Microcontroller Based Fish Catching Machine

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Abstract: The manual fishing method is time consuming and may result in over fishing, which involves human interference and may result in loss of life during heavy tides. Identifying location of availability of fishes in particular area is also a difficult task. Hence scope for automated fishing has got great importance. The present work involves design of microprocessor based fishing machine which doesn't have direct human involvement in fishing. 5V 4-channel relay interface board used in the current work. The fishing machine directions are controlled by using 4-Channel relay which has standard interface that can be controlled directly by microcontroller.

I.INTRODUCTION

Human involvement in fishing has found difficult now a days because of unexpected environmental changes. Lack of implementation and Lack of transparency in regulations to catch fish in international borders has resulted deficiency in demand and supply. Hence in order to overcome above mentioned problems, need for automated fishing has got great potential.

Human population is increasing at the rate of about 7.5 million per year and the major population increase occurs in the under-developed world, an area that holds about 75% of the world population. With the present rate of increase in the world population is likely to double by the year 2020. In India, the current demand for fish food is estimated at a little over 1,000,000 tons per annum as against a supply of about 800,000 tons per annum. This is because the rapid increase in world population has resulted in a huge increase in demand for animal protein and other nutritional requirements. To compensate for this deficit, we are designing equipment having modern technology.**S.C. Duru [1],** has worked on new Optimal Fishing Vessels Design Approach for Power – Speed Prediction and shown that, Numerous regression formula centered on computation of main power and speed are derived from 197 modern existing fishing vessels of length up to 150m and presented here under. Optimal methods for the application of this formula are exemplified using a projected fishing vessel of 100 tonnes dead weight. A power prediction criterion is formulated and used to select the best set out of the three projected main dimensions of this projected vessel, basing on optimum power and speed computation. These formulas can be used for more advanced mathematical, computerized optimization procedure.**Mohamad Zawahid bin Shamsuddin [2]** has worked on a design of a fibre reinforced plastic fishing boat "A conceptual design of a fibre reinforced plastic fishing boat for traditional fisheries". And it also includes a boat design, construction cost, source of finance, suitability and acceptance, suitability and acceptance. The study was carried out through various methods such as observation and discussion on construction practices with FRP boat builders and Reference to literature on the subject such as naval architecture, boat design, FRP boatbuilding industry etc. was also made as an additional input to the study. There are two main components of FRP materials used in the construction of fishing boats; glass reinforcement in the form of chopped strand mat (CSM) or woven roving (WR) and resins The boat is designed to operate traditional fishing gears such as gill nets, portable traps and hook and line. The use of machines such as an automatic hand jigger and a long liner will be recommended.**M.R. Boopendranath [3],** has worked on Basic Principles of Fishing Gear Design. Fishing gears vary greatly in their structure, materials used and principles of capture process and methods of operation. Fishermen may use several fishing gears and methods appropriate for the species and environmental and ground conditions. Several systems of classification of fishing gears have been developed based on the principles of capture, design and technical features and operational methods. Fishing gears whether primitive or sophisticated use five mechanisms in the capture process viz., gilling and tangling. Classification of fishing gear Fishing gears are either passive like gill nets and entangling nets, hook and line and traps or active like trawls, seines and troll line. Active fishing systems are generally energy intensive and more productive than passive gears. Based on the degree of selectivity, the fishing gears are more selective like gill nets, hook and line and traps or less selective like trawls, seines and entangling nets. Depending on the sector in which they are used, there are small-scale or partisan fishing.

Mohamed K El-Nemr[4],has worked on Fish farm management and micro-controller based aeration control system. Production in capture fisheries is stagnate and aquaculture output is expanding faster than any other animal-based food sector worldwide (FAO, 2006). This sector alone contributes nearly a third of the world's supply of fish products (Mallya, 2007). There is a need for utilities to help the fish farmers especially callow ones to manage and plan their farms and equipments they use. Farmers, planners, and managers will go through a decision-making process for all items related to fish farming activity. The decision-making process typically requires some expertise on the part of the planner, manager or extension agent. Operational research (OR) is the use of the applications of advanced analytical methods to help the managers to take better and quicker decisions. It increases the number of alternatives, helps the managers to evaluate the risk and results of all the alternative decisions.

Summary of literature

From the above papers it is observed that the conventional fishing method involves lot of potential drawbacks which includes overfishing, environmental issues and hence the scope for automated or remote controlled fishing has got great scope. In the present work a fishing machine will be designed and fabricated which as a support of closed loop Arduino enabled microcontroller, Bluetooth controlled drive system and servo mechanism to trap fishes.

Present work therefore, aims at highlighting the various techniques employed in catching fishes and the implication of these techniques for sustainable fishing environment.

II. Materials and Experimental Methods:

2.1 Selection of shape of floating body

A hexagonal outer body of each side 21 cm made up of acrylic material is used in the current work.

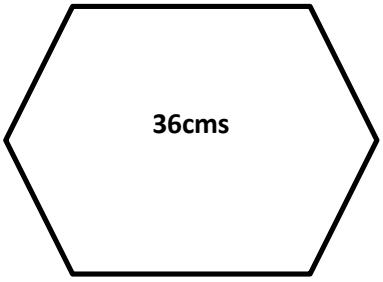

Figure 1Hexagonal basement of the System

2.2 Buoyancy force of a floating body

Mass of outer body: 0.15 kg

Density of fluid (Water): 1000Kg/m^3

Length of each side of hexagon (a): 21cm=0.21m

Acceleration due to gravity: 9.81 m/S^2

Height of floating body: 5cm=0.05m

Area of Hexagon: $A = \frac{3\sqrt{3}}{2}a^2$=0.11 m^2

Volume of the Floating body: 5.73x$10^{-3}$$m^3$

Buoyancy= Weight of the object= mass*volume* Acceleration due to gravity

=6.1 x (5.73x10^{-3}) *9.81

=0.342 N

2.3 Dc Motor Power

In the present design, the model may weigh 4.1 kg and load may be around 2kg.
Brushless DC motor is chosen in the current design.

Hence to propel a system, a motor of capacity of 96 watts available in the market is considered.

$$P_{Input} = \frac{P_{Design}}{\eta_{Motor}}$$

$\eta_{Motor} = 90\%$

P_{Input}=106.67 Watts

Speed=60rpm

Angular velocity $\omega = \frac{2\pi N}{60}$

ω=6.284 radian/sec

$$Torque, T = \frac{P}{\omega}$$

$$T = 16.97\ N - m$$

In this design two motors are used to propel the machine in all four directions.

2.4 Microcontroller system design

Closed loop Arduino microcontroller system is used in the model design to control the direction.

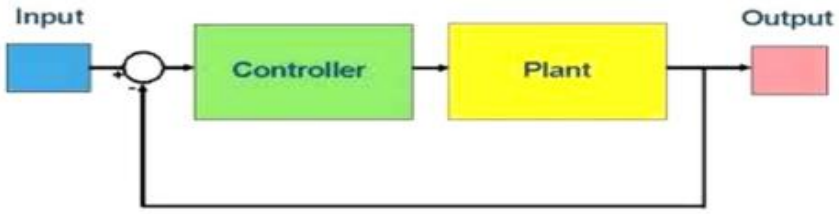

Fig 2 General Block Diagram of closed-loop system

2.5 Closed-loop characteristics

i. Shows a closed-loop action (closed control loop);

ii. An counteract against disturbances (negative feedback);

iii. Can become unstable, i.e. the controlled variable does not fade away, but grows to an infinite value.

Table 1Arduino Technical specifications

Microcontroller	ATmega328P
Operating Voltage	5V
InputVoltage (recommended)	7-12V
Input Voltage (limit)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
PWM Digital I/O Pins	6
Analog Input Pins	6
DC Current per I/O Pin	20 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32KB(ATmega328P) of which 0.5 KB used by bootloader
SRAM	2 KB (ATmega328P)
EEPROM	1 KB (ATmega328P)
Clock Speed	16 MHz
LED_BUILTIN	13
Length	68.6 mm
Width	53.4 mm
Weight	25 g

Radial Blade Propellers

Radial blade fans commonly feature the strongest structural design in the field. They are made to be durable, resilient, and powerful enough to propel in water. In addition to being powerful, radial blade fans also are very easy to maintain. For facilities concerned about high ongoing maintenance costs – particularly with some more advanced configurations – radial blades can save money over the long run thanks to how easy it is to keep them operational.

The main part of the reason we are using radial blades because they are easy to maintain and have the self-cleaning characteristics most radial blade propeller designs possess. Self-cleaning mechanisms are invaluable because they reduce labour costs and help increase operational longevity. Finally, this particular configuration is more affordable, at least initially. Radial blade propeller configurations often incur lower initial capital costs.

Drawbacks of Radial Blade Propellers:

Radial blade propellers aren't without their drawbacks, however;

- The main drawback most facilities see in the field is inefficiency of the blades.
- Radial blades tend to have lower efficiency rates when compared to other designs.

Wi-Fi Camera

Advantages of Wi-Fi Cameras

- Wi-Fi cameras are easy to set up and can sit on a tabletop as long as you have access to power nearby.
- Wi-Fi cameras can be more affordable because they don't require professional installation.
- Footage from your camera is often backed up to the cloud so you can remotely view your cameras
- Cameras can literally be picked up and moved, as long as there is a power point nearby; Wi-Fi means they don't need cables to transmit the data.

Disadvantages of Wi-Fi Cameras

- Wi-Fi cameras can put a strain on your internet and can be subject to dropouts, especially outdoor cameras where structures such as buildings and trees can impede the signal.
- Wi-Fi cameras require power access close by so this can limit your placement options, especially if you want to monitor outside.
- Video is limited with Wi-Fi cameras because of the cost to upload video to the cloud.
- Wi-Fi cameras are often vulnerable to theft because they are not professionally installed.

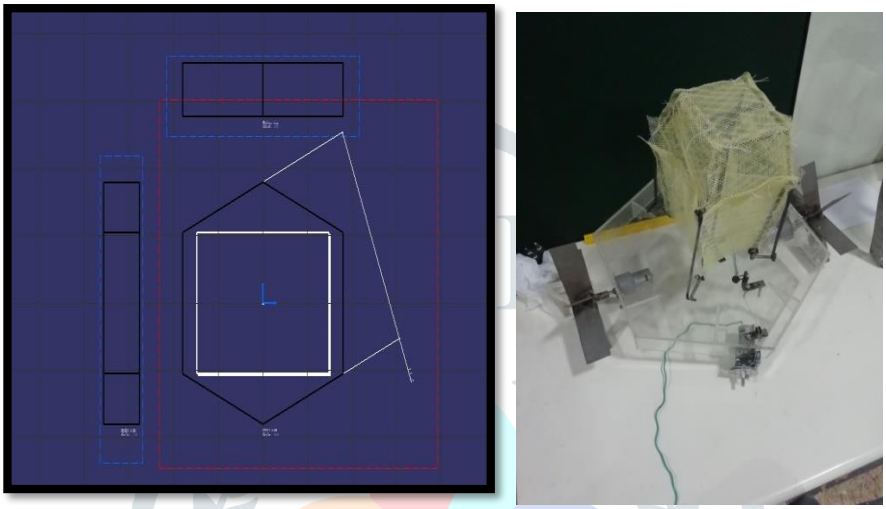

Figure 3 Model design sequence

III Specifications of the designed system

Table 3 Specifications

Total Mass of system	4.1 kg
Load the system can carry	2 kg
Buoyancy	0.342 N
Propeller type	Radial
Number of propellers	2
Capacity of motor	106.67 watts
Torque	16.97 N-m
Number of motors	3
Microcontroller	Bluetooth based Arduino
Relay type	5V 4 channel relay
Camera type	WIFI camera
Fish trapping system	Servo mechanism

IV Conclusion

In the present work a new technologies to improve fishing by using microcontroller which doesn't have human interference is designed. A Bluetooth enabled Arduino microcontroller is used to control and give the movement of the system in all the directions and a WIFI enabled action camera is used to transfer the visual data and servo mechanism is used to trap the fishes.

References

1. S.C. Duru,"New Optimal Fishing Vessels Design Approach for Power – Speed Prediction", Journal of maritime research, Vol XIII. No. III (2016) pp 47–60.

2. Mohamad Zawahid bin Shamsuddin has worked on a design of a fiber reinforced plastic fishing boat"A conceptual design of a fiber reinforced plastic fishing boat for traditional fisheries"

3. M.R. Boopendranath has worked on "Basic Principles of Fishing Gear Design.Fishing gears"vary greatly in their structure, materials used and principles of capture process and methods of operation.

4. Mohamed K El-Nemr, has worked on "Fish farm management and micro-controller based aeration control system".