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Automated Snake Bite Prevention System

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Abstract—Snakebite isnt an illness without a treatment, any-way a substantial number of grievous setbacks go untreated each year. Many governments basically put this issue in the difficult to handle basket.Hence we have made a gadget which will recognize snakes using cameras and spurn the distinguished snake using a snake repeller.This should provoke an uncommon decrease in the number of snakebites and in like manner in the number of deaths.We are planning a basic, easy, convenient gadget which will automate the procedure of snake repeller.

Index Terms—Snake bite, Image processing, Edge detection, Gaussian filter, Sobel filter

I. INTRODUCTION

As per Government of India information, there were 61,507 snake bites with deaths of 1124 during 2006; 76,948 bites and 1359 deaths in 2007.In April, 2015 Union Minister of Health, Family Welfare M.Nadda said that around 1,124 individuals had died in 2012 because of snakebites while 1,008 had died in 2013. People, for the most part poor farming workers, die from snakebites consistently - deaths that can be evaded if the issue got its due from general well being policymakers. The Nadsur and Dhondse towns of the Raigad locale are two of the numerous towns confronting this deadly issue because of snakes. There was an absence of efficient readiness to battle this issue.Hence to determine this issue we are building up a simple device which will have the capacity to recognize snakes and alert nearby prople about the snakes.

II. RELATED WORK

Generally, snake repellers come in pellet or spray styles. It appears, in view of purchaser, that pellets are considerably more viable outside than sprays as is evident from [1]. The way the pellet and spray style deterrents work is by interfering with the snakes feeling of smell. This neurological interruption makes them abandon the territory, leaving to discover 'natural air' to chase prey. For open air utilize, purchasers say the Ortho Snake B Gon is the best choice. Produced using basic oils, it's showcased as a naturally well disposed alternative that won't hurt people, pets or plants. It's intended to keeps snakes from entering the home, and also settling and searching.

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You should simply sprinkle it around your property each 30 days. There are various gadgets accessible globally as "Home and Garden" snake and rat repellent gadgets. These gadgets deal with the standard of using sonic wave sound and vibrations [5].

As the sonic wave is produced while going through a media like soil, it likewise makes vibrations because of energy transfer. In spite of the fact that snakes can not hear sound waves they can detect vibrations, that is somewhat hearing for them. The basic premises of these devices are to create stimuli to prevent chances of conflict by reducing the animals desire to enter or stay in the area where these vibrations are happening. In the gadget that has been spread like an out of control fire via web-based networking media as the " Farmer's magic stick", the above principle and technology has been innovated into portable devices that couldve been based on the traditional method of Hitting a stick on the ground while walking in the dark so that if a snake is in your way, it will sense the vibration and move away. The old principle works because of its very short term window of avoiding snake in front of you when you are walking, the target objective is to warn the snake of your presence expecting it to move away from your path and not to run meters away.

Fig. 1. Ortho Snake Repellent

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J-F Aujol et al [2] has proposed that image segmentation (also known as object/edge detection) isthe way toward iso-

Fig. 2. Electronic Snake Repellent Stick

lating a picture into its constituent parts utilizing data about the boundaries between articles, edges inside items, varieties in intensities, and so forth. Frequently, the human eye can without much of a stretch perceive remarkable data from a picture; notwithstanding, foundation varieties in intensities, clamor and different corruptions, and other exceedingly os-cillatory highlights make the procedure of picture division challenging. An algorithm is built to part a picture into a total u + v of a bounded variation component and the component containing the textures and the noise. This decomposition is enlivened from an ongoing work of Y. Meyer. We discover this decomposition by minimizing a convex functional which relies upon the two variables u and v, alternately in each variable. Every minimization depends on a projection calculation to limit the aggregate variety. Specifically, the u segment can be utilized in nontextured SAR picture rebuilding.

Joachim Denzler et al [3] has proposed- Active motion detection and object tracking: The fundamental guideline is the utilization of two phases, one for movement identification and one for the following itself. A two phase dynamic vision framework is utilized for following of a moving item which is distinguished in a diagram picture of the scene, a nearby view is then taken by changing the frame grabbers parameters and by a positional change of the camera mounted. With a mix of a few basic and quick working vision modules, a powerful framework for object following is developed.

Anaswara S Mohan et al [4] has proposed background subtraction for object detection and segmentation for edge de-tection. So as to acquire a programmed movement calculation that can work with genuine pictures there are a few issues that should be solved, particularly essential are: noise, missing information and absence of an earlier learning. For certain applications the commotion level can become critical. Edge identification is a predominant issue in the field of picture handling and has been inquired about a great deal. Some edge identification systems fall in the spatial space edge location like Canny and sobel. The other class is edge identification in the frequency area.

Mallat and Zhong in their work [6] proposed a dyadic wavelet and a corresponding wavelet transform. The idea was to detect edges in the wavelet domain by applying wavelet transform to the image in different scales. It was observed that the edge structures were visible in each sub-band but the noise levels decreased rapidly along these scales.

Xu et al [7] presented a method in which they enhanced significant structures by multiplying the adjacent DWT levels and Sadler and Swami [8] analyzed the multi-scale product in step detection and estimation . The paper [4] we are following does something along these lines; we make a multi-scale edge detector by multiplying adjacent sub-bands and making edge maps at different scales and combining them in the end. Edges are determined as local maxima in the product function after thresholding. The pipeline majorly includes four image processing techniques: convolution of image with a filter as the wavelets used are essentially filters to be convoluted with the images, downsampling the image to half its size by removing alternate rows and columns from the image, element wise multiplication of image arrays and up-sampling the images to twice their sizes by using some kind of interpolation techniques.

III. RESEARCH GAP IDENTIFIED

1) The vibrations through sonic waves will only work better if the media is packed and dry. Water logged or irrigated or very loose soil doesnt carry or spread such vibrations around.
2) Such vibrations may not deter a foraging/ hunting/ searching snake to move in a area where such devices are planted. Also even if the snake moves away, you will not be able to control its direction of the movement, instead of going away from you it may come towards you increasing chances of conflict.
3) Hypothetically to be an effective deterrent, we will need multiple units kept around the property/field, continu-ously switched on. Again we need to conduct studies for its effectiveness even after leaving it continuously on.

IV. OUR APPROACH

Since, it is not feasible to keep available snake repellents continuously sending vibrations in the soil to repel snakes, we intend to mount a camera on our device which will function as a snake detector. The camera will be able to rotate 360° in its place. As soon as a snake is detected signals will be sent to an alarm and to a laser light installed within the system. The alarm will start sounding to alert nearby people about the detected snake. The laser will point at the detected snake. The movement of the snake shall be tracked and data shall be shared with all nearby devices so that an overall repelling effect can be made possible.

V. PROPOSED SYSTEM DESIGN

Components :

1) Camera : Logitech c170 camera for capturing images of surroundings.
2) Pivot : For mounting the camera.
3) Motor : DC motor for 360° rotation of camera.

L293 IC : For controlling direction of motion of the motor.
Alarm : For alerting nearby people about detected snake.
Arduino UNO : For processing of data and communi-cating with other components.

Laser light : For pointing at the snake and helping nearby users in identifying the position of the snake.

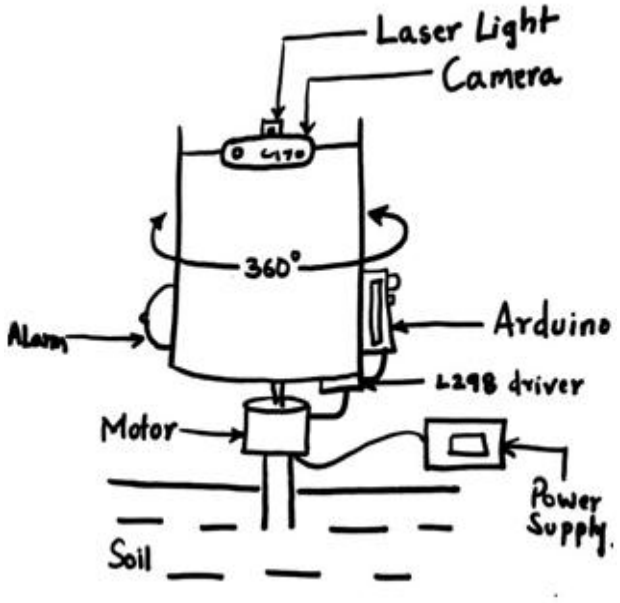

Fig. 3. Proposed system design

VI. METHODOLOGY

A. Programming the Arduino UNO to rotate the motor

In this section, we introduce the programming and the functionality of the arduino UNO board. We intend to rotate our camera 360o in both directions. For this purpose we use a DC motor. A DC motor generally has 2 leads, a positive and a negative. If these 2 leads are connected to a battery, the motor will rotate. If the leads are switched, the motor will rotate in opposite direction. Inorder to control the direction of rotation of the motor without changing the leads, we make use of a circuit called the 'H-bridge'. This circuit switches the polarity of the voltage applied to the load At the point when the switches S1 and S4 (as indicated by fig. 4) are closed (and S2 and S3 are open) a positive voltage will be connected over the motor. By opening S1 and S4 switches and closing S2 and S3 switches, this voltage is turned around, permitting reverse task of the motor. In order to make the 'H-bridge' circuit we have used the L293 H-bridge IC.

B. Image processing for snake detection

In this section we introduce the processing of the surround-ing image leading to the detection of a snake if it is there

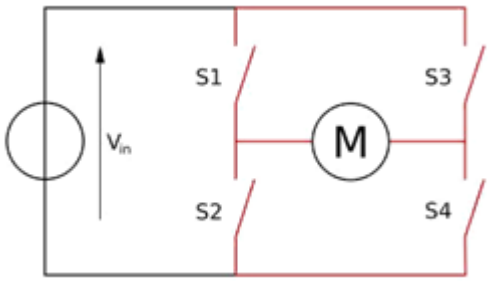

Fig. 4. H-bridge

in the surrounding and a technique to track the snake. We intend to use the edge detection technique in order to detect the snake. This technique is used for image segmentation and data extraction.

1) Gaussian filtering: In order to remove the noise and detail in the image, we blur the image using a Gaussian filter. In one dimension, the Gaussian function is: When working

$$G(x) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{x^2}{2\sigma^2}}$$

Fig. 5. One dimension Gaussian function

with images we need to use the two dimensional Gaussian function. This is simply the product of two 1D Gaussian functions (one for each direction) and is given by:

$$G(x,y) = \frac{1}{2\pi\sigma^2} e^{-\frac{x^2+y^2}{2\sigma^2}}$$

A graphical representation of the 2D Gaussian distribution with mean(0,0) and σ = 1 is shown to the right.

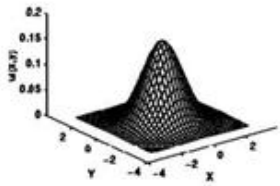

Fig. 6. Two dimension Gaussian function

The Gaussian filter works by utilizing the 2D movement as a point-spread limit. This is practiced by convolving the 2D Gaussian apportioning work with the picture. Luckily, the dispersing has pushed toward near zero at around three standard deviations from the mean. 99% of the flow falls inside 3 standard deviations. This surmises we can normally restrict the fragment size to contain just values inside three standard deviations of the mean.

2) Sobel filtering: The Sobel operator performs a 2-D spatial slope estimation on a picture thus accentuates districts of high spatial recurrence that relate to edges. Normally it is utilized to locate the rough outright angle extent at each point in an input gray scale picture. The operator comprises of a pair of 33 convolution kernels as shown in Figure 7. One kernel is simply the other rotated by 90. These kernels

X – Direction Kernel

-1	0	1
-2	0	2
-1	0	1

Y – Direction Kernel

-1	-2	-1
0	0	0
1	2	1

Fig. 7. Sobel convolution kernels

are designed to respond maximally to edges running vertically and horizontally relative to the pixel grid, one kernel for each of the two perpendicular orientations. After applying sobel filter to the image, we have emphasized the edges in the image. Some morphological reconstruction is done in order to remove unwanted edges. Once we have detected the edges of the snake, we move on to the next module - tracking.

C. Image processing for snake tracking

In this section we introduce the method of tracking that we use in our system. We divide our image into three blocks - left, centre and right. As soon as our system detects edges of the snake in any of the three blocks of the image, it finds the block containing major part of the snake, i.e. containing the maximum edges. Once the block containing the major part of the snake is found, the system tends to align the camera in such a position that the snake is exactly in the centre block of the image. For this purpose, we calculate the centroid of the edges of the snake. If the value of the x-coordinate of the centroid is less than the value of the x-coordinate of the centroid of the image, it implies that snake is in the left block and otherwise the snake is in the right block. In order to align the camera pointing directly at the snake, we need to rotate our camera in such a way that the snake is in the centre block of the image. We rotate the camera to the left if the snake is in the left block and to the right otherwise. Once the camera is aligned in a position pointing directly at the snake, we pass signals to the arduino to switch on the laser light and sound an alarm. Now if the snake moves and changes its position, the centroid of its edges will also change and accordingly we can rotate our camera in the direction of the snake.

VII. RESULTS

This work successfully develops a simple, low cost, portable device which can be installed in any snake bite prone area. The figure 8. shows the model of our system. In order to test our system we simulated a field with some artificial bushes and a rubber snake. The system could successfully detect the

Fig. 8. System model

snake and track its movement. The laser light pointed at the snake as soon as it was detected along with the sound of an alarm. The testing environment needs bright illumination for greater accuracy. The figures 9,10,11,12 below show the snake detection results.

Fig. 9. Result 1

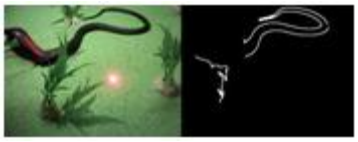

Fig. 10. Result 2

Fig. 11. Result 3

VIII. FUTURE ENHANCEMENT

We have successfully developed a system which can automatically detect snakes and alert nearby users about their

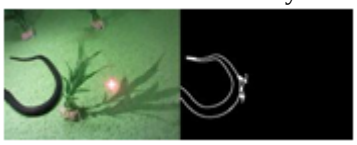

Fig. 12. Result 4

presence. But the system developed has only a certain sight of coverage area. If the snake moves out of the coverage sight of a particular system then it needs to be taken care of by another system in the vicinity of that system. As a result the system needs to be scaled. As the snake moves out of the coverage sight of a particular system, its coordinates can be used to send signals to that system whose coverage sight will include the snake. As a result, more than one systems planted in a field of consideration can coordinate and produce an overall repelling effect of the snakes.

IX. CONCLUSION

This work successfully develops a simple, low cost, portable device which can be installed in any snake bite prone area. It will automatically detect snakes and alert nearby users about their presence. Users will also be aware of the snakes position as the system will point a laser light at the snake. Moreover, no monitoring is required as the system is automated. Further work will investigate the behavior of the model under other types of dynamic situations like when there are more than one snakes near the system, and also on the improvement and scalability of the system such that a number of such systems can be used to effectively repel snakes from a field in consideration.

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