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Garbage Waste Monitoring System using Ultrasonic Sensors on FPGA

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Abstract: *Healthy environment is imperative to a healthy and happy community. With the age old system of hiring people to regularly check and empty filled dustbins, the process has been prone to human error and neglect. Additionally, due to different frequency of usage of dustbins in different areas, routine checks which are based on time crevices is inefficient because a dustbin might get filled early and may need immediate attention or there might not be any need of a routine check for a long period of time. This makes present system resource expensive and ineffectual, as overflowing, stinking dustbins become more of a problem than a solution.*

Keywords: *garbage collection, FPGA, ultra sonic sensors, buzzer, led, GSM module.*

I. INTRODUCTION

We are living in an age where tasks and systems are fusing together with the power of electronic gadgets to have a more efficient system of working and to execute jobs quickly! With all the power at our finger tips, this is what we have come up with. One of the main concerns with our environment has been solid waste management which impacts the health and environment of our society.

The detection, monitoring and management of wastes is one of the primary problems of the present era. The traditional way of manually monitoring the wastes in waste bins is a cumbersome process and utilizes more human effort, time and cost which can easily be avoided with our present technologies.

A big Challenge in the urban cities is Solid waste management [1]. Not only in India but for most of the countries in the world. The project gives us one of the most efficient ways to keep our environment clean and green. FPGA and Global System for Mobile Communication (GSM) are the latest trends and are one of the best combinations to be used in the project. Hence, a combination of both of these technologies is used in the project.

This is our solution, a method in which garbage waste management is automated. This is our FPGA based Garbage Monitoring system, an innovative way that will help to keep the cities clean and healthy.

II. EXISTING SYSTEM

In the existing system, the garbage monitoring system is quite complicated and has many disadvantages. In the existing system, garbage is collected by corporation, weekly once or by 2 days once. Though the garbage stinks and overflows the garbage bin and spread over the roads and pollutes the environment. It is time consuming and frequent monitoring of the system is also required.

III. PROPOSED DESIGN

In order to overcome the difficulties of the existing system and to provide cost effective garbage collecting system, the following design is approached. In the proposed design, we have used two sensors i.e., both are ultrasonic sensors. They are given certain threshold values and if the FPGA board detects values with the ranges, then the LED's are switched ON, buzzer rings and with the help of a GSM module, the result is displayed on LCD.

This saves time and is very efficient.

IV. BLOCK DIAGRAM

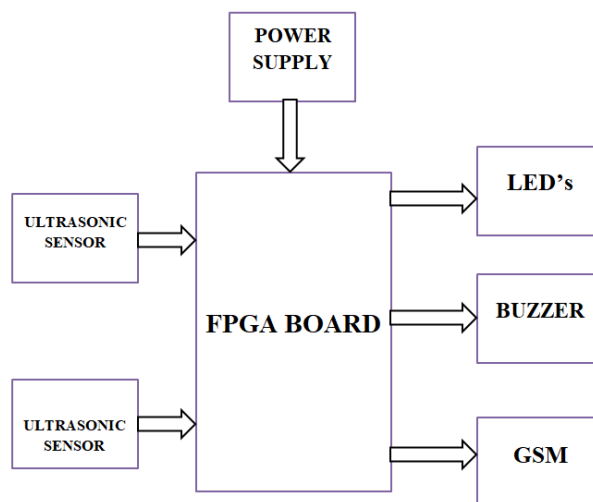


Fig: Block diagram of garbage monitoring system using ultrasonic sensors on FPGA.

V. WORKING

In real time experience, due to large amount of waste dumped at once can cause serious problems and there can be chances of causing illness. In such cases, proper cleaning is to be done in time, when notified. This makes the system work smoothly and efficiently. The proposed system is used to notify the worker, if the garbage is full with the help of GSM. The system detects with the parameter like distance with the help of ultrasonic sensors. For this, two sensors are used and both are ultrasonic sensors. Some predefined values of these sensors are stored in FPGA board. Ultrasonic ranging module HC - SR04 provides 2cm - 400cm non-contact measurement function, the ranging accuracy can reach to 3mm. Ultrasonic sensors are connected to FPGA it checks if the contact value is reached or not.

When the contact value is reached then the LED begins to glow, if the garbage bin is completely filled then both the LED glows else only one LED glows. This results in ringing of buzzer. After this, the information is passed to the GSM module and the municipality gets notified with the help of message and thus they can take a preliminary action to clean the area.

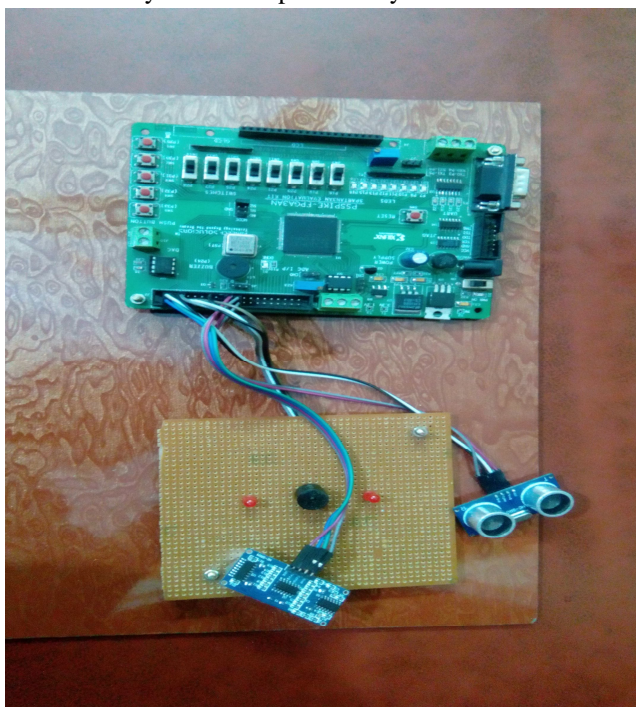


Fig: Experimental setup of garbage monitoring system using ultrasonic sensors on FPGA.

The circuit gets active and a buzzer sound indicates that the garbage is full and it is to be cleaned.

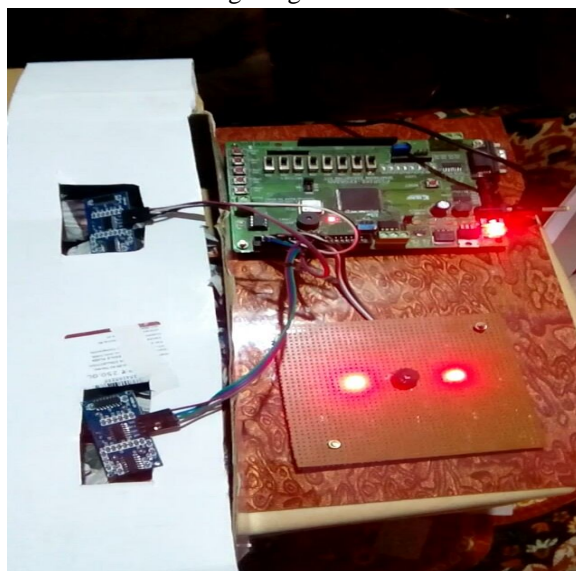


Fig: Circuit in working condition

VI. FLOW CHART

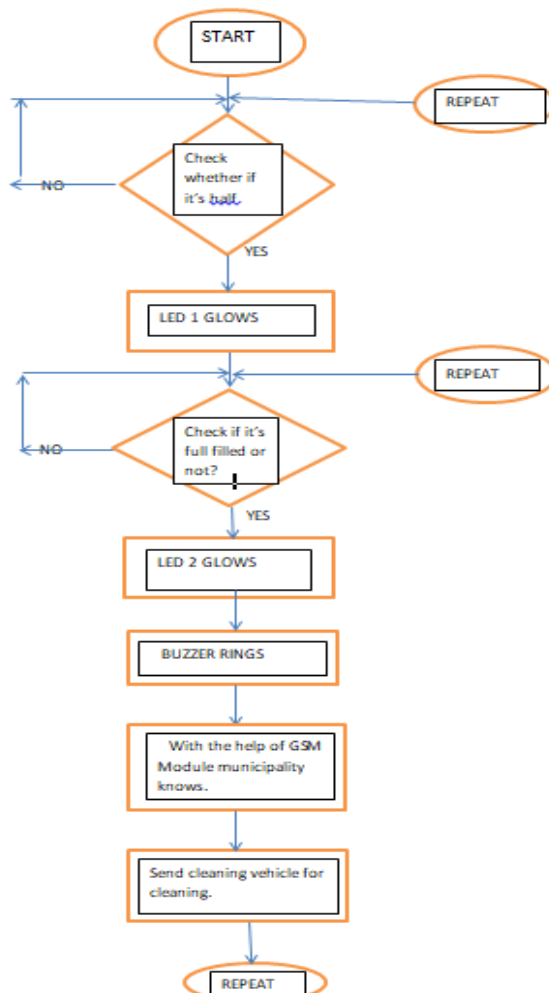


Fig: Flowchart of garbage monitoring system using ultrasonic sensors on FPGA.



VII. RESULTS

A. *There can be four results in this project. They are*

- 1) When the garbage is HALF, LED1 will be ON.
- 2) When the garbage is FULL, LED2 will be ON.
- 3) When both LED glows, the buzzer rings.
- 4) When buzzer rings, with the help of GSM the municipality gets notified.

VIII. CONCLUSION

Here, it is concluded that the man power requirement and cost for the process of garbage monitoring system can be eliminated. There are a few complications that we thought would occur if we took this product on a big scale. Ensuring the Ultrasonic distance sensor is correctly placed. If the pile of dump increased in the middle the sensor could be giving misleading data.

This project on the whole looks promising, but definitely needs small adjustments as mentioned above

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