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Role of Information Technology (IT) to Hike Fish Productivity in Fish Farm House

Syed Asif Ali

Department of Computer Science SMI University Karachi, Pakistan

Abstract: Fish industry provides food to people and on the other ensures monetary solvency also. Unfortunately in most of the countries this industry remains neglected and is not properly documented resulting in loss of revenue to the national exchequer. So, there appears every need to ensure its documentation with a view to keeping its up-to-date records and introducing new trend of information and communication technology to it. This is the demand of time. What is important is that information and communication technology techniques should be used in fisheries to keep track on global trends. The threat in fisheries can easily be monitored or/and mitigated through use of the technology. The proposed model can help calculate growth rate of fish also.

Key words: Information Technology (IT), Fish Growth Model (FGM), Bionetwork.

INTRODUCTION

Fishing Industry:

The fish industry deals with processing, preserving, storing, transporting, marketing and selling of fish on the one hand and on the other maintains growth and safety of fish species.

Fish industry performs an important role in revamping the economy of many countries in the world (Comitini, S., & Huang, D. S.,1967). Traditionally fishing is done two ways either in salty seas or in sweet water rivers, lakes, ponds, dams' etc (Bardach, J. E., Ryther, J. H., & McLarney, W.O., 1972).

These days fish farming or aquaculture trend is rapidly expanding all over the world. Side by side crab faming is also very popular in many country (Salam, M. A., Ross, L. G., & Beveridge, C. M. 2003).

Basic Requirements for Fish:
Farming OR AQUACULTURE:

Biotic species have their own culture and they feel comfort in their environment called ecosystem or bionetwork. Like all biotic fishes have their own unique bionetwork or ecosystem called 'Aquaculture'. For Fish farming it is necessary to provide a completely artificial bionetwork close to their real culture, otherwise timely growth and increased productivity of the species would face odds. The first thing that is necessary for the fish farming is land and then sufficient water in pond/tank, hatchery, feeding, fingerlings, market etc are other important factors (Adams, S.M., Brown, A.M., & Goede, R.W., 1993).

Farming can be done in lakes, ponds and dams etc. For proper growth of fish in farms and suitable marketing following factors need to be considered (Albaladejo, V.D., & Corpuz, V.T.,1981):

1. High capacity of water in farm
2. Size and capacity of pond
3. Pond's proper cleaning..
4. Maintaining temperature of water
5. Feeding of fish (Most of the farmers use their prepared feed for all types of fish which may delay their growth. Feed also match with the culture of fish species).

Proper marketing. (Farmers must keep in mind which fish people like the most. Further, they must decide before hand if the product is for local market or for export. Yet again, farm house should be near the market. (Schreiber, D., Matthews, R., & Elliott, B., 2003), (Helfrich, L.A., & Libey, G., 1991).

How IT Support the Model:

It is important to nurture the fish population in a reasonable way. It is also necessary for giving attention to intensive fish farming and ecosystem maintenance in the open water. For the fish farming field, it is important to determine both the size and number of fish. For ecosystem controlling, it is important to determine the number in a specific area. If the size of pond or tank is small then the growth of fish will be hampered. It is essential to determine the size of pond or tank in accordance with the fish species length. Proposed research suggests that the automatic counting of fish species from the sample of fish population should be taken by camera in the form of digital pictures and through artificial neural network.

In the past physical or manual counting and weighing of the fish took place. In the process chances of loss the life of fish were high (Wright, R. A., 2000).

Corresponding Author: Syed Asif Ali, Department of Computer Science SMI University Karachi, Pakistan
E-mail: asifkhi@hotmail.com, aasyed@smiu.edu.pk

Fig. 1: Manually Measure the length of fish

It Based Proposed Fish Growth Model For Fish Farming:

Step 1- In proposed IT based Fish Growth Model first picture (Sample of fishes) of under lakes, ponds, dams etc. will be taken as a sample where farmers grow fishes by artificial bionetwork.

Step 2-In case of large size of lakes, ponds, dams etc the area or region in side lakes, ponds, Dams' etc is marked. See Figure 1.

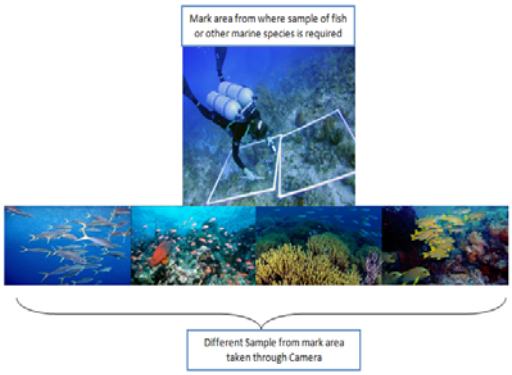

Fig. 2: Marked Area or Region in Fish Farm when Size of lakes, ponds or dams is large

Step 3- After getting sample from Artificial Bionetwork data through camera. The counting of fish takes place from the given sample of fish population which is in the form of digital pictures.

Sometimes it is very difficult to calculate the length of fish from sample taken by camera.

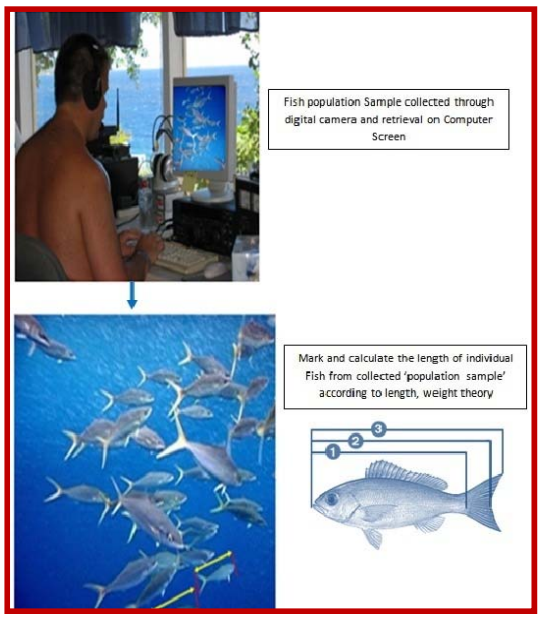

Fig. 3: Measuring length and Height of Fish using ICT

Fig. 4: Fish Sample show the overla pping of fishes

This problem can easily be mitigated by repeating the sample one after another and then taking average result.

To solve this problem, an artificial neural network can be developed to estimate the length of fish where they are overlapped. The proposed neural network is very simple. It is a three-layer neural network with back-propagation structure.

In case of overlapping fish patterns an Artificial Neural Network (ANN) techniques is the best way to determine the matching length of fish database in the computerize database. The match between a given fish sample and an ANN based model calculate the degree of similarity from standard length of fish store in database or from sample-to-sample to identify the average length of fish.

Digital fish picture is divided into different levels and treated as input of neural networks.

Sample data of different type of fish species is saved in database (see Figure). Hidden layer compares the multiple levels of fish digital image pattern with database fish length pattern and identifies actual length of overlapped fish.

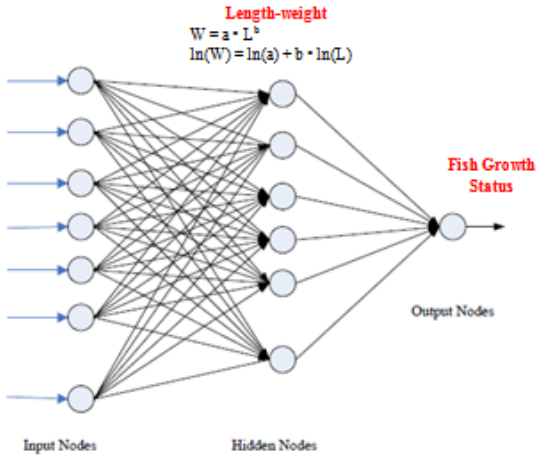

Fig. 5: ANN for Calculate the length of Fish in overlapping case

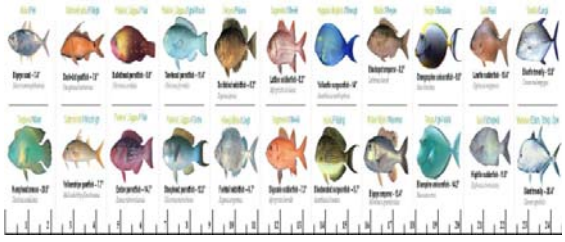

Fig. 6: Standard length of various Fish Species

Step 4- Farmers should be aware of the Age Composition Statistics (ACS) of fish so that they can decide whether fish fry are ready for sale. The fish collectors should be very careful when handling the product in order

to prevent injury to them. However, the proposed system is very safe. Sample data can easily be transferred from camera to computer and by using fish growth model which identify the age of fish and their weight. (See Figure 2). The age, length and weight of fish can be calculated by the method described in Session V.

Statistical Part Of Proposed:

IT Based Fish Growth Model :

The most common metrics used for growth of fish species models and determining length-weight relationship are as follows (Harrison, T. D., 2001);

Size Characteristics:

- Length
- Weight

Measuring Length:

There are three different ways to measure the length of fish. They are:

(1) Standard Length
(2) Fork Length
(3) Total Length

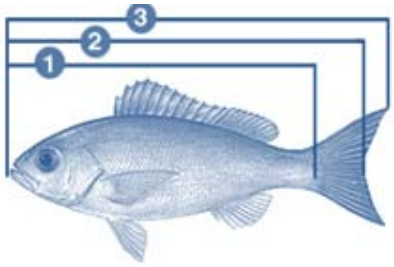

Fig. 7: Fish Length Measurements

The length of different species of fish is different and it increases as they mature. Mean length is directly proportional to age. Following are the steps for measuring the length of fish calculated on a measuring board using a linear scale (mm). The board is adjusted with a second measuring device before taking the fish collection. As a precaution and for better result this is necessary that the measuring board is in working order. On the safe side it should be rinsed with salty water.

Step-1. Place a fish on the measuring board on its right face, with its head facing the recorder's left 2. Grip the head of the fish tightly against the head portion prior to measuring the fish.

Step-2. The total length of fish is measured into the nearby millimeter. To maintain accuracy one should know how to measure the length of fish manually (figure-8). The total length of fish is defined as the length from the most frontal part of the fish to the tip of the longest caudal fin ray. (Repeat the step 2 to calculate the standard size of individual fish species).

Step-3. Compute the standard length of the fish to the nearest millimeter. Standard length is defined as the length of a fish from the front of the upper lip to the posterior end of the vertebral column.

Figure 8: Measuring Length of Fish[8]

Figure 8.1: Incorrect Measurement [8]

Figure 8.2 : Correct Measurement [8]

Step-5. After computing the length of fish, measurement of fish weight is complete.

Measuring Weight :

For weight of fish following formula is to be applied (Harrison, T.D., 2001):

$$W = (G^2 \times L)/800 \quad (1)$$

Weight (wet or dry)

Fig. 9: Fish Girth Measurements

G=girth in inches L=short measurement in inches
Girth: widest part of the fish

2. Condition indices.

Fish condition indices based on the length-weight relationship, energy reserves, growth rates, and relative size (gonad somatic index).

Length-weight relationships: usually one of the best statistical relationships Cone, (R.S. 1989) (Pangle, K. L., & Sutton, T.M. 2005).

$$W = a \bullet L^b \quad (2)$$

$$\ln(W) = \ln(a) + b \bullet \ln(L) \quad (3)$$

W and total length L is exponential; the general form is as below:

$$Y = a \times B \quad (4)$$

On compare with W= a L B, where
W is independent variable
L is dependent variable.
a & b are intercept and power respectively.

After measuring the length and weight of fish farmers can easily guess their growing size. If the growth is abnormal they can treat them. In case the fish gain their actual or standard size they are ready for marketing. In case of disorder in size due to disease or improper feed, necessary steps must be taken for damage control. In case of loss of life of fish for whatever reason, this model helps the farmers make or modify their market strategy.

Feature Of IT Based Proposed Fish Growth Model:

1. Proposed model can check both the Individual Growth Model and Population Growth Model of fish species.

2. Previously the length of fish was measured either physically or manually. In manual method there was maximum chance of damage to body or even loss their life. Now there is no need to calculate the length of fish manually.
3. Each stage of Population Growth model (eggs, larvae, juveniles and adults) can be monitored.
4. Because of continuous monitoring and proper nurturing productivity of fish will enhance.
5. Temperature, quality and quantity farming tank or pound, feeding requirement can easily be checked through ICT based model.

6. As the length and weight of fish can be measured at any stage, the marketing strategy can accordingly be adopted easily.

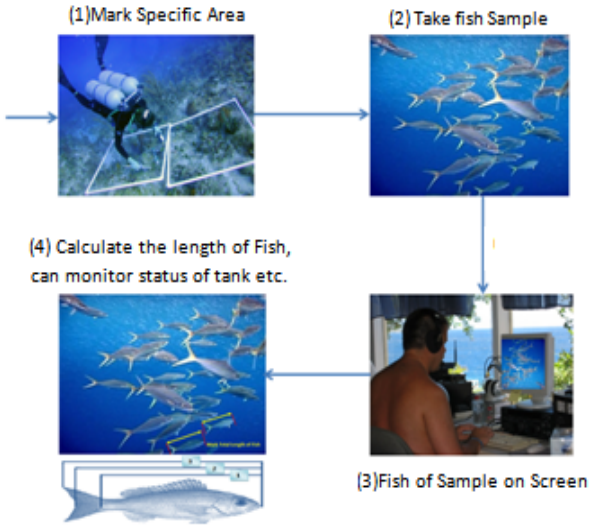

Figure 10: Calculating length of fish, monitoring status of tank, using proposed ICT based system

Fig. 10: Calculating length of fish, monitoring status of tank, usung proposed ICT based system

Conclusion:

Fishing is an important industry which generates revenue for the country. To increase the productivity of fish artificial framing is emphasized upon. Many countries bank on this method of production to revamp their economy. On the one hand it meets internal demand of the country and on the other earns foreign currency through export. However, artificial farming in not so easy. It needs special arrangement to make it as close to natural ecosystem as possible. Traditionally it is relatively difficult to measure manually the length and size of fish. Because through manual process the fish get hurt.

The proposed system using information and communication technology facilitates the fish scientifically. Further continuous monitoring of their length, size and age become easy and cheap. Amount as expenses remains within limit. Therefore, more revenue generation is ensured.

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