

SIPILAH: AN IOT-CONNECTED AUTOMATIC WASTE SORTING SYSTEM USING INFRARED, INDUCTIVE, CAPACITIVE, AND ULTRASONIC SENSORS WITH ARDUINO UNO AND ESP32



Author(s): Yudis Jalu Wicaksono¹, Sandy Maulana Wibawa², Daris Rifaldi Setiana³, Fadlylah Arfaraaz⁴, Hidayat^{5*}, Turaev Sirojiddin Jurakobilovich⁶

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Abstract:

Waste management at the source level remains a significant challenge in many regions, including Cipadung Kidul, Bandung City, which prompted the development of SIPILAH (Automatic Waste Sorting System) to improve the efficiency of waste separation and support technology-based environmental education in local communities. Previous studies on automated waste sorting systems have largely focused on industrial or large-scale environments, with high implementation costs and limited adaptability for community-level use. The system, built on an Arduino Uno microcontroller, classifies waste into three main categories—metal, organic, and non-metal inorganic—using infrared proximity sensors, inductive and capacitive proximity sensors, and three ultrasonic sensors for object and volume detection, while an ESP32 module sends notifications via Telegram when the trash bin is nearly full. Testing showed an accuracy rate of 90% across 20 trials, indicating reliable detection and classification performance. Its modular and contactless design enhances usability and hygiene while encouraging environmentally friendly habits in the community. With these capabilities, SIPILAH represents a promising small- to medium-scale waste sorting solution that can help address ongoing waste management challenges.

¹ Undergraduate Student, Department of Computer System, Universitas Komputer Indonesia, Indonesia, Ph. +6288221454348, Email: yudis.10222018@mahasiswa.unikom.ac.id

² Undergraduate Student, Department of Computer System, Universitas Komputer Indonesia, Indonesia, Ph. +6287847674445, Email: sandy.10222020@mahasiswa.unikom.ac.id

³ Undergraduate Student, Department of Computer System, Universitas Komputer Indonesia, Indonesia, Ph. +6281214586431, Email: daris.10222016@mahasiswa.unikom.ac.id

⁴ Undergraduate Student, Department of Computer System, Universitas Komputer Indonesia, Indonesia, Ph. +6281953769383, Email: fadlylah.10222003@mahasiswa.unikom.ac.id

⁵ Lecturer, Department of Computer System, Universitas Komputer Indonesia, Indonesia, Ph. +628562049640, Email: hidayat@email.unikom.ac.id

⁶ Professor, Department of Natural Sciences at Karshi State Technical University, Uzbekistan, Ph. +998979525181, Email: sturayev063@gmail.com

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For full paper, contact:

Prof Muhammad Imran Aslam

Editor-in-Chief, NED University Journal of Research

Ph: +92 (21) 99261261-8 Ext:2670; Fax: +92 (21) 99261255

Email: NED-Journal@neduet.edu.pk

Website: <http://www.neduet.edu.pk/NED-Journal>