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NOTICE: EXPRESSION OF INTEREST AND INTERACTION WITH TECHNICAL CONSULTANT

Applications are invited for the expression of interest of **Technical Consultant / Domain Expert** for the research project "AI-Driven Robotic System for Recognition and Intelligent Segregation of Municipal Solid Waste (MSW)".

- **Role Designation:** Algorithm/ML Owner & Sensor-Fusion Lead.
- **Key Details:**

  Position: Technical Consultant (Domain Expert)

  Duration: Duration of project, from [31-12-2025] to [29-10-2026]

- **Minimum Eligibility:**
  - Associate Professor or equivalent post in the AGP 13-A as per 7th CPC in a government organisation.

- **Key Responsibilities:**
  - Collection of required waste samples.
  - Development of machine learning models, datasets, and real-time AI processing framework.
  - Hardware setup, calibration, and maintenance of sensors.
  - Multi-modal fusion algorithm development and data processing.
  - Calibration and validation of 2D/3D vision systems, ToF, inductive and weight sensors integrated with robotic end-effectors.

- Please submit your expression of interest in a sealed envelope having technical and financial bids in two separate sealed envelopes, addressed to the Principal, Zakir Husain Delhi College, superscribed **"Application for the post of Technical Consultant"**, latest by 14/02/2026.

- Date of Interaction: 16-02-2026

5/2/2026

Dr. Manish Kumar
Principal Investigator
Department of Electronics
Zakir Husain Delhi College
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Principal
Zakir Husain Delhi College
University of Delhi

Brief about Project

Abstract:

This proposal presents a strategic collaboration to develop an advanced autonomous, AI-driven waste segregation system for waste-to-energy production facilities. This research work on AI-Driven Robotic System for Recognition and Intelligent Segregation of Municipal Solid Waste (MSW) Using Industry 4.0 Technologies (**AI-SEG**) systems will position the organization at the forefront of sustainable technology innovation while addressing critical operational challenges in handling municipality solid waste processing and energy generation.

AI-SEG System aims to address critical challenges in the waste processing pipeline by efficiently identifying waste (combination of computer vision and sensor fusion array) and removing metallic components, tires with wires, cloth bags with metal elements, stones and glass through two robotic Arm (Fanuc -M-710iC/50) that could damage processing equipment. The subsequent section presents NTPC's Municipal Solid Waste (MSW) initiative and outlines specific challenges that the proposed AI-SEG system addresses

1. NTPC Municipal Solid Waste (MSW) Initiative and Challenges:

NTPC's waste-to-energy plant represents a significant advancement in sustainable waste management and alternative energy production in India. The facility converts municipal solid waste (MSW) into green charcoal and other solutions, offering both waste reduction and renewable energy benefits. However, the efficiency and safety of operations are compromised by the presence of:

- Metal components (wires, fasteners, cans)
- Tires containing metal reinforcements
- Fabric bags with metal elements (zippers, buckles)
- Stone, concrete and other inert materials
- Glass fragments

These materials (weight>5Kg) pose risks of equipment damage, production downtime and reduced output quality. NTPC Municipal Solid Waste (MSW) facility processes thousands of tons of municipal solid waste annually, but faces a critical bottleneck: contaminated waste streams cause equipment failures, reduce product quality and create safety hazards. Current manual sorting methods are inadequate for industrial-scale operations, resulting in:

- **Huge annual losses** from equipment damage and downtime
  30-40% reduction in processing efficiency due to contamination
- **Significant safety risks** for operational personnel

The existing waste processing setup lacks effective pre-segregation capabilities for these problematic materials, particularly:

- Items exceeding 300mm in size and greater than 5kg

- Metal contaminants embedded within otherwise usable organic waste
- Hard-to-detect materials within mixed waste streams
- Insufficient automation in the waste sorting process

Section 1.3 defines the key research project objectives and measurable targets for the proposed AI-SEG system.

2. Research Project Objectives:

Building upon the identified challenges in NTPC NETRA's current waste processing operations and the comprehensive system requirements outlined above, this research proposal establishes three primary objectives that directly address the critical need for automated waste segregation technology.

- To develop a robotic system along with sensor fusion for the automated segregation of waste materials at the NTPC NETRA plant on an open conveyor before material enters the shredder.
- To design and implement algorithms for identifying and classifying target waste materials (metals, glass, oversized items, tires, wired cloth bags).
- To optimize the system for speed, accuracy and efficiency in a waste processing environment.

To understand the current technological landscape and validate the need for advanced waste segregation solutions, the next section reviews relevant literature in robotic automation, computer vision and industrial AI applications, establishing the research foundation for the proposed AI-SEG system.