

# Arduino Based Auto Control Systems to Prevent Ship Overloaded

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## 1. Introduction

In water transportation people often focus on profit more and not so much care about safety guidelines. This problem will lead to some accident from minor to serious accident cause to death. This research is inspired by an accident occur few months ago where two boats in Lake Toba sunk because of overloaded passengers and motorbike. Based on Liputan6's news, there are about 200 passengers who died because of sinking boat. The capacity of passenger stated on ship certificate is not more than 50 people. The navies and helmsman didn't take these safety guidelines as an important thing to manage because the thought of that they would gain profit if they let more passengers in into the boat and save time. The total passengers were far greater than the limits and same goes to the passenger belonging such as motorbike were many and cause the overloaded. So, we made a simulation that is used to detect and count the number of passengers on board with WebCam using OpenCV and Python programming, whether the people inside has reached the limit that provide by ship certificate and block the machine from being operate using Arduino to control ship machine. In this system we used ultrasonic sensor as well to count the height of the water from water-line to the Plimsoll mark. The Plimsoll mark height is set in the Arduino to being calculate by utilizing 6 ultrasonic sensors placed on every draft of the ship to determine the deadweight tonnage of the ship. We than calculate the displacement by adding the deadweight tonnage amount and lightweight tonnage amount. This can determine the amount of water reached the limit. This method is used to count the weight of the ship by utilize Archimedes principles. By implement this system we hope could help government in monitoring and preventing ship from overload that may cause some death.

## 2. Research Method

The use of plimsoll mark on the ship is to determine the deadweight of the ship. If the water go above the plimsoll mark it means, the ship is overloaded. We use the ultrasonic sensor to detect the height of the water. We attached 3 ultrasonic sensor to each side of the ship. Then we use Arduino IDE to code the height of the water. Next method is the object detection by using OpenCV. Here, we trained our own system, which detects the lego. Whenever the lego passed the blue boundaries set in the program, then the number will be added 1 into the LCD. We used Python 3.7 as our programming language to program the system.

The next step is weight detection. We utilized load cell as the weighing scale. This is used to determine the maximum weight of a boat. So whenever the weight inside the boat has reached its maximum weight set, the output will execute. We can know the maximum weight from the document of the ship. We also made an application for the owner of the boat to set the maximum weight of the ship.

This is the circuit arrangement:



Fig.2.1. Circuit Model

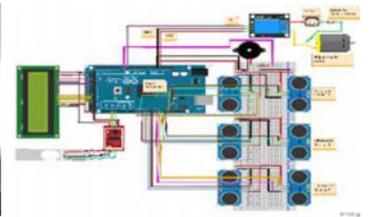


Fig.2.2. Schematic

## 3. Result and Analysis

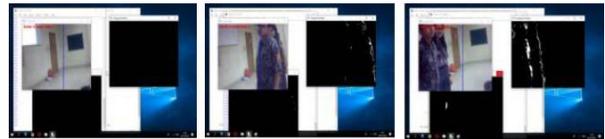


Fig.3.1.1. Before Entering Fig.3.1.2. After Entering Fig.3.1.3. Exit Detection

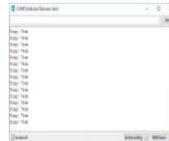


Fig.3.2.1. Not Overloaded



Fig.3.2.2. Overloaded



Fig.3.3.1. Setting Max. Weight Fig.3.3.2. Before Overloaded Fig.3.3.3. After Overloaded

The camera is working to count people based on set boundaries within coverage area of the camera and the data can be send to the system to activate or deactivate the relay to block the ship propeller. The ultrasonic sensor can be used to check water level to prevent the overload. The weight detection is used to detect the maximum weight of the boat and things inside. In this case, we used load cell to determine the weight then will be displayed in the LCD screen.

#### **4. Conclusions**

1. We used ultrasonic sensor to know the distance between the water and the ultrasonic sensor that later will determine weather the ship is overloaded or no.
2. We've trained miniature of legos so we got the perspective how to train an object beside legos.
3. We've made an application that is used to let the owner of the ship set the maximum weight based on the document of the ship or maybe they could calculate the maximum weight by themselves. So we used load cell to determine the maximum weight, weather the load cell reached the amount of weight set, the output will be executed.

#### **5. References**

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- [2] Soumyajit Dasgupta ,2016 The Use of plimsoll mark
- [3] Gary Bradski and Adrian Kaehler. 2008. Learning OpenCV
- [4] P.Viola and M.Jones,"Rapid Object Detection using a Boosted Cascade of Simple Features",conf. on comp. vision and pattern recognition 2001.