Line Follower Smart Dustbin using IOT

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Abstract : This paper represents a cost-effective design of an intelligent waste container for small scale and large scale use cases. This project is based on IOT. It includes Arduino Uno board , Ultrasonic sensor to open the lid of the Dustbin and to check the fullness level of the container, Air Quality Sensor to analyse the air quality of surrounding and IR sensor for line following system.

IndexTerms **- Ultrasonic Sensor, IR Sensor, Servo Motor, DC motor , Gas sensor.**

1.INTRODUCTION

With the increase in population, there is a huge increase in waste .Here we propose Smart Dustbin that operates automatically to help solve this issue using IOT and sensor based circuit. Usual dustbins required to be open by pressing foot against its lever and then throwing garbage. Also a person needs to keep track when it is full so that it can be emptied and does not overflow. Here we propose a smart dustbin that does all this by itself .Our system consists of an ultrasonic sensor in order to detect waste and on placing the waste in front of dustbin it opens automatically without any help .It includes IR sensor and gear motors for line following purpose.

The dustbin opens automatically when it receives the signal and closes its hatch .Also the dustbin consists of a level sensing ultrasonic sensor that constantly measures the level of garbage. The dustbin also contains Air Quality sensor which analyses the quality of surrounding air.

2.LITERATURE REVIEW

2.1 RESEARCH PAPER

As we have reviewed paper "A Smart Dustbin using Mobile Application" from Anil kumar. It consist of wireless line following embedded system. The proposed work is embedded system having capability to perform differentprogramming .Usually the lines are predefined path. The path might be black line or black surface or white line or white surface . Here a microcontroller usually act as brain of circuit.Motors with 9V operating voltage for wheels of the Robot ,and 2 IR for line following purpose.

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3. SENSORS:

3.1 Ultrasonic Sensor*:Ultrasound is a technique of measuring distance from objects/obstacles. It contains a transmitter and a receiver. The transmitter transmits a short Ultrasound pulse periodically. If there is an object in front, the pulse hit the object can come back. The receiver then measures the round trip time and can estimate the distance based on the round trip time.*

3.2 IR Sensor : An infrared sensor is an electronic device that emits rays in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. Usually in the infrared spectrum, all the objects radiate some form of thermal radiations.

3)Gas Sensor (MQ-135): **Air quality sensor for detecting a wide range of gases, including NH3, NOx, alcohol, benzene, smoke and CO2. Ideal for use in office or factory. MQ135 gas sensor has high sensitivity to Ammonia, Sulphide and Benzene steam, also sensitive to smoke and other harmful gases.**

4. MOTOR :

4.1 DC Motor:

A DC motor converts direct current electrical power into mechanical power. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic to periodically change the direction of current flow in part of the motor. By adjusting the voltage of the DC motor, speed is controlled. In DC motor voltage is proportional to the speed. As the speed increases, voltage increases.

4.2 Servo Motor

Servo motors are available as AC or DC motors. Early servo motors were generally DC motors because the only type of control for large currents was through SCRs for many years. As transistors became capable of controlling larger currents and switching the large currents at higher frequencies, the AC servo motor became used more often.

5. ARDUINO

The Arduino UNO is a micro-controller board based on the ATmega328pu. It has 14 digital input/output pins of which 5 can be used as PWM outputs, 6 analog inputs, 4 UART's (hardware serial ports), a 16 MHz crystal oscillator, 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 an AC-to-DC adapter or battery to get started. The Arduino UNO can be programmed with the Arduino software.

6. FIGURES AND TABLES

S.No.	COMPONENTS	QUANTITY
1	Arduino	1
2	Motor Driver	1
3	Ultrasonic Sensor	2
4	IR Sensor	2
5	DC Motor	2
6	Servo Motor	1
7	Air Quality Sensor	1

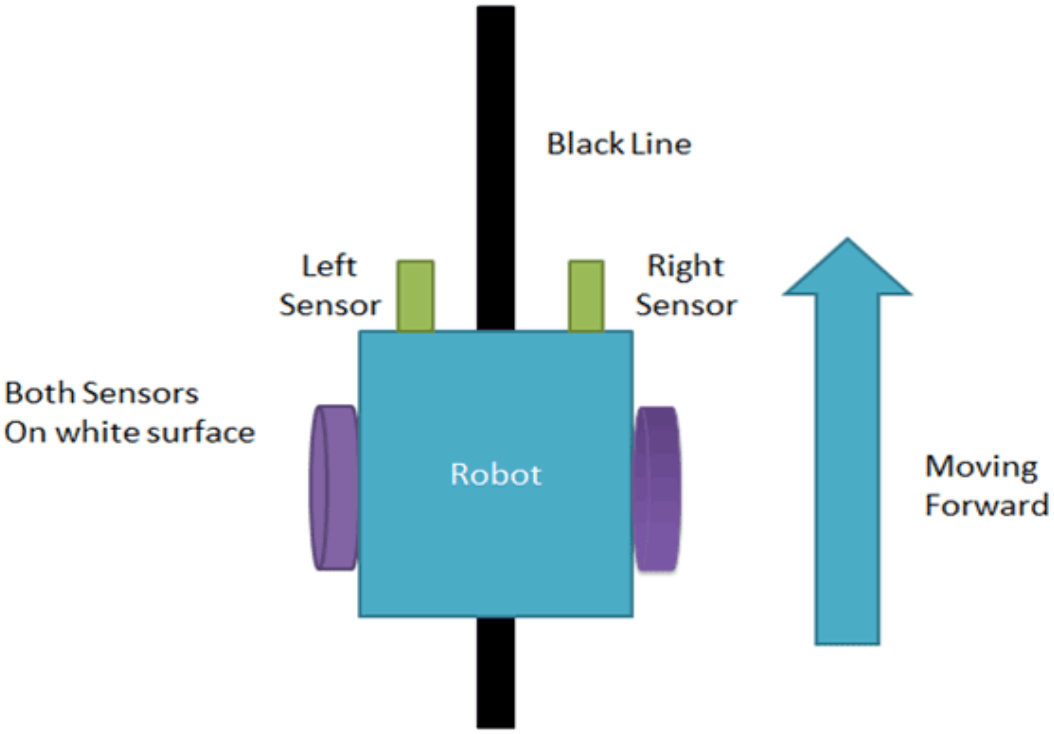
7. Research Methodology

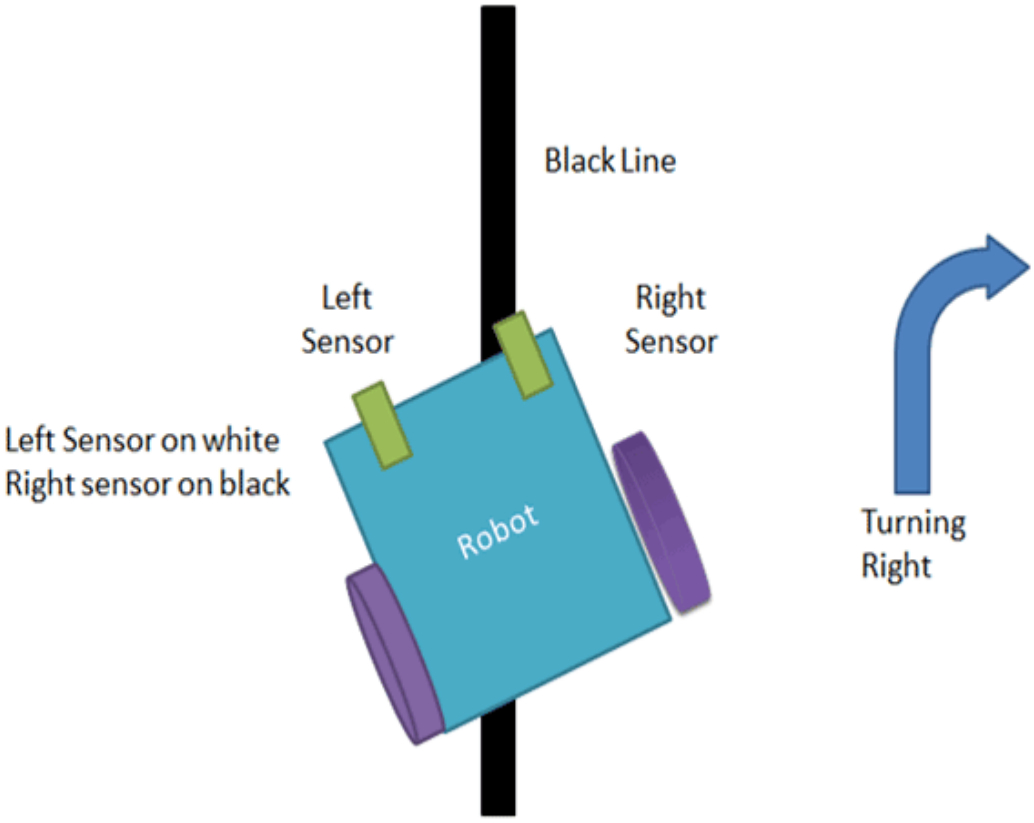
The Smart Dustbin is based on the concept of Internet of Things (IOT) and Line Follower Robot. It consists of an ultrasonic sensor which opens the lid of the dustbin with the help of Servo motor on detecting the waste material placed in front of it. The Dustbin also consists of level Sensing Ultrasonic Sensor that constantly measures the level of Garbage within the threshold in the bin and automatically detects if the threshold is reached .The Dustbin also contains Air Quality Sensor (MQ-135) which Analyses the Quality of Surrounding air and led glows red if the quality of the air is poor. The Dustbin consists of a smart circuit that transmits this information over the web to signal the main garbage collector of the facility the particular garbage bin.

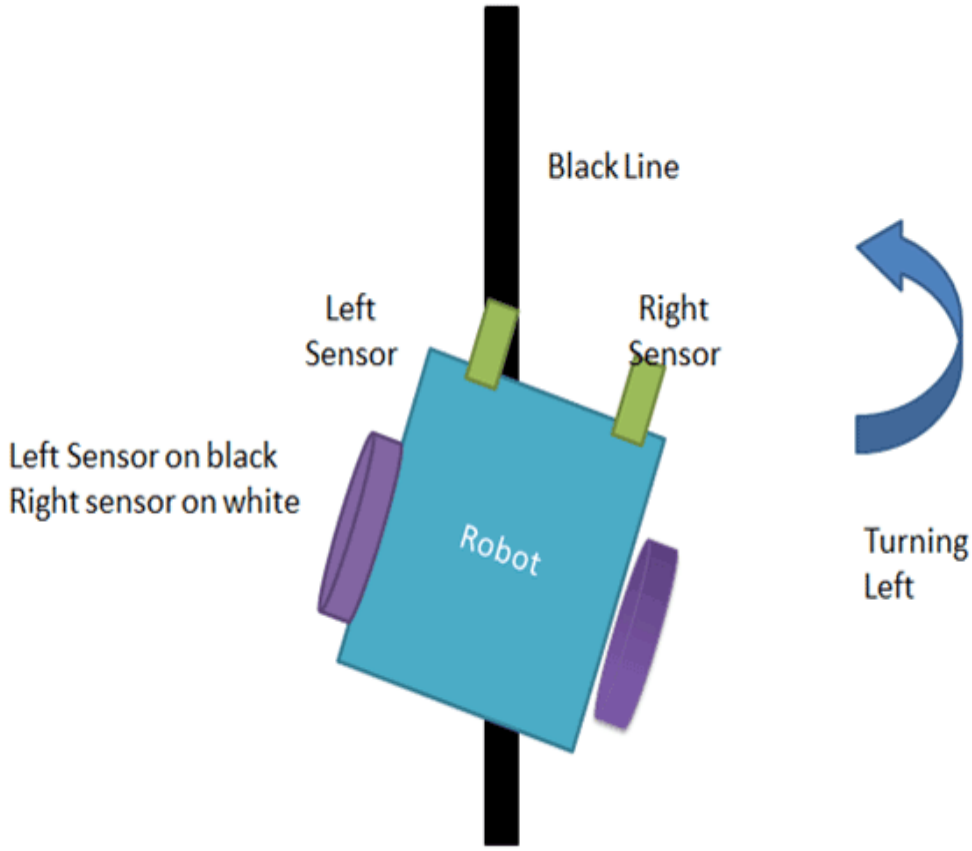
The IR Sensors are used to detect the path for the guided motion of the moving system .The IR transmitters emit the infrared rays which are detected by IR detector and appropriate signal is generated. There are two IR sensors connected to the Arduino Uno through motor drive for the development of line following robot which tracks a black line.

This system basically works like android mobile app controlled bot using Bluetooth mechanism .this system is connected to Arduino Uno board through pins. When user gives the instruction as '0'the movement of the robot will stop. When the instruction is '1'the robot moves in forward direction and '2' for reverse direction. The

instruction '3' is for the movement to its left direction and '4' is for the movement to its right direction. Using all these directions robot can easily be accessible to the user towards reaching the desired destination. We are placing the dustbin at the top of the robot for its movement.







8. APPLICATIONS

This project can also be used in the" SMART CITY". This project is also helpful in the government project of "SWACHH BHARAT ABHIYAN". The bin is of vast usage in offices , home ,school ,colleges and even in public places for garbage management.

9 . CONCLUSION

At the end of the project, it could be concluded that the design is Cheaper. The Components are easily available and it uses open source technology.

The device uses less power consumption, user friendly and has a good battery backup.

Such devices can monitor the garbage bins and informs about the level of garbage collected in the garbage bins to keep our environment clean & green. The cost & effort are less in this system.

The Solar Panel can be used with water proof circuit design. The Human Machine Interface can be developed. Linking with Adhar card and GSM module can be done.

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