International Journal of Advances in Engineering and Management (IJAEM)
Volume 2, Issue 1, pp: 357-361 www.ijaem.net ISSN: 2395-5252

Mosquito Larvae Detection and Killing System

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Date of Submission: 11-06-2020 Date of Acceptance: 28-06-2020

ABSTRACT-Mosquitoes are one of the most dangerous insects in the entire world. Over one million people around the world wide dies from mosquito-borne diseases which are called as protozoan diseases like, malaria, filarial diseases and viral diseases such as dengue, encephalitis . In addition , It also acts as a vector being the main cause for transmitting many diseases .In this method we are proposing a new process where we detect the mosquito larvae present in polluted water bodies , using BT(Bacillus Thuringiensis) spray, which is an insecticide that kills the mosquito larvae present in the water bodies ,BT generally affects only the larval stage ,the mosquito lifecycle has many stages starting from egg , pupa, larva and adult .This method also helps to take the count of the larvae. Larval stage is one of the stages of mosquito lifecycle , which we are targeting to kill, because it becomes very difficult to kill the adult mosquitoes. The reason why we are using BT is because it is an insecticide unlike the pesticides which is very harmful for the environment .

INDEX TERMS- Mosquito Larvae Detect, Mosquito Larvae Spray,Larvae Identification, Kill Mosquito Larvae.

I. INTRODUCTION

Mosquitoes generally goes through four separate and different stages of its life cycle and they are : egg, pupa, larva and adult. All of these specified stages can be easily recognized by its appearance.

Egg : Eggs are laid by adult mosquitoes only one at a time or sometimes attached together to form something called "rafts". They float on surface of the water ,some of the eggs are laid on ponds are mostly flooded by water . Most of the laid eggs hatch into larvae within 48 hours: water is a necessary part of the habitat. They are very hard and stick to the walls of the container like glue and can survive ,it only takes a very small amount of water to attract any female mosquitoes,Cups,bowls, open containers ,tanks etc are some of them

Larva: The larva lives inside the water but it only comes on water to breath for oxygen the larva comes out from eggs ,but only when the water level rises to cover the eggs , this means the rainwater or human adding water to containers with eggs will trigger the larvae to emerge ,Larvae shed their skin 4 times ,which grows larger after every molt. Larvae have siphon tubes for breathing and they always hang upside down from the water surface . The larvae feed on microorganisms and other oganic matter in the water. Only during its fourth molt larva changes into a pupa.

Pupa: The pupal stage is a resting stage andnon feeding development stage, but pupae are mobile ,responding and moving to light changes ,this is the stage where mosquito will change into an adult . This type of metamorphosis seen in butterflies when the butterfly develops .

Adult: The newly developed adult mosquitoes rests on the surface of the water for only short period of time to allow itself to dry and all its body parts to get harden. They have to spread their wings and dry properly before it could fly. Blood feeding and mating doesn't occur for few days .

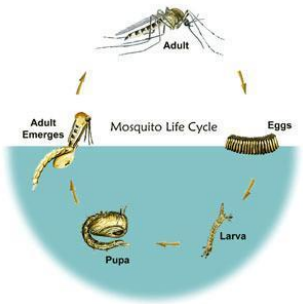

Fig. 1: Life cycle of Mosqutio

II. LITERATURE REVIEW

Every Software development requires the survey process. This Survey process is required to get the main requirements to the software. The Survey also includes studying the current system and also studying about the tools that is needed for the development of the software. A proper understanding of this tools is very much essential for the software. An extract of the information of

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material collected during literature survey are as follows :

Author M F sulaima has proposed a method for detecting mosquito larvae .As per that system Aedes larvae detector system is proposed that is a hydrophone sensor which is used to detect the appearance of larvae by the sound wave in the water and a pesticides is used as the output to kill the larvae simultaneously. This existing system is capable to both detect and kill Aedes larvae. The hydrophone that has been implant in this study is used as self-made hydrophone which it develop by the raw materials. This hydrophone is functioned as sensor to detect the small movement under water that is mosquito larvae. The suitable pesticide that is commonly used for controlling this larvaeAedes is Bacillus Thuringiensis (BT). This pesticide must be eaten by larvae to be more effective and works by interfering with digestion[5].

Fig. 2: Hydrophone with different mechanism

A proper equipment is designed for acquiring the video of the mosquito larvae in several multiwell plates simultaneously by a camera, and a video analysis module is done for detecting the survival states of larvae aedes in each well in real time. and then the accuracy of the larval survival state in that system was more than 85%.[3] Moreover, that investigation has indicated through this that the developed system not only can be used in the larvae aedes bioassays but also suitable to detect and analyze the behaviors of large amount of the other larvae.

This paper describes an improved YOLO algorithm for vehicle detection, which efficiently improves the result by vehicle detection. Through this experiments, increasing the network depth of the detected image could make the network better fitting the vehicles in aerial images . [4] In the process of down sampling, a method which the features of small objects are gradually filtered out, so which we consider to call the top-level information to detect aerial vehicle. By calling the top-level Information, the global network information can be utilized to improve the result of prediction. Through a series of improvements, the detection algorithm exceeds State-of-theart vehicle detection algorithm.

The detection mechanism used to detect the insect pests in the image is extended region grow algorithm. The successive captured images from the camera is fed into system. Using the algorithm of extended region grow the image is analyzed and then the pest is counted in the image of pest in crop. the experimentation that we did provided the identification and counting in 90% .both the identification and counting is implemented[8].

III. METHODOLOGY

In this proposed system, we use a combination of software and hardware system i.e.., an IoT system. In the software part we use an image processing mechanism which is used to detect the larvae in water. In hardware part we take the detected part and do spraying according to larvae density and thus kill the larvae using BT. The below section gives the detail description of this software and hardware part.

In order to provide an implementation of camera access with the Raspberry Pi, we created a simple motion detection class that can be used to detect motion in the frame views of camera connected to the Pi. Here we detect the larvae using thresholding as a preprocessing technique then we find the contours in the thresholded image. Next we are counting the larvae density in that image. Based on this count we send an value to the nano. Next this nano sprays the BT and kills the larvae.

The hardware components used here are Raspberry pi, Ethernet cable, Arduinonano board, Power bank, Sprayer/Water pump, pi camera. Below is a block diagram of the hardware.

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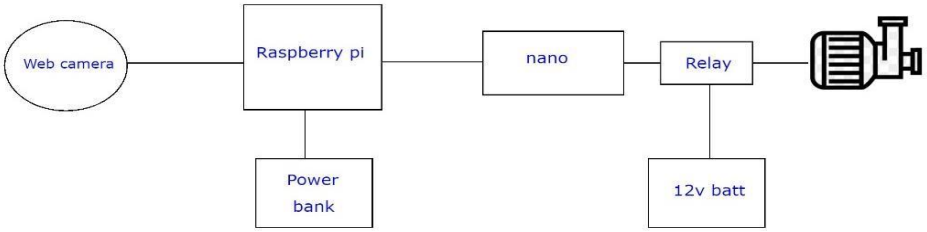

Fig. 3: Block diagram of proposed hardware system

As in the above figure, pi camera/web camera captures the video. This camera is connected to Raspberry pi then python code is executed on pi and this code detects the larvae in the frame and gives the count. Power bank is used to give power supply to the pi. . Next the count is passed to the nano board, which controls the motor to spray according to the count. Count here is calculated as values 0, 1, 2 and 3. If larvae count in frame is 0 then pi sends 0 value to the nano saying it to spray zero times(no spray), if count of larvae in frame is less than 10 then pi sends 1 value to the nano saying it to spray one time and larvae density is minimum, if count of larvae in frame is between 10 to 20 then pi sends 2 value to the nano saying it to spray two times and larvae density is average, if count of larvae in frame is greater than 20 then pi sends 3 value to the nano saying it to spray three times and larvae density is maximum. Here we have made an serial connection between pi and nano. Below is a code of for the serial connection between pi and nano:

```
import serial
ser=serial.Serial('/dev/ttyACM0',9600)
if total==0:
 ser.write('0')
if total<10:
 ser.write('1')
if total<20 and total>10:
 ser.write('2')
if total>=20:
 ser.write('3')
```

```
int sensorPin = A0;
int ledPin = 13;
int sensorValue = 0;
int autoSpray = 12;
void setup() {
pinMode(sensorPin, INPUT);
pinMode(ledPin, OUTPUT);
pinMode(autoSpray, OUTPUT);
Serial.begin(9600);
}
void loop() {
if(Serial.available()==0){spray(0)}
if(Serial.available()==1){spray(1)}
if(Serial.available()==2){spray(2)}
if(Serial.available()==3){spray(3)}
void spray(int count){
    if(count==0){
        digitalWrite(ledPin,Low);
        digitalWrite(autoSpray, LOW);
    }
    else{
        for(int i=1;i<=count;i++){
        digitalWrite(ledPin, HIGH);
        digitalWrite(autoSpray, HIGH);
        delay(1000);
    }}
}
```

IV. RESULT ANALYSIS

The snapshot of the detection of larvae in water is shown below. This system gives an accuracy of 77%. In this system only larvae is detected not the pupae.Also the sprayer works efficiently. Sprayer sprays accurately with an accuracy of 80%.

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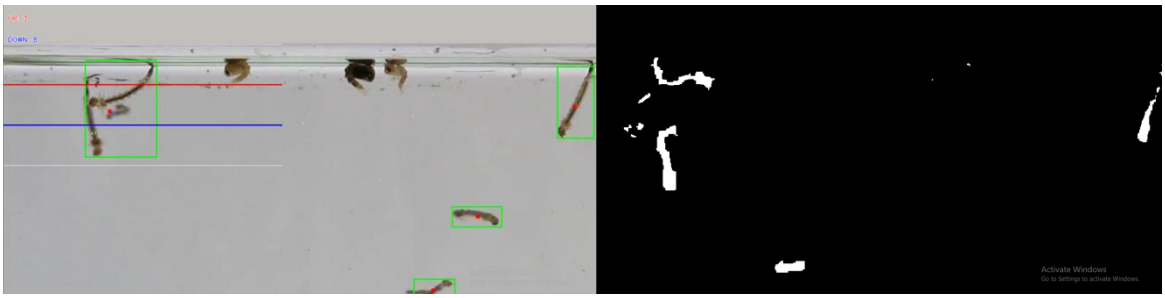

Fig. 4: Detected image using contour(left), thresholded image(right)

This system is affordable when compared to hydrophone in terms of cost, since hydrophone is very costly. Maintenance is easy since it is not an complex system. But this does not detects pupae only larval stage is detected.

V. CONCLUSION

In this work, to eliminate the mosquitoes effectively on larval stage has been proposed properly. The successfully of this proposed technique will give some contributions to the community through reducing burden of facing dengue fever issue and other disease issues that can cause death. In order to get better result in future, the depth of water must be analyzed while extensive studies on what causes larvae to move up and down in the water have to be further explored accordingly. In the other hand, instead of using hydrophone to manipulate the movement of larvae in order for us to kill them, advanced technique can be used to detect mosquito larvae in murky waters by applying enhancement of our work. Our system is an prototype model, which can be implemented in real world with additional enhancements.

ACKNOWLEDGEMENTS

We are indeed grateful to many groups of people who have helped us with various aspects of this study. We would like to thank Prof Amruth V as well as special thanks for our head of the department DrSharath Kumar Y H for giving us the opportunity to do this wonderful project on “Mosquito Larvae Detection and Killing System”.

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Amruth V, et. al. "Mosquito Larvae Detection and Killing System." *International Journal of Advances in Engineering and Management (IJAEM)*, 2(1), 2020, pp. 357-361.

International Journal of Advances in Engineering and Management
ISSN: 2395-5252

IJAEM

Volume: 02 Issue: 01 DOI: 10.35629/5252

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