International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 05 Issue: 06 | June - 2021 ISSN: 2582-3930

A REVIEW ON SAND MEASUREMENTS SYSTEM USING VOLMENTRIC MEASUREMENT- NON TRANSITION APPROACH

Amit Dodke[1] , Sagar Bulhare [2]Pranali Ukey[3],.Akansha Bhaisare[4] , Anamika Khobragade[5]

Assistant Professor Department of Electrical Engineering, Nagpur institute of technology, Nagpur
Students of Department of Electrical Engineering, Nagpur institute of technology, Nagpur
Students of Department of Electrical Engineering, Nagpur institute of technology, Nagpur
Students of Department of Electrical Engineering, Nagpur institute of technology, Nagpur
Students of Department of Electrical Engineering, Nagpur institute of technology, Nagpur

ABSTRACT-

In this paper presents the work related Volumetric Measurement of sand. The presentedwork consists of two main parts. The first part is related to the Sensor and hardware partcreation and the second part is associated with the software utility.For the first part of sensor and hardware part creation, use distance measuring sensorslike ultrasonic, LiDar etc. These sensors give distance of every point, gathering all theinformation and calibrate with expected dimensional parameter to plot 3d surface. Gettingexact dimensions of container in 3D plane, save this in log file Log file could be csv or exel For the second part, utility software will be developed using programming language like VB,python or java. This utility will receive data and plot the surface plane on plot. Plot could belike 3d histogram which will show the exact shape and dimensions of the object. Utility willstore the entry exit logs along with volume or relevant weight along with the vehicle number.Different experimentations will be carried out to calculate volumetric measurement of trucksand. On completion of research and development we are expecting the robust system for volumetric measurement of sand

KEYWORD-Sand measurement, Volumetric measurement, Ultrasonic sensor, Lidar

INTRODUCTION-

If ever seen sand castles at the beach, you know that the sand used to dump in dumper directly from the river. As it contains water weight of wet sand used to be measured over weighting Bridge. This method of measurement having some drawbacks because exact weight of sand is not calculated. At a time of dumping of sand into the truck most of the time the sand is wet due to this exact weight of sand is not calculate. After travelling few hours the weight of sand become less as water came out of truck due to this confusion occur between the seller and buyer. This is the complex issue where neither seller nor transporter is responsible for this imaginary loss. As we are finding some existing volumetric measurement system which are already use for measurement of sand volume in truck, but this are very complex and costly. So to overcome this problem we are proposed some automation solution based on volumetric measurement. With the help this method we can easily measure the sand volume and weight also the cost of this proposed system is low compare to traditional method.

LITERATURE REVIEW-

Volumetric measurement of any solid material inside the container is not performed yet as a project. There are commercial methods which are use for the measurement for volume of sand. These commercial methods are provided by Loads can industry from UK uses a Laser scanning technology. This load volume scanner system utilize laser scanning technology combined with proprietary LoadScan software to measure the exact volume of the material loaded in a truck or trailer bin. With this system we calculate actual volume, not a converted weight estimate whilst also recording a 3D color profile of every load. It means we don't pay for water content; we can eliminate customer and /or supplier disagreements over quantity, and we can easily track material movements.

RESEARCH OBJECTIVE

The primary objectives of this study can be summarized as follows:

1. To understand distance measurement sensor's working protocol, and select one for our requirement
2. To design and development volumetric measurement system.
3. To develop desktop utility software for the volumetric measurement.

DEFFERENT METHODS FOR SAND MEASURMENT

Under loading trucks can be extremely detrimental to the bottom line on any project if it slips by unnoticed. Sprint Sand and Clay, Houston's leading supplier of fill material, has improved its daily efficiency by up to 8% on large mass hauling jobs thanks to Load scan's load volume scanner (LVS).The load volume scanning system utilises laser scanning and RFID technologies combined with software that creates 3D model images of trucks to measure the exact volume of the material loaded in a truck or trailer bandwidth over 20 active mining locations and a network of over 200 dump trucks and trailers that provide quality sand, topsoil, fill dirt, select fill, mulch and other construction and landscape materials, Sprint Sand and Clay has the resources needed to supply projects of all sizes throughout all five counties surrounding Houston.Matt Strickland, vice president of Sprint Sand and Clay, explains how volume measurement plays a huge role in their operations as it gives them the information they need in real-time to ensure their operators adjust loading capacities to avoid Under loading.

Not only does the scanner increase efficiency it also enables Sprint Sand and Clay to ensure future bids are estimated accurately by forecasting using data gathered by the LVS. The Loads can system has the potential to increase transparency with clients to give both parties comfort in knowing the true cubic yard yield of each truck. Loads can can be used as an educational and quality control tool for internal operations to ensure loading practices are as consistent as possible.

PROPOSED METHODOLOGY

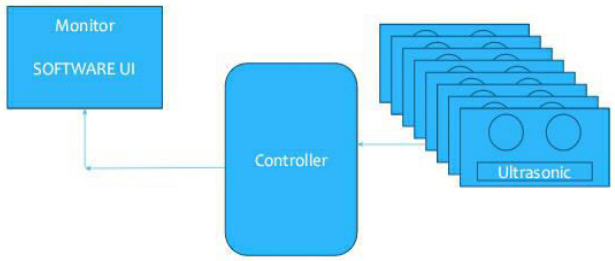

Figure 1: Basic Block Diagram of Proposed System

. This project divided into two parts in first part we select two different types of distance measurement sensors (Array of Ultrasonic Sensor, LIDAR Sensor) depend on the experiment which sensor provide the exact coordinate of the object. On the basic of R&D work, we select suitable sensor for the development process.

Second part there is completely software development part. For software development use c, java or other programming language. Depends on the requirement use suitable language for development purpose. After development of software we provide the css or exel file to the software so that it perform the desired task which are already programmed and provide the 3D view of Dumper or Truck so exact volume of sand in the dumber or Truck is calculated easily

ARRAY OF ULTRASONIC SENSOR

Ultrasonic sensor is basically use for distance measurement. With the help of this sensor get the exact point of contact of the object and on the basis of those points plot the graphical representation of the object. Cost of Ultrasonic sensor is very low as compare to other sensors. Also with the help of array of ultrasonic sensor easily plot the 3D representation of object.

.

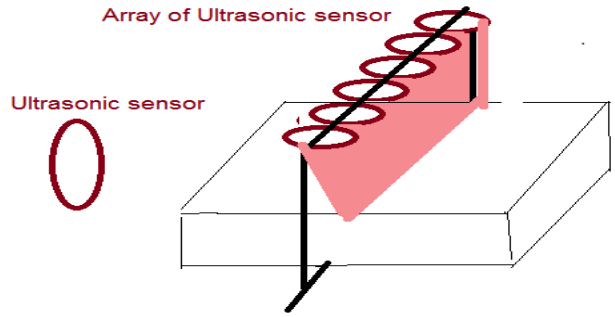

Figure 2: System Design

COMPONENTS DETAILS

Arduino Uno

* Arduino Uno is a microcontroller board based on the ATmega328P (datasheet).

* It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator (CSTCE16M0V53-R0), a USB connection, a power jack, an ICSP header and a reset button.

* It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

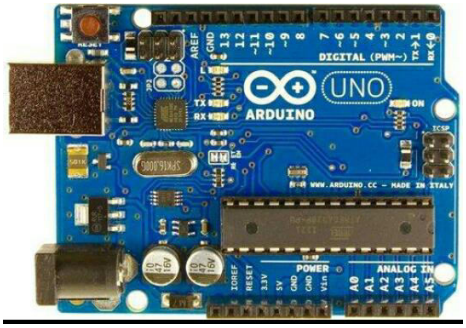

Figure3:Arduino Controller Board features

An Ultrasonic sensor is a device that can measure the distance to an object by using sound waves. It measures distance by sending out a sound wave at a specific frequency and listening for that sound wave to bounce

back. By recording the elapsed time between the sound wave being generated and the sound wave bouncing back, it is possible to calculate the distance between the sonar sensor and the object.

$$Distance = \frac{Speed\ of\ Sound * \text{Time Taken}}{2}$$

Since it is known that sound travels through air at about 344 m/s (1129 ft/s), you can take the time for the sound wave to return and multiply it by 344 meters (or 1129 feet) to find the total round-trip distance of the sound wave. Round-trip means that the sound wave travelled 2 times the distance to the object before it was detected by the sensor; it includes the 'trip' from the sonar sensor to the object AND the 'trip' from the object to the Ultrasonic sensor (after the sound wave bounced off the object). To find the distance to the object, simply divide the round-trip distance in half.

Figure3: Ultasonic sensor

The ultrasonic sensor has two pins: Trigger and Echo, which are used for calculating the distance of the object by generating sound waves and thus calculating the time duration of the echo that is generated.In our proposed project Array of ultrasonic sensor is used to calculate the level of Sand in dumper.

CONCLUSION

In this Paper mainly focus on R&D work for proper selection on Sensors which are required for the proposed work.The proposed approach is cost effective and easy to implement any place for the measurement of sand in the dumper.The 3D Image is shown depends on the perfect coordinates of the sensor.

REFERENCES

[1] Andersen, H.-E.; McGaughey, R.J.; Reutebuch, S.E. 2005. Estimating canopy fuel parameters using airborne LIDAR data. Remote Sensing of Environment.94: 44149.

[1] Andersen, H.-E.; Reutebuch, S.E.; McGaughey, R.J. 2006. A rigorous assessment of tree height measurements obtained using airborne LIDAR and conventional field methods. Canadian Journal of Remote Sensing. 32(5): 355.

[2] Baltsavias, E.P. 1999a. Airborne laser scanning: basic relations and formulas.ISPRS Journal of Photogrammetry and Remote Sensing. 54: 199-214.

[3] Baltsavias, E.P. 1999b. Airborne laser scanning: existing system and firms and other resources. ISPRS Journal of Photogrammetry and Remote Sensing. 54: 164-198.

[4] Clark, M.L.; Clark, D.B.; Roberts, D.A. 2004. Small-footprint LIDAR estimation of sub-canopy elevation and tree height in a tropical rain forest landscape.

[5] Remote Sensing of Environment. 91: 68-89. Gatziolis, D. 2007. LIDAR-derived site index in the the U.S. Pacific Northwest–challenges and opportunities. Espoo, Finland: International

Archives of Photogrammetry Remote Sensing and Spatial Information Sciences. 36 (Part 3/W52): 136-143.

[6] Gruen, A.; Akca, D. 2005. Least squares 3D surface and curve matching. ISPRS Journal of Photogrammetry and Remote Sensing. 59: 151-174.

[7] Hinsley, S.A.; Hill, R.A.; Bellamy, P.E.; Baltzer, H. 2006. The application of LIDAR in woodland bird ecology: climate, canopy structure and habitat quality Photogrammetric engineering and Remote Sensing. 72: 1399-1406.

[8] Lee, J.; Yu, K.; Kim, Y.; Habib, A. 2005. Segmentation and extraction of linear features for detecting discrepancies between LIDAR strips. IEEE International Geoscience and Remote Sensing Symposium. Los Alamitos, CA: Institute of Electrical and Electronic Engineers. 7: 4954-4957.

[9] Maas, H.-G. 2002. Methods for measuring height and planimetry discrepancies in airborne laserscanner data. Photogrammetric Engineering and Remote Sensing. 68(9): 933-940.

[10] Means, J.; Acker, S.; Fitt, B.; Renslow, M.; Emerson, L.; Hendrix, C.2000. Predicting forest stand characteristics with airborne scanning LIDAR.