LASER based Man Overboard Detection System

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Abstract: The world is full of endless possibilities and these possibilities multiply when you are onboard ship. One such possibility is "man-overboard." The tragic event of Man-Overboard is one of the major causes of harm to life when one is at sea. Man overboard is not harmful because one falls from a height of about 8-10m into a sea of enormous depth filled with creatures unknown, the man overboard is considered to be harmful because if one falls into the sea unnoticed, there is almost no chance of his survival. The above mentioned situation is what is usually found in cruise ship. Many cases have been found where the person died because the notice of him not being onboard the vessel came after a considerable amount of time, and this time which is now lost, could have been used to rescue him. Hence the person who meets with such accident usually dies.

To combat with such a dangerous situation we have proposed a simple system that can be installed and run onboard any ship with minimum maintenance and cost. Safety comes first and to increase safety such a system is the need of the hour.

The mentioned system comprises of a LASER (Light Amplification by Simulated Emission of Radiation) module and LDR (Light Dependent Resistor) detector. The LASER beam when falls upon the LDR, varies the resistance of the LDR accordingly, when the LASER beam is unable to reach the LDR the resistance changes, changing the value of potential drop, thus turning on a transistor which in turn turns on the alarm system, and hence it comes to the notification of everyone that there is a man overboard emergency. The basic principle on which this would work is that when a man falls overboard, by falling down, he would be breaking the LASER-LDR circuit by blocking the path of LASER beam.

Installation of such a system will just require projections at some intervals to be constructed, and a simple electronic circuit which is capable of functioning as above. This can be achieved at very low cost. By this installation an event "man-overboard" that is considered extremely tragic can be brought to notice making the rescue of the person overboard easy.

1 INTRODUCTION

The aim of this paper as explained in the abstract is to make a system that facilitates the detection of "man-overboard". Man overboard is a situation that is commonly encountered on cruise ships. Many passengers who are not familiar with the unsafe conditions which may occur at sea (Rolling or Pitching) tend to fall overboard. This fact is discovered after considerable time being lost and hence, their recovery becomes difficult and usually the life of the person is lost.

The main problem is that the person who is falling overboard is not getting detected. If the detection of the event of man overboard is done as soon as the mishap occurs, the chances of survival are much higher.

2 MAIN WORK:

2.1 LDR Circuit

The solution to this problem lies in a simple LASER-module, LDR (Light Dependent Resistors) circuit.

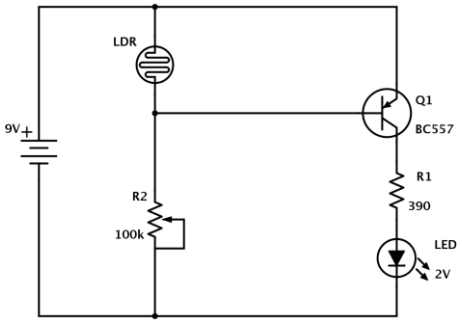


Figure 1. Basic LDR circuit to be used [1]

The circuit as shown in the figure above is a normal LDR circuit. The basic principle behind which this whole installation is based on is that, the resistance of an LDR falls with an increase in light intensity which can be used to control the current in a circuit and hence to trigger an alarm. The diagram shown below shows the relation between resistance and light intensity for an LDR which is the base on which the LDR will be functioning.

2.2 The LASER-LDR System

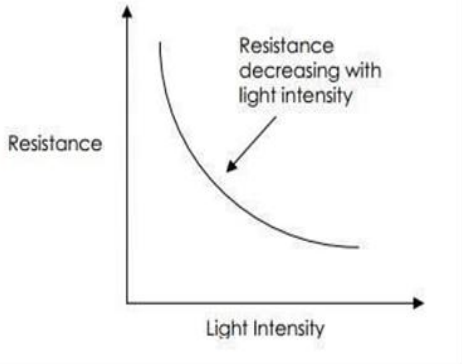


Figure 2. LASER-LDR System

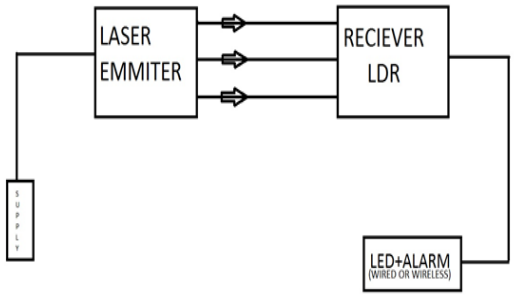
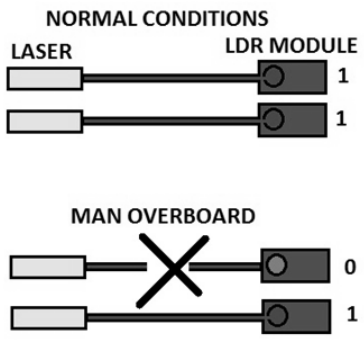
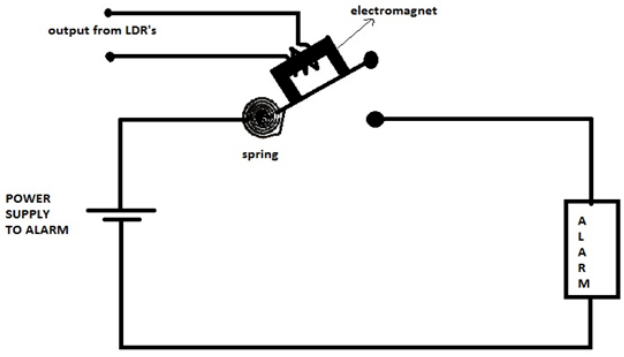


Figure 3. How the module shall react to Man-Overboard





The above two diagrams show how the system shall work and how the module shall react to a man overboard case.

LASER module will emit LASER beams of very high intensity, with the intensity being such that the sun's light in the day, and its absence in the night wouldn't lead to a considerable variation of resistance and hence voltage.

When the emitted LASER beams are able to reach the LDR without much hindrance, the resistance of the LDR would be low, and accordingly the current would not flow through the LED/Buzzer/Alarm. But when a person falls, he would block the path of the LASER beams momentarily. As the LASER beams would not be able to reach the LDR, the resistance of the LDR will vary considerably and hence the potential across the LDR would vary leading to the turning on of the LED or Buzzer or alarm that has been installed.

The alarm shall be installed at the bridge, since one officer is always present on the bridge. This officer would take the required action.

2.3 The Alarm System

For continuous ringing of alarm, we can provide a soft iron piece with a spring attached to it at its' hinged end in between the path of the current reaching the alarm. An electromagnet connected to the LDR circuit can be used on the other end of the iron piece to keep hold of it. [3] When the LDR circuit breaks the current in it will fall considerably and lead to lesser magnetic flux. So the spring force will become greater than the magnetic force and the iron piece will rotate making the circuit of the alarm system complete and the alarm will keep ringing until its initial position is restored mechanically

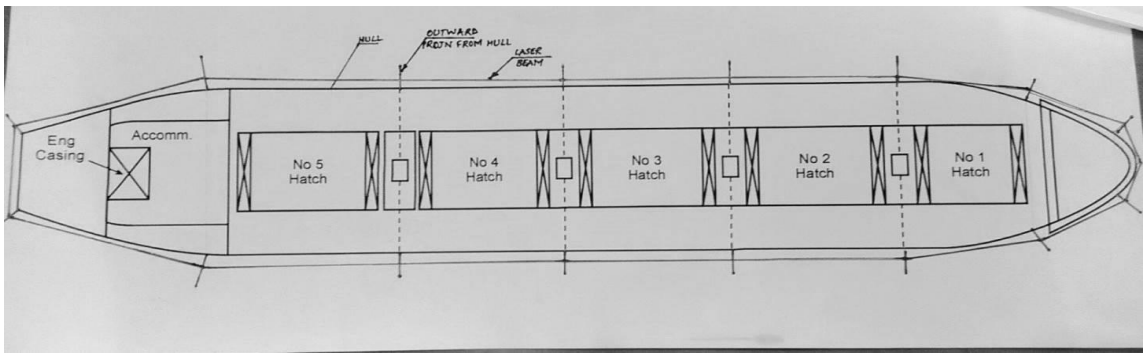


Figure 4. Alarm System

2.4 Installation onboard a ship

Referring to the diagram shown above, we will have a certain number of projection extending outwards from the hull. At one side of the projection would be a LASER module, and on the other side will be the connection of the LDR module, both of them being completely independent to each other. The independency of the LDR-LASER installation will help us in detecting the approximate location from where one has fallen which will facilitate the rescue of the fallen individual. A panel containing a number of LED's representing different space of the ship will be provided on the bridge.

Each combination of LDR and LASER will have a specified LED allotted on the panel which will facilitate for the feature mentioned above.

3. CONCLUSION

The above mentioned safety system installation is a simple application of LASER which will benefit the passengers and crew of ships as it provides a way to detect man overboard immediately and necessary actions can be taken within time to save a life. It may prove to be a major safety system on cruise ships and ferries where most of the people on the ship are unfamiliar to sea.

4. REFERENCES

[1] www.build-electrnoc-circuits.com/ldr-circuir-diagram/
[2] www.kitronik.co.uk/blog/how-an-ldr-light-dependent-resistor-works/
[3] Based on the concept from : Page 460, Electrical Machinery, Dr. P.S.Bimbhra, Khanna Publishers