CHAPTER THREE

RESEARCH METHODOLOGY AND ANALYSIS OF THE EXISTING SYSTEM

3.1 RESEARCH METHODOLOGY

The method that will be employing in the implementation of automatic control of the smart waste bin is using the top to bottom approach method. The various units that will be considered are listed below:

i. A sensing unit for monitoring trash level in the bin,

i. A controlling unit which acts as the brain for the control system and is responsible for doing the core work in the control of the system,

ii. An indicating unit which shows the level of trash and act as a visual aid to user in the trash bin,

iii. A switching unit that simply triggers the servo motor ON and OFF, depending on the signal received from the microcontroller to OPEN or CLOSE the bin,

iv. A GSM modem to send and receive SMS to/from the appropriate waste disposal body,

v. A PIR sensor unit to detect the presence of coming human close to the bin for waste disposal.

The system design and implementation will be carried out according to the system's block diagram below:
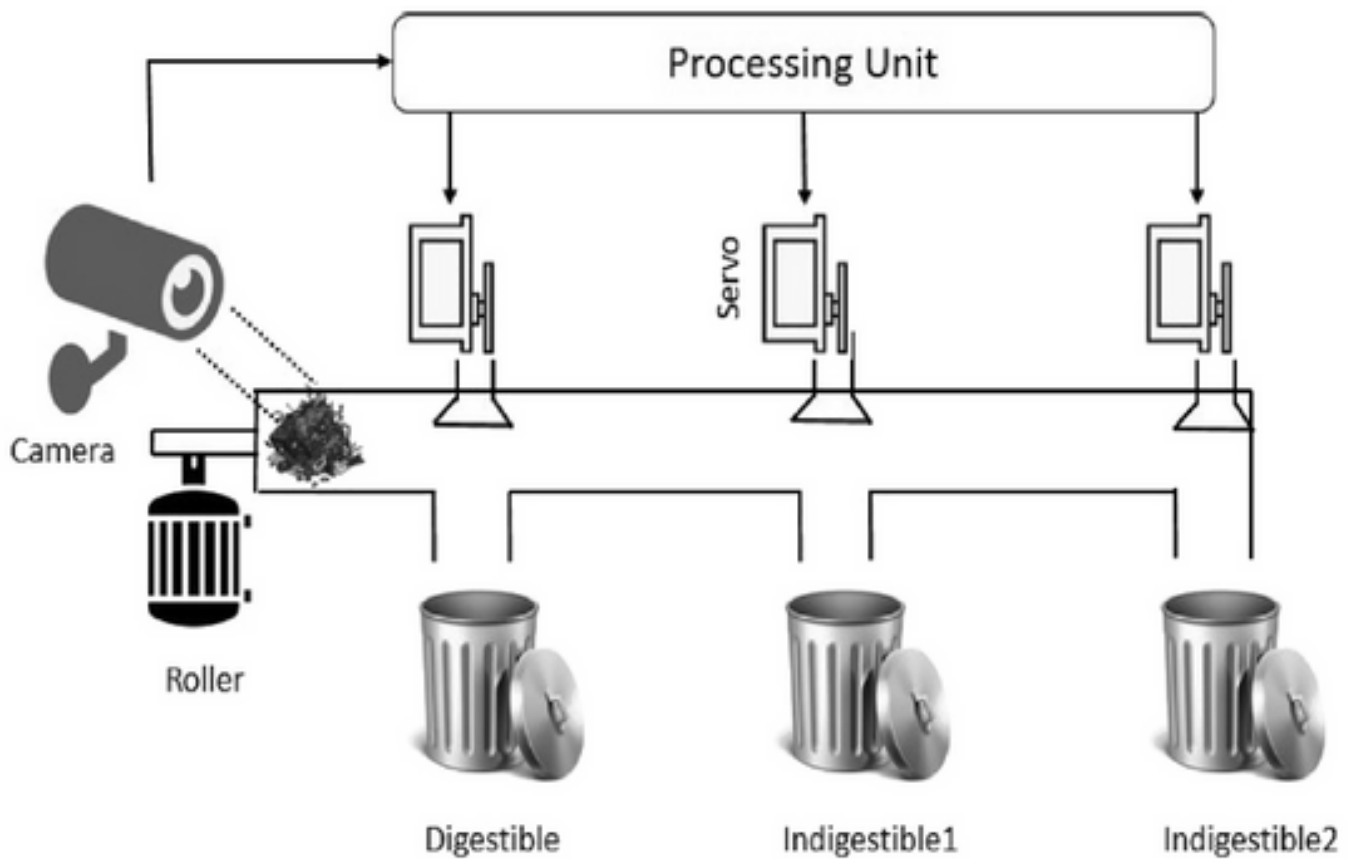
Figure 3.1: Block Diagram of the Proposed Smart Waste Bin System (Source: Encyclopedia)

3.2 ANALYSIS OF THE EXISTING SYSTEM

The current waste management system lacks efficiency and smart features. Traditional waste bins are passive and do not provide real-time information or smart functionalities. Users often face challenges in knowing the fill level of the bins, leading to inefficient waste collection processes. Additionally, there is no systematic way to handle different types of waste, and alarms are not integrated to notify authorities or waste management teams when a bin needs attention. Inefficiencies plague the waste collection process due to the absence of real-time monitoring. Traditional bins do not promote or facilitate the sorting of recyclables, compostables, and general waste, impeding recycling efforts. Users lack information about the fill levels of bins, resulting in overflowing containers, unpleasant surroundings, and unhygienic conditions. The reactive nature of the system means that maintenance teams only identify issues during physical inspections, leading to delayed responses and increased operational costs.

3.3 PROBLEMS OF THE EXISTING PROBLEM

Traditional bins do not promote or facilitate the sorting of recyclables, compostables, and general waste, impeding recycling efforts. Users lack information about the fill levels of bins, resulting in overflowing containers, unpleasant. The following are problems of the existing system:

i. Inefficient Waste Collection: The lack of real-time monitoring results in inefficient waste collection routes, leading to unnecessary fuel consumption and increased carbon footprint.

ii. Ineffective Sorting: Traditional bins do not encourage or facilitate the sorting of recyclables, compostables, and general waste. This hinders recycling efforts and contributes to environmental pollution.

iii. Limited User Awareness: Without a feedback mechanism, users are unaware of the current fill level of the bins. This leads to overflowing bins, unsightly surroundings, and unhygienic conditions.

iv. Delayed Maintenance: The absence of an automated notification system means that waste management teams often discover issues only when they physically inspect the bins. This results in delayed maintenance and increased operational costs.

3.4 DESCRIPTION OF THE PROPOSED SYSTEM

The envisioned smart waste bin system aims to overcome existing limitations through innovative features, real-time monitoring is enabled by smart sensors in each bin, offering up-to-date information about fill levels. This data is transmitted to a central server, empowering waste management teams to optimize collection routes. A shuffle refuse mechanism is integrated into the bin, automatically sorting recyclables, compostables, and general waste, thereby promoting efficient waste management and boosting recycling efforts. An alarm system sends automatic notifications to waste management teams when bins reach predefined fill levels, ensuring timely collections and mitigating the risk of overflow. Users can access a mobile app or web portal to check nearby bin fill levels, encouraging responsible waste disposal.

The proposed smart waste bin system incorporates several advanced features to address the limitations of the existing system:

i. Real-Time Monitoring: Smart sensors are installed in each bin to provide real-time information about the fill level. This data is transmitted to a central server, allowing

waste management teams to optimize collection routes.

ii. Shuffle Refuse System: The bin is equipped with a shuffle refuse mechanism that automatically sorts recyclables, compostables, and general waste. This promotes efficient waste management and enhances recycling efforts.

iii. Alarm Notification System: An integrated alarm system sends automatic notifications to waste management teams when a bin reaches a predefined fill level. This ensures timely collections and reduces the risk of overflowing bins.

3.5 ADVANTAGES OF THE PROPOSED SYSTEM

The shuffle refuse system enhances waste sorting, leading to increased recycling rates and a reduction in landfill contributions. The following are advantages of the proposed system:

i. Optimized Collection Routes: Real-time monitoring enables waste management teams to optimize collection routes, reducing fuel consumption and environmental impact.

ii. Improved Recycling Rates: The shuffle refuse system encourages proper waste sorting, leading to increased recycling rates and a decrease in landfill contributions.

iii. Timely Maintenance: The alarm notification system ensures that maintenance teams are alerted promptly, reducing response times and minimizing operational costs.

iv. Enhanced User Awareness: Users are informed about the status of nearby bins, fostering a sense of responsibility and contributing to cleaner and more hygienic public spaces.

v. Data-Driven Decision Making: The system generates valuable data that can be analyzed to identify trends, optimize waste management strategies, and make informed decisions for future improvements.