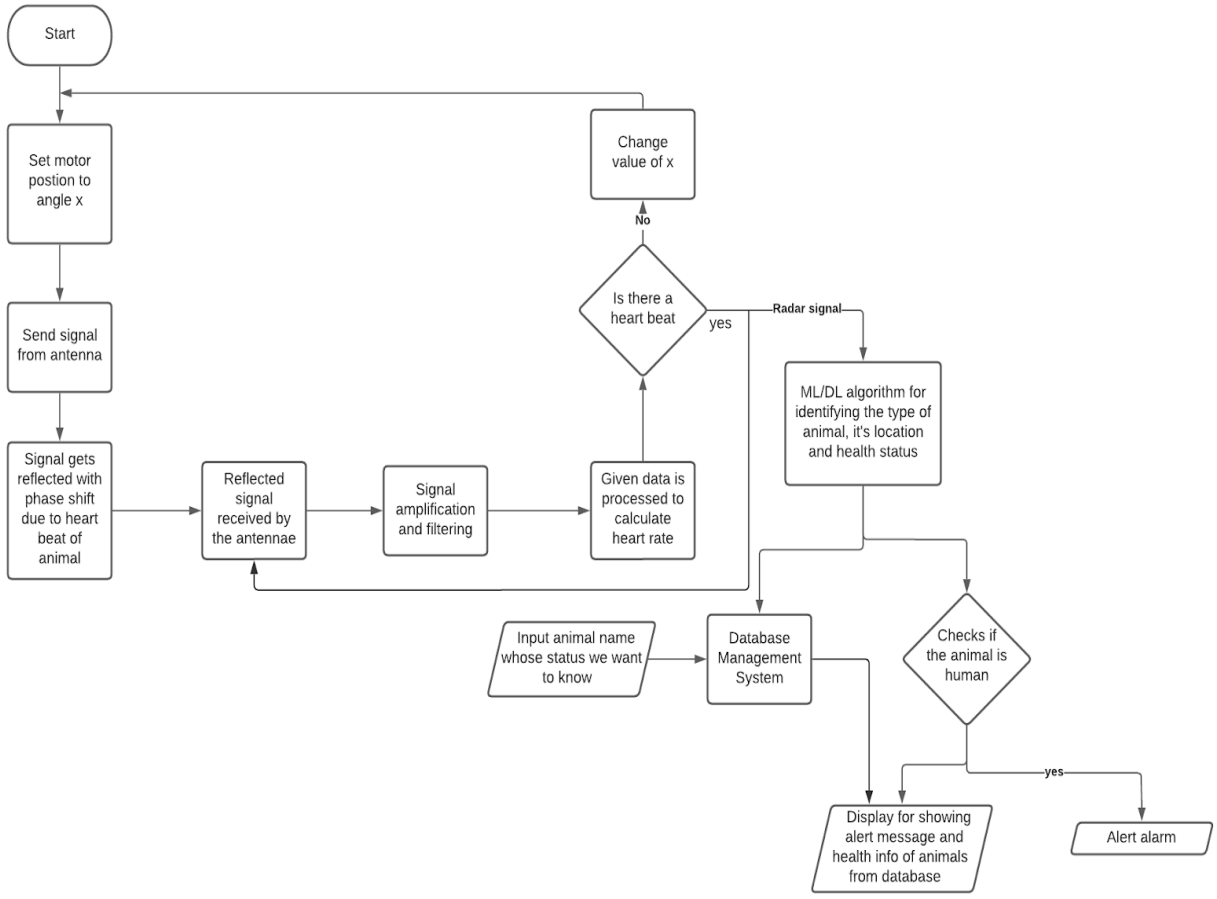
2. Proposed Design:

A. Objective:

The objective of the project is to track the vital signs of animals within a wildlife sanctuary. The project uses UWB Radar to measure the breathing rate and heartbeat rate of living beings. The project can also track the movement of animals and humans which can be used to detect the presence of humans and prevent the occurence of any illegal hunting and poaching activities.

B. Proposed Solution:

a. Block Diagram:



C. Components Required:

COMPONENTS / PARTS	**How is it being used in the proposed solution? Explain its role/functionality.**
Microcontroller (Arduino) (Signal processor)	This is the brain of the prototype which controls the flow of signals and is directly connected with the master controller.
Electrical source (Battery or AC mains)	Its function is to power up the entire circuitry
Servo motor(s)	Controlling the direction of burst of radio waves
Transceiver: Radar Module	(Transmitter + Receiver) Radar Module consisting components which emit and receive the electromagnetic waves

	from the reflected bodies (transmitting and receiving antennas).
Solar panel	This is to power up the battery source
Signal modulators	Signals transmitted between two devices tend to lose their energy and hence these devices come into the role of conserving the main data in the signal.

3. Innovativeness of the Proposed Solution

Some of the existing models for the purpose of tracking wild beings use methods like microchips and GPS which require a physical device to be worn by the animal at all times. This is not feasible as these devices are prone to damage, usually heavy and cannot be used for smaller animals. Further, it gives no information with respect to monitoring of heartbeat and breathing rate in contrast to this proposed solution.

Weather is not a constraint and this system can work all day long. The radar technology gives real time tracking of the vital signs of the animals by emitting waves and analyzing the reflected waves. This eliminates the demerits of wearing a physical device and the time taken for this estimation is very less.

Economically this model requires less capital cost than conventional setups possessing these features.. The radar system also has an edge over the camera system as sometimes there are chances of occurrences of blind spots.

Additionally, implementing DL models here would further expand the applications of this product as it would cover more wild beings and make it easy for the user by recognizing them.

4. Impact of the proposed solution (Application):

1. Reduced risk of endangerment of animal species - In areas where poaching is common, use of radar technology to detect the presence of humans can alert the authorities in time and reduce the occurrence of illegal hunting and poaching activities.
2. Reduced risk of animal attacks near human habitat - Movement of animals near the edges of reserves and sanctuaries can alert the authorities and can prevent the entry of wild animals into areas occupied by humans.
3. Continuous data of animal vitals - The constant stream of data related to the vital signs of animals can further help in reducing the risk of endangerment of species.

5. References

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