

# DESIGN AND IMPLEMENTATION OF SMART BIN AND SMART LIGHTING SYSTEM

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## ABSTRACT

People are inculcated with the smart feature in the day-to-day life. With the advent of technology, they are able to use it in almost all aspect of their lives. In the urban areas, the focus is towards minimizing the efforts for garbage collection and energy saving. In this paper, we use Arduino microcontroller to execute the operation. The smart bin and smart lighting system solves regular operating issues and ease the process.

**Keywords:** Internet Of Things (IoT), LDR, RFID, Smart bin.

## I. INTRODUCTION

Health and hygiene is a need for the hour. Due to urbanization, there is an increase in garbage accumulation in most populous places. This effects on the health and sanitation of citizens [1]. With the aforementioned reason, there also comes a concern for street lighting. There is an unnecessary loss of energy when the light is not required and requirement of manpower to operate the street lighting [2]. By the year 2025, the amount of garbage will double its presence which is 68.8 Mn tons per year, which is a serious issue to be addressed [1]. There is also a problem with open disposal of garbage, which causes a mess. It takes a lot of labor effort to maintain the same level hygiene every single day.

There is an energy deficit in the country which is primarily due to the overuse of infrastructure and other public facilities. According to a recent survey, there is a usage of staggering 78% of the energy supplied to street lights which are high on its bar, the above loss can be attenuated if supervision of system is done [3]. The conventional approach for both systems results in a huge economic loss [4]. The requirement of the skilled labor force is also a big concern, due to the fact that there may be a delay in the protocol. but the advent of technology is solving the problem which cracks down to smart bin collection and smart street lighting system.

The next section deals with the background which states the issues. Section III, IV deals states with experimental setup, result in analysis. The conclusion and future work are discussed in section V.

## II. BACKGROUND

The Electricity supply and demand is dispatching and there is also increase in the deficit of energy. In the 21<sup>st</sup> century, people are occupied with the thought of good health and hygiene for this to happen garbage generated needs to be on the check [5]. Human effort is a must have to keep the track of above-spoken problem, it takes time, energy and cost to maintain the repo. Pollution will come into the picture in both cases. The following figure 1 depicts statistics on the economical exchequer to the government agencies for basic utilities provided to the citizens. This also shows the fact that ample amount of money is spent on sewage maintenance and power supply to the lighting. The proposed project gives the solution to aforementioned.

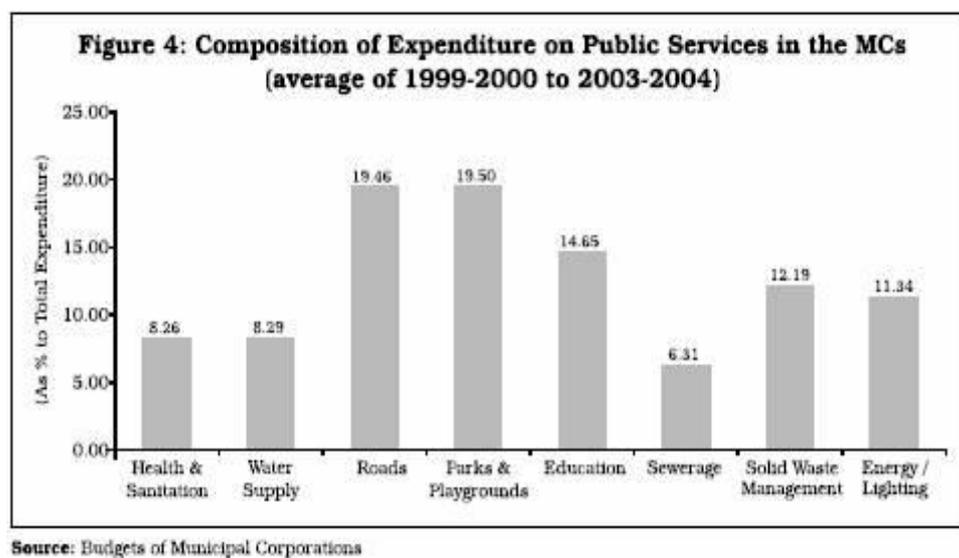


Fig.1 :Statistics of economical expenditure by different sector

## III. EXPERIMENTAL SETUP

The proposed model consists of a line following robot which is garbage carrier and it has two robotic arms which helps in dumping waste materials, the setup also has an automatic street light. In this framework, dustbins are arranged at different locations [6]. The status of the smart clean dustbins is retrieved from web. Two IR sensors are placed at the top most position to sense the bin filling status. Bad smell is sensed using Gas sensor at the base of dustbin. Both sensors communicates signals to the controller. The RF-transmitter encode the information originating from the controller and send to Arduino unit which acts as a receiver, it sends the information to RF-collector robotics which is associated with the Arduino Ethernet shield. Arduino responds to the information received by the collector and it transfers on website page through the Ethernet shield.

Load cells in the dustbin determine the threshold weight and limit it to get overloaded. The algorithm has developed which checks filled level continuously and if dustbin is filled to its maximum limit then there is an indication at the same time the encoded signal will be transferred. Active status of dustbin is shown on the web page using connections through Ethernet shield. Simplified flowchart of proposed system same time the robotics get information, It goes to the dustbin and collects automatically. Monitoring the webpage will help the garbage collection department to track for the exact location and amount of the garbage. The garbage vehicles can then unload the garbage from a particular location. The function of WI-FI module is to send a message to the garbage collection department.

The street has a various sensor PIR, IR, and LDR which sense the signal given to microcontroller. The controller will illuminate the power according to the intensity of light. By this way, we can achieve the application of smart lighting system [7].

#### **IV. RESULTS AND DISCUSSION**

The proposed system shown in figure 2 offers remote monitoring of the real-time bin status data from two sensing systems: waste filled level sensing, bad smile sensing. Explicit of the individual systems are described below. The sensing of waste filling level inside a bin is based on the measurement of the time of flight i.e. the time taken by an IR pulse to transmit and receive its reflected echo between the sensor and the sensed material level. The gas estimation of the waste inside a bin is based on the principle of an electrical conductor whose resistance changes when its length changes due to stress and it are virtually proportional to the applied strain. A Wheatstone Bridge Network is formed by using four strain gauges with four separate resistors. Waste inside the bin causes a variation in the value of one or more resistors due to the generated strain. The street light application checks for the external lighting condition and operates accordingly.

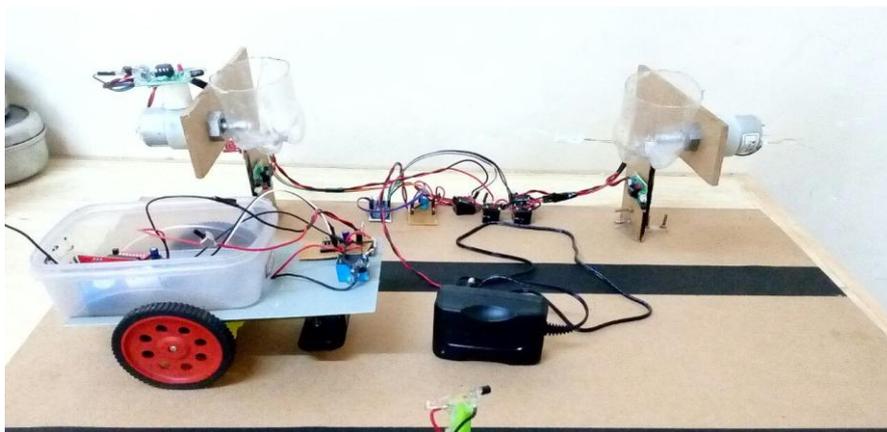


Fig.2 : Smart bin and smart lighting system

## V. CONCLUSION AND FUTURE WORK

In this 5G world, the smart feature is a must needed technology and there is a huge demand for smart cities. In case of a smart city, the smart bin and smart lighting are most necessary. The proposed system is designed for proper management of garbage and efficient use of electricity. The cleaning process will take less time to finish the process and will have efficiency in the process. Since the government is investing a lot on smart technology it is recommended that they choose the efficient system so that they can save both energy and time.

This prototype is a scalable and economical option and can save a huge cash flows from government. the street light feature is currently fixed with LED, This can be fixed with large street lights to get this into the market.

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