

Atmega-2560 Based Pothole Filler

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Abstract- Pothole repair in concrete pavements is one of the most commonly performed highway maintenance operations. Now a day’s problem of potholes of increasing day by day. Potholes are formed by rainwater flowing through cracks in old or weakened Roads. The water is soaked up by the mixture of rock, gravel, and sand that supports the road. Vehicles travelling over the road leads to cracks on road. There is a need to do the process of filling potholes automatically to reduce labour work. It basically consist of ATMEGA2560 (AVR) and white line sensor,IR proximity sensor,Buzzer,etc.

Keywords- Firebird V, pothole filler, arduino, atmega, servomotor, IR sensor.

I. INTRODUCTION

Due to the increase in world’s population, there is an increase in load on the infrastructure. Roads have been flooded with the vehicular traffic. Maintenance of road has become increasingly difficult. This is the prime motivation behind making a Pothole Detection and Maintenance. One of the increasing problems the roads are facing is worsened road conditions. Unexpected hurdles on road may cause more accidents. Also because of the bad road conditions, fuel consumption of the vehicle increases; causing wastage of precious fuel. Because of these reasons it is very important to maintain good condition of roads. This in turn can ease the Driving. But there are various challenges involved in this. First of all there are various methods to get the information about the road conditions. Lastly the details must be conveyed in a way which can be perceived and used by driver. We in this project try to design and build such a system. In this system the access point collects the information about the potholes in the vicinity.

II. LITERATURE SURVEY

The maximum fatalities were reported in Maharashtra. Roads in rural areas are mostly prone to potholes where construction quality is found to be poor as compared to urban areas and big cities [3].Observing the increase of the problem of potholes we decided to contribute our knowledge and efforts in the field of embedded systems to make a bot which will help us to maintain the roads regularly [1].Now making a bot who will be able to accomplish such a difficult task was very big challenge for us. The bot should be able to

interface with various hardware components along with that it should also be able to be controlled both manual and automatically which required programming. These conditions were satisfied by the bot named Firebird V which consisted arduino atmega2560 in it[2].

III. SYSTEM ARCHITECTURE AND DESIGN

We are using this bot for completion of our task. The bot has various parts already installed in it for example two motors, two wheels, various ICs, etc. Along with the FIRE BIRD V we are using arduino so reduce difficulty level to some extent. We are using arduino for interfacing IR distance sensor and servo motor. Main components of our project are as follows:

- A-FIRE BIRD V
- B-ARDUINO
- C-SERVO MOTOR
- D-IR DISTANCE SENSOR

A- FIREBIRD V

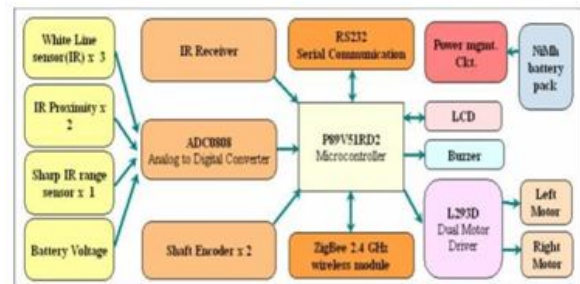


Fig 3.1: Block diagram of FIRE BIRD V

FIRE BIRD V consists of various microcontrollers like NXP P89V51RD2. It has three white line sensors, one infrared sensor, three IR proximity sensor, two position encoders and battery voltage sensing. It is the heart of our project as all of the mechanism is built of this bot. Servo motor will be interfaced on the bot itself.

B-ARDUINO

Arduino is a board which can be used for interfacing various things on it. That’s why we are using arduino for interfacing distance IR sensor on it. We are using arduino for

interfacing IR sensor because it becomes so easy to interface and program anything using arduino.

C-SERVO MOTOR

Servo motor is a mechanism which has a wing like structure which can rotate after constant time interval. We are using servo motor for material dropping purpose. Servo motor will be attached to some container which can hold a quantity of material in our case it is cement or water, and when the bot stops near to pothole the servo motor will rotate and will open the mouth of container and the material will be filled in the pothole.

D-DISTANCE IR SENSOR

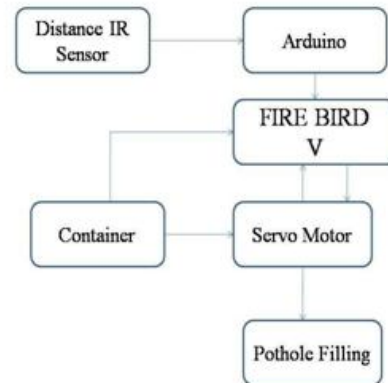
Distance IR sensor is a distance sensor which uses infrared radiation to measure the distance and detect the obstacle. We are using this principle to detect the pothole, and to measure the depth of pothole. By measuring depth of pothole we can come to know that how much material we can use to fill the pothole. It continuously measure the distance between itself and the obstacle. It can measure distance ranging from 10cm-80cm, which is good enough to measure the depth of any pothole.

IV. IMPLEMENTATION

The Bot will be operated on a Prototype Model. This prototype model will be of size (5x2) Feet. All the potholes will of a standardized size & it will take same time to fill all the holes. The distance travelled by the bot will be controlled by the timer.

A-FIRE BIRD V

It is considered as a heart of whole mechanism as it controls everything. Each and every part needed for our project is attached to FIRE BIRD V. Distance IR sensor which is connected to arduino is connected to firebird v. Servo motor is also connected to firebird v. FIRE BIRD V is used to give supply to arduino. Servo motor is handled by FIRE BIRD V as it handles its speed of rotation and timing of the motor. Container is assembled on it.

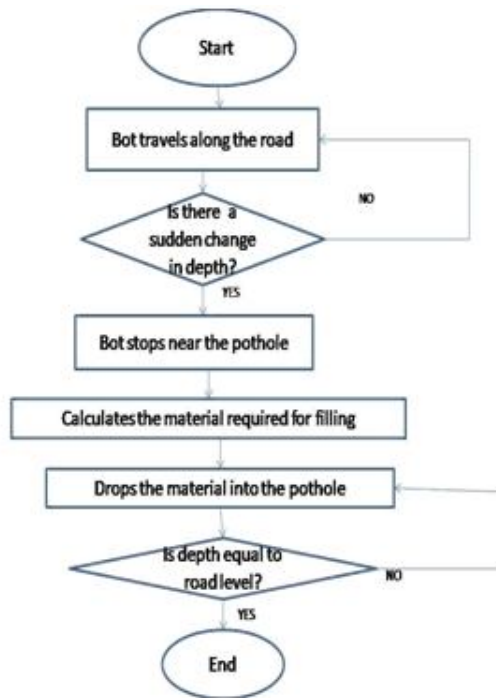


B-DETECTION MECHANISM

Our detection mechanism consists of distance IR sensor and arduino. Distance IR sensor uses infrared radiations for measuring distance between itself and obstacle. It is used to detect the pothole by continuously measuring the depth of road. As the bot moves along the road the depth remains constant but as the depth increases suddenly then there must a pothole on a road. This principle is used for detecting potholes. Arduino is used for programming distance IR sensor.

C-FILLING MECHANISM

Filling mechanism consists of two things namely container and servo motor. Container is used to hold the material which is to be filled in pothole in our case it is the mixture of cement and water. This container is assembled on FIREBIRD V and to this container servo motor is attached. Servo motor is a type of motor which is operated on a timer. The wings of servo motor rotate after a constant time duration. Servo motors are of two types namely 180 deg and 360 deg that means the wings of servo motor rotates 180 deg or 360 deg at a time according to its type.



As shown in the flow chart first bot starts to travel along the road. The depth calculated by the distance sensor will be constant for the plain surface road. If the pothole is present on the road then there will be sudden change in the depth. This sudden change is detected and presence of pothole is known.

Now when the pothole is detected we need to fill the pothole for this purpose we need to measure the dimensions of pothole and measure the material required. For this reason the depth given by distance sensor is used. We are assuming that pothole is cube shaped, so by calculating the volume of cube we can get how much material is required to fill the pothole.

If the pothole is completely filled then the depth measured by distance sensor becomes equal to the plain road and the filling mechanism stops. If the pothole is not completely filled then the bot continues to fill the pothole until the potholes get completely filled.

IV. CONCLUSION

Hence we conclude that the bot will move on predefined route. The bot will move along the road and stops near the pothole and starts the filling mechanism.

When we implemented white line follower the area covered by bot was less, hence if we use zig zag path instead of straight path we will cover more area.

V. ACKNOWLEDGEMENT

FIREBIRD-V FROM E-YANTRA LAB
EMBEDDED SYSTEMS & ROBOTICS LAB SUPPORTED
BY ELSI-IIT Bombay.

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