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River-Bed Profiler System

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Abstract:-

The main objective of our system is to minimize weight and amount of material required, thus even reducing requirement of high specification motor,reduce cost,obtained data wirelessly transferred to the control room,generate graphical form of river surface, the current and old data can be accessed for further analysis.

Its a high measurement of river bed surface topography in model type rivers are useful in studies to analyse energy, momentum, bed surface elevation, for rivers, lakes, and reservoirs. This project concept is finding the depth of the river across a section of its stream by using ultrasonic sensor and then obtained data is saving the data in a data storing device , which then can be brought into an excel format file. The data then can be obtained is converted in a graphical format giving us a topographical map of the river bed. For this, a movable mechanical setup on rails will be equipped with sensors for depth measurement and motors for moving the setup across the river. An ultrasonic sensor gives us the depth from the position of sensor to the river bed. The values obtained from ultrasonic sensor can be used to calculate the actual depth of the river. Finally, the data collected thus will be used to generate a graphical representation of the collected data i.ea river-bed profile.

To satisfy the objectives we replace PLC by arduino controller so the we reduce processing time,use metal steel material to design hardware, for smooth motion feet the rod in bearings,use ultrasonic sensor to obtained surface profile, DC motor used to drive sensor assembly from star to end so the complete surface of river had been scaned.to plot 3D graph use MATLAB and finally obtained 3D image of river surface to control system through remote location we create graphical user interface(GUI)using MATLAB.

At the end of project, we have developed system able to detect depth of the river and obtained data will be sent to the control room at the remote location wirelessly.Using obtained data the system plot 3D image of river surface.

I. INTRODUCTION

A river-bed profiler is not a completely new concept. There are already existing versions of a river-bed profiler developed in concerned institutions, albeit and at central water power and research station(CWPRS) located at Khadakwasla, Pune with a few limitations, being earlier attempts is system should be highly portable, less complex, and total coast of system should be less and also in view of generating a satisfactorily good river-bed profiler.

Its modelling is such that, the existing system is based on PLC and to drive motors existing system required heavy driver modules so the modelling is such that replaced PLC by arduino controller it has fully low weight and processing time of controller will be in microsecond(us).To reduce weight of hardware we used metal steel material. there are two rails across both edges of the river and at center connecting rod over sensor arry assembly will be mounted, These center connecting rod rotated by DC motor . This sensor arry assembly moves along the river flow direction. Having produced x-direction motions as such, so the sensor can give reading with respect to river surface and the obtained reading are stored easily in an Excel sheet form, the values sorted in excel sheet is further used for future analysis. This reading is the further transferred wirelessly to control room pc with the help of Bluetooth which is used to generate a river-bed profiler, in a software tool MATLAB. To control system through remote location we create a GUI window through which DC motor, starting and stopping of scanning, 3D plotting is control.

II. LITERATURE SURVEY

This existing system is based on PLC technology. This system has more processing time and also the reading obtained is in numerical form.The hardware present in Existing system is include kit of PLC,motor drivers these is more heavy and also have complex wiring. Because of these components the existing system is bulky and less portable to carry toward the field. Its required human power to carry hardware so existing system has certain limitations.

According to our project requirement we done market survey there present variety of controllers,level detection sensors,motors,wireless data transfer modules.As we developed prototype system we think about selecting less costly,high accuracy,flexible to operate components. So that we chooseArduino Uno ATmega328, Ultrasonic Ranging Module HC-SR04,DC motor, Bluetooth module.

We try to overcome limitation of existing system in our projeect of river-bed profiler. Firstly, the bulky metallic rails all make up for a very heavy setup. Thus, more support, and motors with higher power and torque ratings are needed to be used. We making changes in this design, to minimize weight and amount of material / metal required, thus even reducing requirement of high specification motors, cumulatively saving a lot of expenditure. Also, the existing system has not, the

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features like water-land differentiation to avoid taking reading other than that below water surface, or like having a dynamically updated record of changing water level across the stream too, which we have planned to implemented in our project as added features, apart from some increase in speed, and resolution.

III. THE SETUP

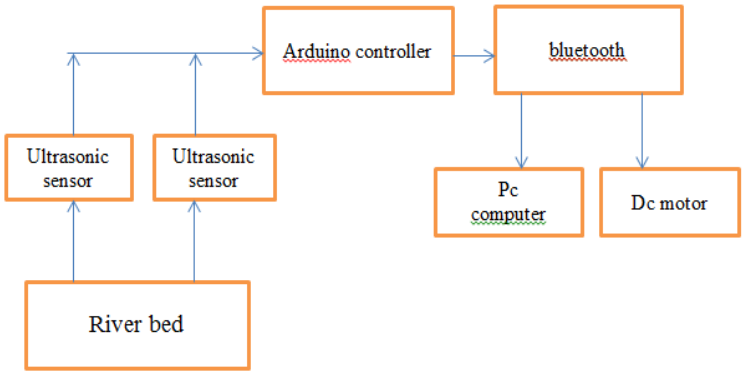

Fig 1:- block diagram of system

IV. INTERFACING OF ULTRASONIC SENSOR WITH ARDUINO :-

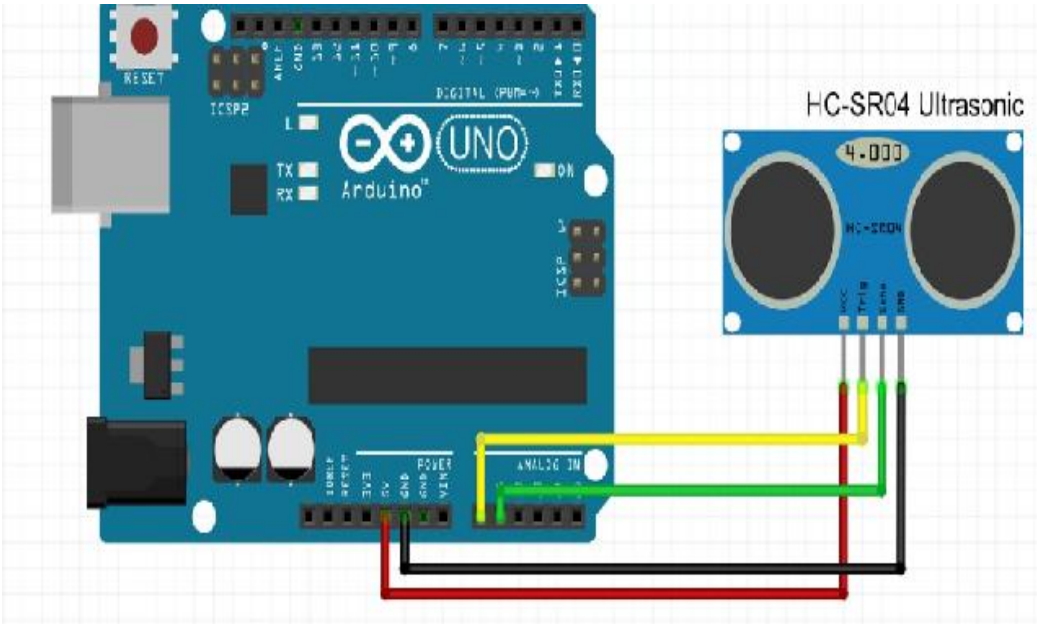

Fig 2:-interfacing

- To obtained bed profile the ultrasonic sensor is used.
- Sensor is interface with controller.the value from ultrasonic sensor is fed to controller.
- Sensor trigger pin must receive a pulse of high(5v) for 10us.
- Then sensor will transmit out 8 cycle of 40 kHz ultrasonic burst.
- Sensor wait for the reflected ultrasonic burst.
- When the sensor detected ultrasonic from receiver,it will set the Echo to high(5v)and delay.
- Delay period is a width which proportion to distance.
- To obtain the distance ,measure the width(Ton) of Echo pin.

V. DISTANCE CALCULATIONS

- Time = Width of Echo pulse, in us(micro second).
- Distance in centimeters =Time/58.
- Distance in inches = Time/148

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VI. HARDWARE DESIGN:-

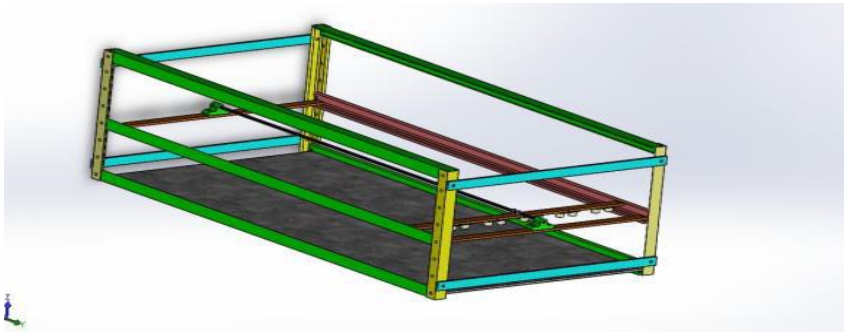

Fig 3:-prototype model of River bed Profiler

- **LENGTH:-**1.8m
- **WIDTH:-**0.75m
- **HEIGHT:-**0.35m

VII. GENERAL ALGORITHM:-

- Power up the device to start execution.
- Enable sensor and storage device.
- To start the working, move the profiler setup one step ahead on the rails by energizing the motor once.
- At each step, the DC motor drives the measurement module from one end to another, the ultrasonic sensor will start taking their respective reading and storing in the storage device.
- The distant value recorded by the sensor is used as the bed profile,for calculations of actual profile of bed.
- After the cycle is complete, the stepper motor is again moved one step ahead and the DC motor and the sensor are made ready for the next cycle.
- After repeating such cycles, all required amount of data is collected and then the storage device is retrieved for transfer of and conversion of the collected readings into a graphical representation, using a software tool.

VIII. APPLICATION

- Survey of River Topography.
- For deeper study and even education regarding river-bed profiler.
- Planning of building of structures across the river.
- Emergency Flow control and Diversion planning for rivers.

X. CONCLUSION

We have successfully conclude that we have overcome the existing system by developing Arduino controller based system and with this we satisfy the objective as we define And finally we get 3D image results as same as river bed.As a new modification we successfully added remote data aquisitionand offline results analysis.

XI. RESULTS

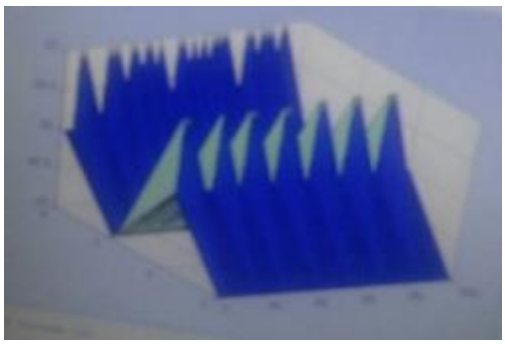

Fig 4:-Result of 3d image of surface

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XII. REFERENCES

1]B. Han and T. A. Endreny, River surface water topography mapping atsub-millimeter resolution and precision with close range photogrammetry:Laboratory scale application," IEEE Journal of Selected Topics in AppliedEarth Observations and Remote Sensing, vol. 7, no. 2, pp. 602 - 608, 2014.

2] M. Durand, E. Rodriguez, D. E. Alsdorf, and M. Trigg, Estimating river depth from remote sensing swath interferometry measurements of river height, slope, and width," IEEE Journal of selected topics in applied earth observations and remote sensing, vol. 3, no. 1, pp. 20 31, 2010.

3] S. Lane, K. Richards, and J. Chandler, Developments in monitoring and modelling small-scale river bed topography," Earth Surface Processes and Landforms, vol. 19, no. 4, pp. 349,368, 1994.

4] F. Engelund, Flow and bed topography in channel bends," Journal of the Hydraulics Division, vol. 100, no. Proc. Paper 10963, 1974.

5] S. Lane, R. Hardy, L. Elliott, and D. Ingham, High-resolution numerical modelling of three-dimensional flows over complex river bed topography," Hydrological Processes, vol. 16, no. 11, pp. 2261,2272, 2002.

6] A. Gessese, M. Sellier, E. Van Houten, and G. Smart, Reconstruction of river bed topography from free surface data using a direct numerical ap-proach in one-dimensional shallow water flow," Inverse Problems, vol. 27,no. 2, p. 025001, 2011.

7] N. Struiksma and A. Crosato, Analysis of a 2-D Bed Topography Model for Rivers. Wiley Online Library, 1989.

8] N. Struiksma, Prediction of 2-d bed topography in rivers," Journal of hydraulic Engineering, vol. 111, no. 8, pp. 1169{1182, 1985.

9] K. W. Olesen, Bed topography in shallow river bends. Delft University of technology, Faculty of civil engineering, 1987.

10] D. V. Brian Hahn, EssentialMatlab For Engineers And Scientists.

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