BOAT OVERLOADING INDICATOR

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Abstract- Overloading of the boat with persons and luggage can cause lot of risks to on-board passengers. One of the solution for overloading issue is simply limiting the weight but, due to lack of knowledge some helms allow heavy weights. To overcome this problem, a boat over loading indicator is developed using load cell which limits the weight of persons and their luggage. If the maximum weight exceeds the load capacity of the boat, an alarm will be triggered. The engine of boat will be turned off and informed to the police department through a message. Then the necessary action will be taken on concerned helm.

Index Line—Load Cell, HX711 Amplifier, Arduino, GSM and GPS

1. INTRODUCTION

Overload passenger in public transport is a serious problem in many countries across the world, because it incurs huge costs in terms of life, property. Many countries have established a system to reinforce overload limit regulation (rule) and some are attempting to address the issue and implement strict controlling mechanisms. The struggle for the problem since the last decades particularly after the introduction of tourism events are required to pay more attention. And yet these are playing major roles in the transportation satisfying the transport demand generated by the growing economy and ever increasing population both in developed and developing countries.

The problem of overloading is generally under control in many developed countries while it is still a challenge too many developing and under developed nations. Now a day, with the increasing number of people in cities, the problem of poor transportation services has grown to an alarming extent. Due to less availability of transportation in riverside areas, the boats are overloaded for most of the times, which often results in some kinds of fault occurrence in boats and people's life will be in danger. The GSM and GPS based monitoring and controlling passenger system is a system by calculating the weight of persons that makes Load cell measures the no of passengers are required to travel in a boat. GSM is used as communication link between Officials and travellers. GPS is used to identify the location where the no of passengers are more than the weight capacity of a boat and sends this location to the officials through GSM.

Load cell module after receiving weights data displays it on LCD installed at each boat so that the driver can see the weights and allow measurable passengers to the boat. GSM based overload monitoring system will provide effective real time vehicle monitoring, mapping and reporting this information value and adds by improving the level of service provided. This system uses ARDUINO Uno microcontroller. The inbuilt (ADC) receives analog data from sensors and converts it to digital format and gives it to the arduino uno microcontroller. This system is interfaced with a GSM modem. This system senses the conditions continuously and a message is sent to police station.

The GSM modem is connected to arduino uno using USB interface. Whenever a short message service (SMS) is sent to the GSM modem, the GSM modem receives the data and sends to the arduino board. After receiving the signal from the arduino it processes the data and sends the read data to GSM modem.

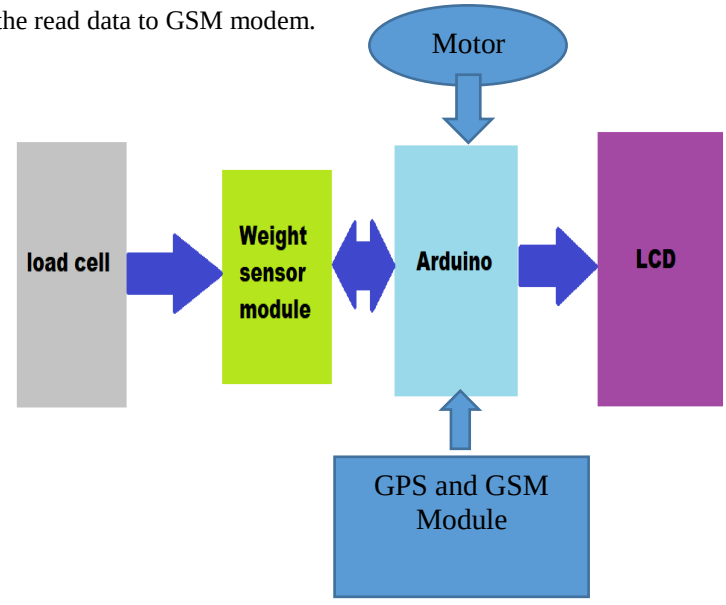

Fig.1: Block Diagram

2. DESIGN COMPONENTS

a) Load cell:

Load cell is a transducer device which converts one form of energy into another form it converts force or pressure into electrical output. Magnitude of this electrical output is directly proportion to the force being applied. Load cells have strain gauge, which reads data when pressure is applied on it. And then strain gauge generates electrical signal on compression as its effective resistance changes on placing a load. A load cell usually consists of four strain gauges in a Wheatstone bridge configuration. Load cell comes in various ranges are1kg, 3kg 5kg, 10kg, 100kg and more depending upon our requirement.

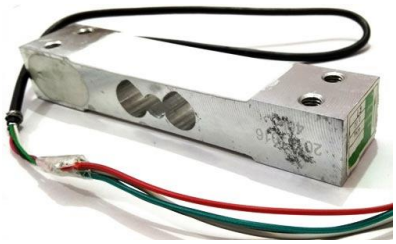

Fig.2: Load Cell

The generated electrical signals by Load cell is in few millivolts, so they need to be amplified by some amplifier and hence HX711 Weighing Sensor comes into picture. HX711 Weighing Sensor Module has HX711 chip, which is a 24 high precision A/D converter (Analog to digital converter). HX711 has two analog input channels. So HX711 module amplifies the low electric output of Load cells and amplifies it & converts into digital format and this signal is fed into the Arduino to derive the weight.

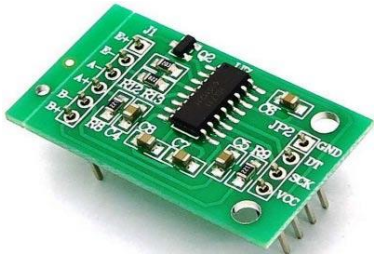

Fig.3:HX711 Amplifier

b) GPS and GSM:

A GPS tracker uses either the Global Positioning System satellites or the Global System for Mobile Communications to determine precise location on the surface of the earth.

Fig.4: GPS Antenna

Both GPS tracking and GSM tracking are operated by a receiver collecting data from at least 4 satellites in order to determine precise position. GPS GSM tracker devices accomplish this task by referencing information from the cellular tower that is closest to the GSM / GPS tracking device. Between the two technologies, GPS systems are capable of much more precise location measurements, within a meter, whereas with GSM tracking technology, positioning can only be determined within 10 meters.

Fig.5: GSM 900A Module

c) Arduino UNO

The Arduino UNO is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is loaded with digital and analog input/output (I/O) pins so that they can be interfaced to any output device and other circuits. The board has 14 Digital (I/O) pins, 6 Analogue (I/O) pins, and programmable with the Arduino IDE (Integrated Development Environment) via a type B USB cable.

Fig.6: Arduino UNO

3. SOFTWARE IMPLEMENTATION

The Arduino integrated development environment (IDE) is a cross-platform application for Windows, macOS, Linux that is written in the programming language Java. It is used to write and upload programs to Arduino compatible boards. It consists of a serial monitor to observe the outputs serially in a monitor. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures.

4. HARDWARE IMPLEMENTATION

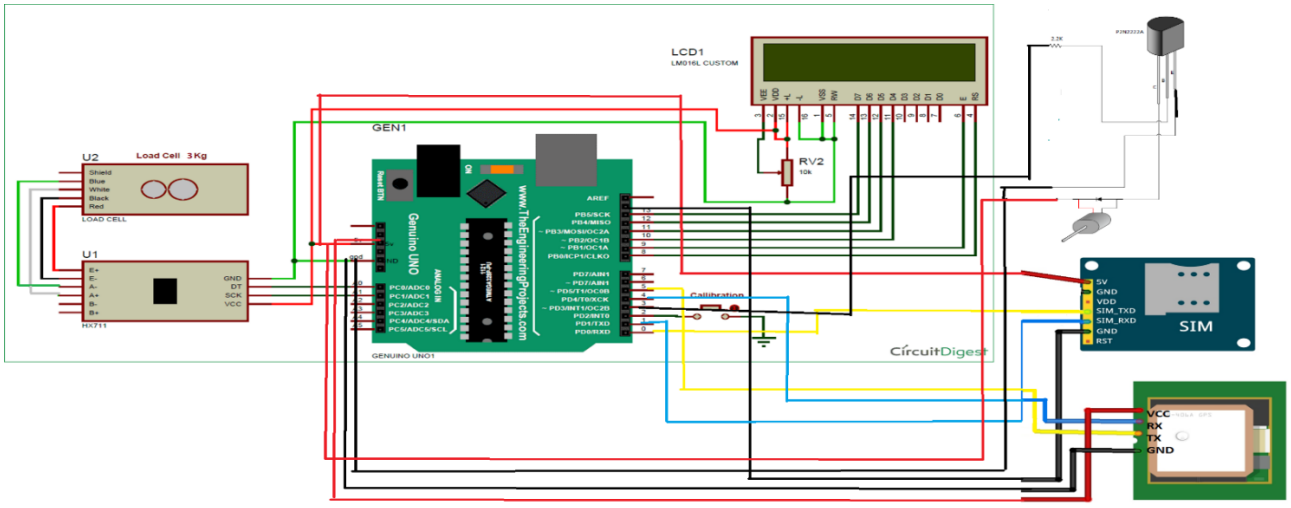

Fig.7: Total Interfacing of Overloading Boat Controller

When pressure is applied on the weight sensor it detects the pressure and displays the weight and if weight applied is more than prescribed weight than the gsm and gps activation the location of the incident will be sent through an sms to police department and the boat motor will be turned off.

5. DESIGN FLOW PROCESS

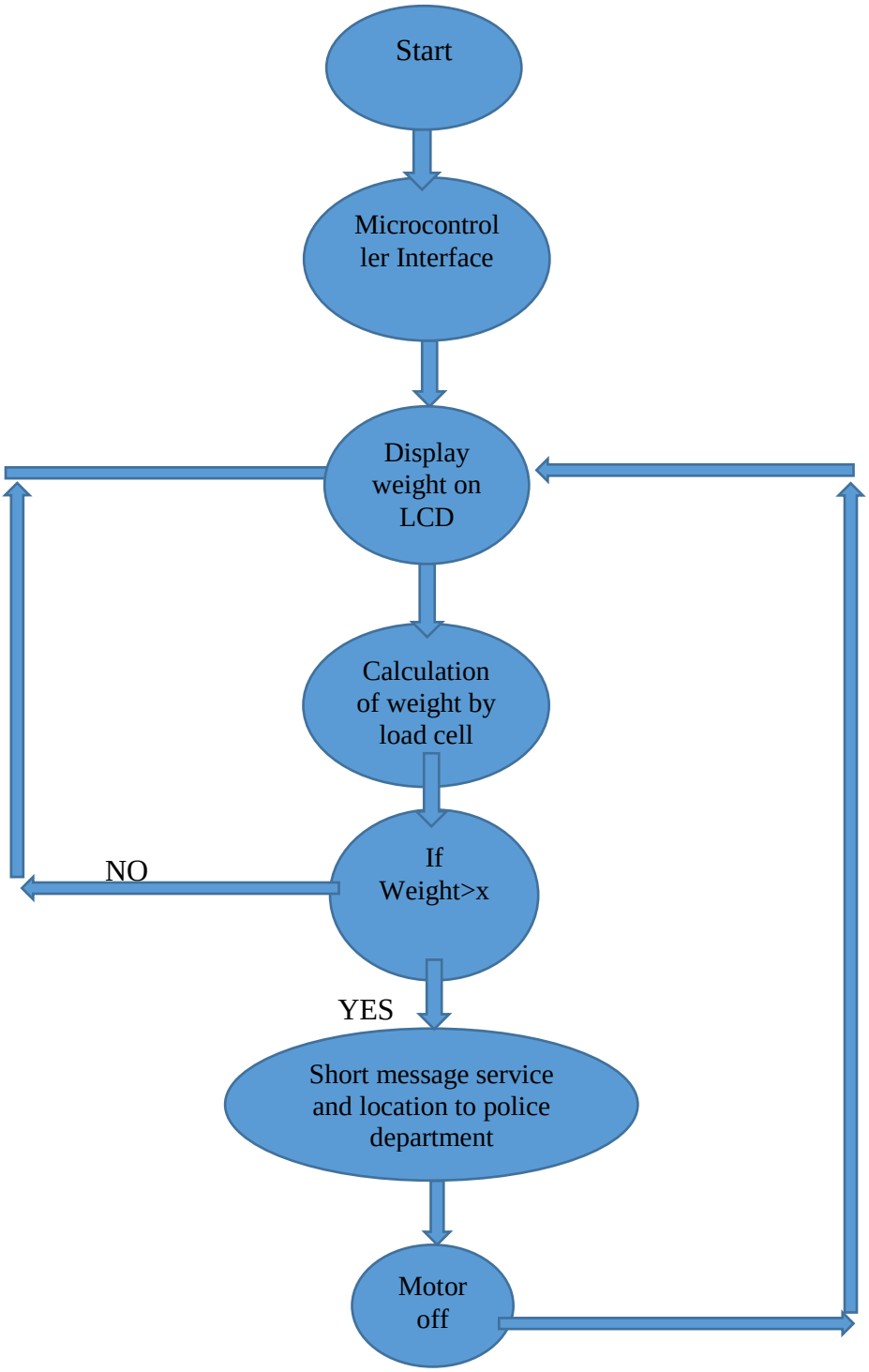

Fig.8: Design Flow

When the circuit is powered the code is uploaded to the arduino board the calibration to the circuit is needed by placing a 100g wait after arduino reads and calculates the weight after this process is completed any weight can be placed and if the weight placed is greater than x an sms and location will be sent to the officials. The motor which is controlled by the arduino will be turned off when the weight is greater than x.

6. RESULTS

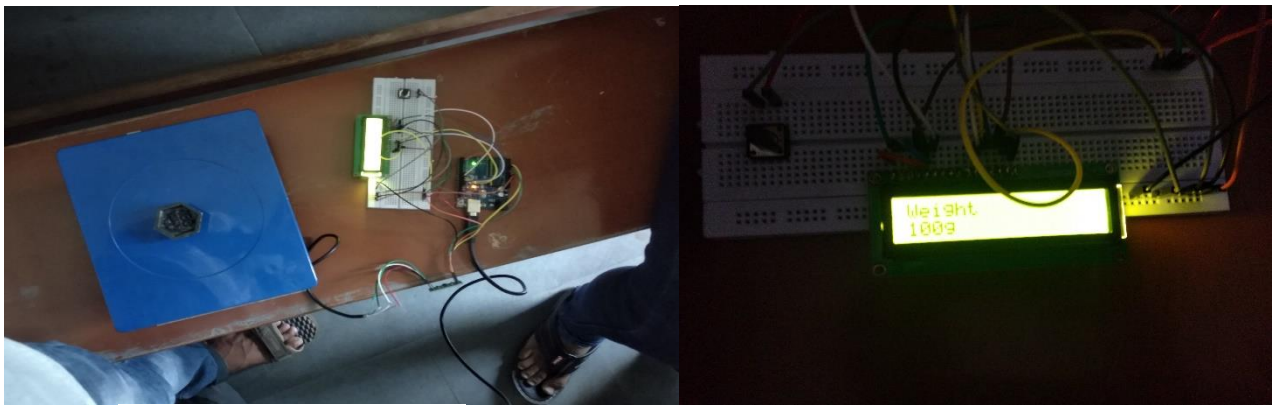

Fig.9: Load cell weight display

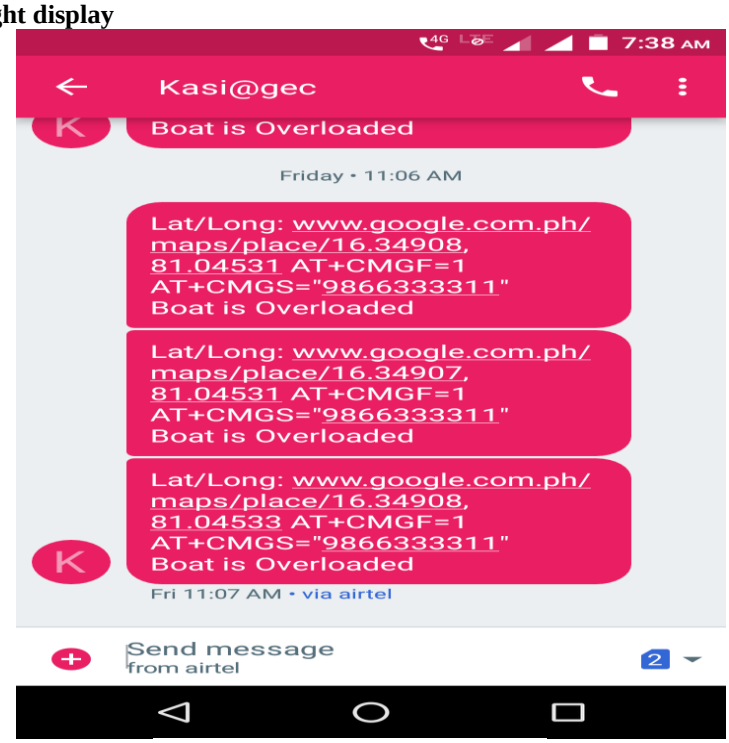

Fig.10: GPS Location through sms

As we have placed a weight of 100g the weight calculated by load cell shows display on lcd as 100g the software has been designed that if the weight is greater than 500 the message and location of the incident is sent to the mobile phone.

7. CONCLUSION

To avoid the problem of overloading in boat we are going to develop a circuit which limits the weight of persons and their luggage using weight sensor. If the maximum weight of persons exceeds the load capacity of the boat, an alarm will be triggered. The engine of boat will be turned off and informed to the police department through a message. Then the necessary action will be taken on concerned helm.

8. REFERENCES

[1]. https://ieeexplore.ieee.org/document/7803080.pdf
[2]. https://www.ijariit.com/manuscript/gps-based-real-time-vehicle-tracking-system-for-kids-safety-using-rfid-and gsm/.pdf
[3]. https://www.researchgate.net/publication/224108265_Load_cells_in_force_sensing_analysis _Theory_and_a_novel_application.pdf
[4]. https://circuitdigest.com/microcontroller-projects/arduino-weight-measurement-using-load-cell.pdf
[5]. http://www.electronicwings.com/arduino/gps-module-interfacing-with-arduino-uno,pdf
[6]. https://in.omega.com/prodinfo/loadcells.html
[7]. Understanding gps principals and applications, Elliot D. Kaplan, Artech House Mobile Communications
[8]. Wireless communications principles and practice 2nd edition, Theodore S. Rapport