

Waste Management System using QIDK

Embedded Systems Workshop

September 10, 2024

1 Introduction

The Qualcomm Innovators Development Kit presents many uses that could be extended to various fields. This kit can be used to create a smart Waste Management System that could be used to detect garbage and hence be used to report the observations to concerned authorities for suitable steps to be taken. The project makes use of the QIDK to build a system to perform this analysis on the edge.

2 Project Overview

The project aims to develop an innovative waste management system that leverages the capabilities of the Qualcomm Innovators Development Kit to address waste sorting and management challenges. The system will employ a camera module to capture images of waste items, which will then be analyzed to improve waste disposal practices.

3 Project Flow

The project will proceed in the following stages:

1. Exploration of computer vision algorithms for real-time image capture and storage.
2. Data collection for various types of waste bins.
3. Development of a machine learning model for waste classification.
4. Implementation and deployment of the model on the Qualcomm QIDK.
5. Real-time deployment and testing of the system on the IIIT campus.

4 Project Requirements

4.1 Hardware

- **Qualcomm Innovators Development Kit (QIDK):** This will be the primary development platform.
- **Camera Module:** This will integrate with the QIDK to capture real-time images of waste items.

4.2 Software

- **Image Processing and Basic Computer Vision Algorithms:** Image processing and some basic computer vision algorithms will be used to analyze the captured set of images to perform classification tasks from Qualcomm AI Hub.
- **Data Analysis Tools:** Tools used for analyzing the data collected and showing the results.
- **Machine Learning Framework:** For developing and training the waste classification model.

5 Deliverables

5.1 Deployed Working System

A functional waste management system that demonstrates image-based waste classification and analysis, deployed on the QIDK. Further use of this system can be to develop metrics of the waste being thrown into correct bins as well as the garbage that is not thrown into any bins, etc. You can explore such uses and analysis for which this system.

5.2 Analysis and Results

Your report should include:

- A presentation of your image processing algorithms' performance, along with data analysis.
- Include your findings and interpretations from the real-time deployment on the IIIT campus.

6 Analysis Approach

The analysis component of this project encompasses several stages:

- **Image Capture and Storage:** Implement algorithms for efficient real-time image capture and storage.
- **Data Collection:** Gather a comprehensive dataset of waste bin images for training and testing.
- **Image Classification:** Develop techniques for identifying and classifying different types of waste using machine learning models.
- **Model Deployment:** Implement the trained model on the QIDK for real-time classification.
- **Data Interpretation:** Analyze the results of the deployed system to provide actionable insights into waste management practices on the IIIT campus.

Document your approach and results comprehensively at each stage of the project.