

Garbage Management in Smart Cities using Automatic Robot

Poonam R. Pathak, Khushboo Lalit Oswal, Shilpa Ratnakar Patil, Ashwini Hanmant Pawar

Abstract— The fourth generation defiance demands various advanced technologies and their interactions and incorporation in human world which definitely has moved from the era of sci-fiction and research & development towards reality. Smart cities are now acquiring, utilizing and are fully charged with impending technologies, gradually they have adopted various forms of technology in multiple areas of economic and social life sector. Robots are designed, deployed and utilized for human comfort, as robot is an emerging field in the smart city infrastructure and in its application. A garbage collecting robot can obtain information about its surrounding environment, work for more time mitigate human effort and cost. A Robot can move as per instructed by user or in an automated way which is interaction between machines and humans.

Index Terms— Automatic Mode, Battery, Destination Point, Garbage Separation and Evacuation, Manual Mode, Node MCU, Robotic Arm, Smart City, Servo Motors.

1 INTRODUCTION

DEVELOPMENT of Science and utilisation of Advanced Technologies have shown sound impact on the day to day routine of Smart cities, Smart cities equally intricate the use of Robots, as robotic field has gained recognition to ease Human Labour in Today's world. We use robot to fulfil our daily needs. This gives us a glimpse of articulation of various advanced technologies and domains altogether giving a new accord to the Infrastructure of Smart cities. The field of computer science and engineering concerned with creating robots that can move and react to sensory input. Robotics is one branch of artificial intelligence. Robots are automatic machines. Robots can perform mechanical and repetitive jobs faster and more accurately than humans. Robot having its own brain fitted with computer logic so that it can do the work according to the algorithm designed into it. Robots play an important role in each & every field. It is used at industries, factories, offices, universities, societies and houses. The robots are just becoming as intelligent as human nowadays.

Various robotics parts are:-

Actuators

1. Sensors
2. Mechanical control devices like motors
3. Microcontroller – Arduino

Robots have all the above described parts. Actuators are for controlling a mechanism that ultimately controls the entire unit. Sensors are sensing devices in the robot that, transmit a signal and receive the signal and accumulate various environment information that is given to microcontroller for deciding the operations of machines. Mechanical control devices are devices used to control movement of robots using motors. Microcontroller is brain of robot wherever program is written and sensors are connected as i/p and actuators as o/p. Arduino is a Microcontroller Board which has embedded codes used for controlling mechanical control devices.

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2 PROPOSED SYSTEM

System is implemented into two modes using android application:

1. Manual Mode
2. Autonomous Mode

Proposed Algorithm for garbage management system in smart cities using Automatic Robot in MANUAL MODE:

- Step 1:** User starts the Android application.
- Step 2:** User switches to the app in manual mode, as two modes are available for robot in android application.
- Step 3:** User will command robot to start the work and move towards to the workspace.
- Step 4:** Robot as per instruction of user will move and detect the offset (detection of source i.e. Primary source location, Secondary source location) and start to collect the garbage.
- Step 5:** Robot will collect the garbage also detect the type of garbage (metallic and non-metallic)
- Step 6:** After detecting the type of garbage it will drop it into the respective shells of the type of garbage (the garbage shell i.e. Metallic and non-metallic portion)
- Step 7:** Robot moves as per instruction, collects garbage also segregates the type of garbage and storing it into respective garbage shells, during the movement or while robot is every time filling the garbage he acknowledges the status of garbage

bin, in case if the bin is full it will be notified to the user as buzzer sound.

Step 8: The user after hearing the buzzer, he will instructs the robot to empty the bin at nearby garbage area.

Step 9: Robot after vacating the garbage bin halts for further instructions, user commands him to start the activity for further cleaning.

Step 10: Repeat steps 5to9 until entire the workspace cleaned.

Step 11: The user after acknowledging that, the cleaning of entire workspace area has been accomplished; user commands the robot to move backtowards the source of workspace (i.e. Primary source) and stand like dustbin on the specified area.

Proposed Algorithm for garbage management system in smart cities using Automatic Robot in AUTOMATIC MODE:

Step 1: start.

Step 2: Assigning source and destination of the workspace to robot which he has to clean up.

Step 3: Robot starts detecting the garbage from source of the workspace.

Step 4: After detecting the garbage robot will scan the object whether it is metallic or non metallic.

Step 5: After scanning the garbage the bin will rotate as per the scanning result that whether to dump garbage in metallic part of bin or nonmetallic part of bin.

Step 6: After collecting each garbage robot will go into sleep mode for fractions of seconds for recalling the procedure of detecting garbage.

Step 7: After recalling robot will continues with remaining workspace till the destination gets over.

Step 8: When the workspace is completed and robot reaches its destination of the workspace robot will rescan all over the workspace again–

8.1: If any object is found robot will repeat steps 3-7

8.2: If no object is discovered robot will stand aside the workspace as a trash-bin (normal dustbin).

Step 9: Stop.

3 SYSTEM OVERVIEW

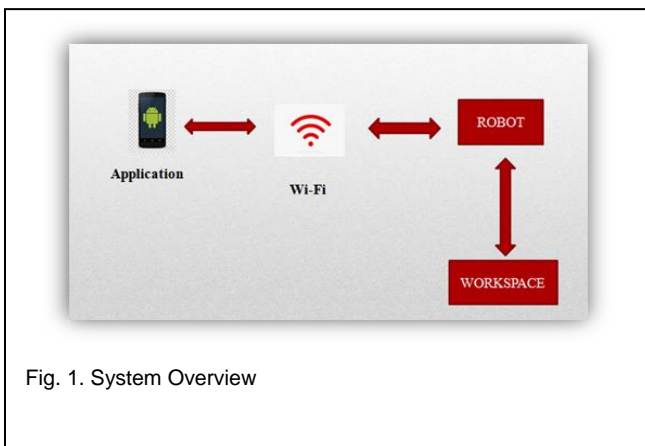


Fig. 1. System Overview

This is overview of system architecture which shows that an android application is used for controlling robot which is being connected to the Wi-Fi technology. This application's Wi-Fi

connection is connected with robot's Wi-Fi connection through microcontroller. Now that robot is completely connected with application and now he is ready in his workspace for cleaning the garbage area.

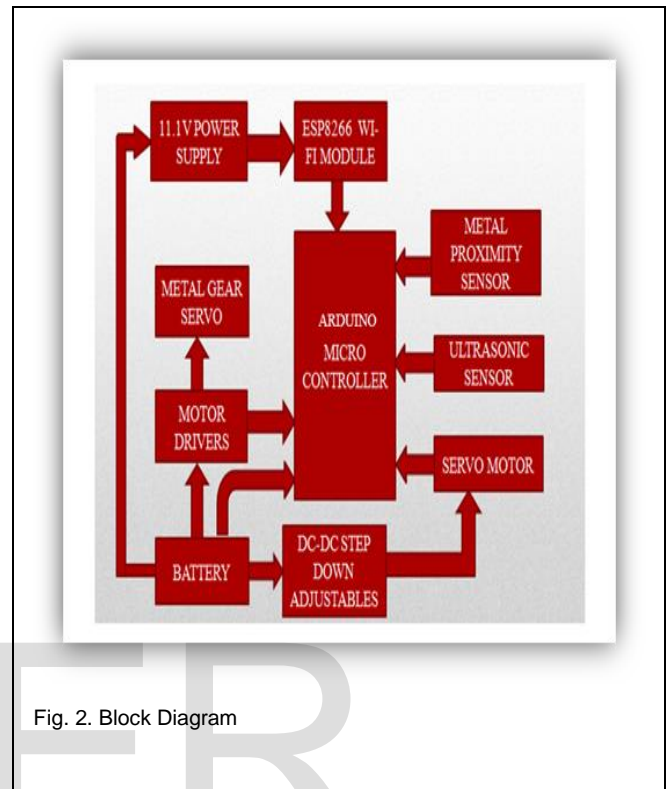


Fig. 2. Block Diagram

This is internal structure of our project in which all the modules connected to each other is being shown. The power supply module is connected to battery which passes the voltage to supply and to Wi-Fi module. That Wi-Fi module is connected further to the microcontroller. All servo motors and motor driver are connected to microcontroller. There are two sensors used which are metallic proximity sensor and ultrasonic sensor connected to microcontroller. Dc-dc step down is used for controlling voltage of the motors which is connected to servo motors.

4 DESIGN AND METHODOLOGY

4.1 WORKING OF ROBOTIC ARM

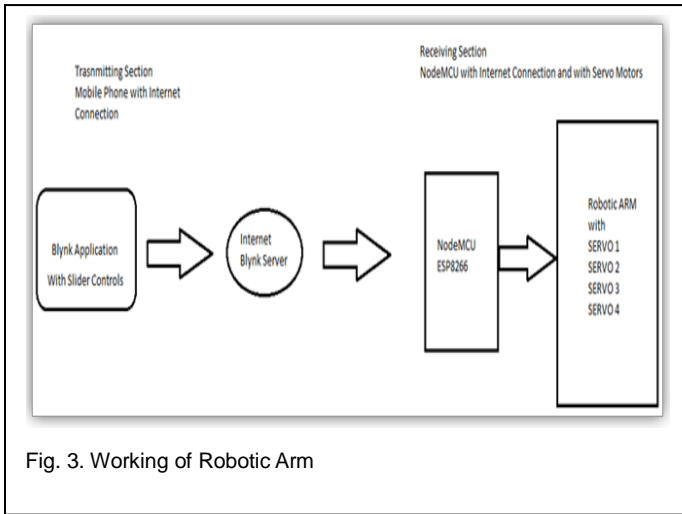


Fig. 3. Working of Robotic Arm

4.2 USE CASE DIAGRAM

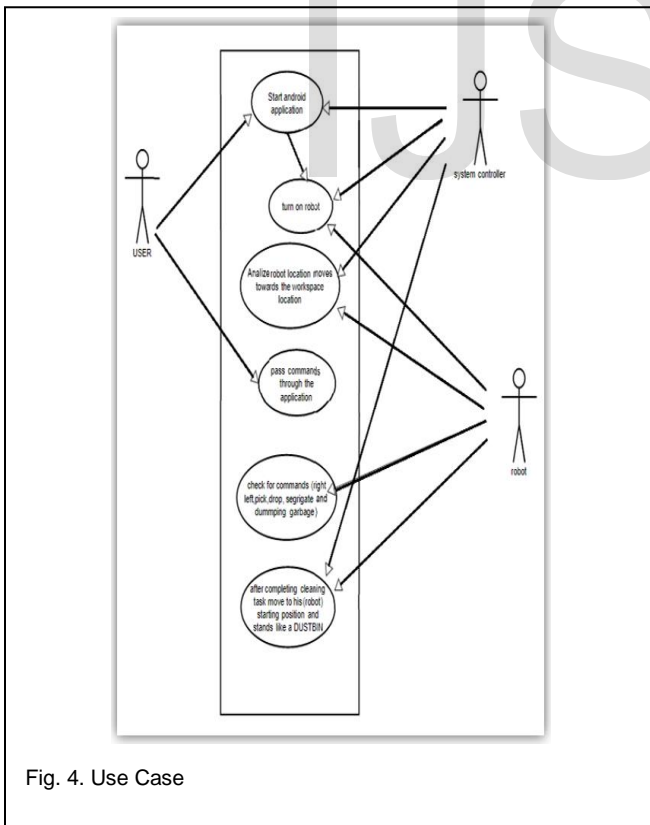


Fig. 4. Use Case

5 CONCLUSION

System Endorse smart city infrastructure, using involvement of advanced technologies in the field of robotics, which is branch of Artificial Intelligence .Smart city infrastructure for upgrading itself needs to ease the quality and the standard of living for its citizens. These technologies have previously shown direct impact on in-house project hence , our system gives a new objective to integrate the outside world of smart city with the influence of robot, thus reducing human resource consumption overall cost and enhance the quality of smart city environment.

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