Lab 1 – TrashTag Product Description

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1 Introduction

Litter in outdoor recreational areas, such as rivers, parks, lakes, and greenways, remains an environmental and operational concern for communities. Trash discarded by visitors or illegally dumped not only disrupts natural ecosystems but also poses safety hazards, economic burdens, and long-term environmental impairment. According to the U.S. Environmental Protection Agency, aquatic trash harms ecosystems through entanglement, ingestion, and habitat disruption, contributing to the growing global problem of microplastic pollution (EPA, 2023).

Municipalities also bear the significant financial burden; U.S. cities collectively spend over $11.5 billion annually on litter cleanup alone (Keep America Beautiful, 2020).
Beyond the environmental and financial impact, the current process of identifying and removing trash is inefficient. Cleanups often depend on volunteers or city workers walking long distances with little guidance, hoping to encounter problem areas. Citizens who find large items (such as tires, furniture, or appliances) often do not know whom to notify or how urgently cleanup teams will be able to respond. This contributes directly to several critical gaps.

Firstly, there is a resource gap: cleanup organizations struggle to quickly and effectively identify illegal dumping sites. Without accurate, current information, teams often deploy labor unnecessarily or show up at a site unprepared for the size of the debris.

Secondly, there is a communication gap: most citizens do not have a proper channel for reporting litter. Reports, whenever made, are very general or late, making organizations unaware of exact locations or severity.

Thirdly, there is a convenience gap: most people notice trash when they are doing something else (walking, hiking, swimming). Once they get home, the opportunity or motivation to report it is gone.

Lastly, there is a perceived impact gap: people often feel their contribution doesn't matter or isn't noticed. When there's no visible feedback about participation in cleanups, participation remains low, despite widespread concern about pollution.

To tackle such societal and environmental challenges, TrashTag proposes a geolocation-based reporting platform where people can quickly upload geotagged photos when they find any trash. It maps those reports in real time to an interactive map, letting organizations identify hotspots, understand the scope of cleanup needed, better plan events, and mobilize the right equipment and volunteers. Such tracking creates gamification through points, streaks, and eventual visible cleanups that will increase engagement and fill current gaps in communication. TrashTag is a unified data management and communication platform that enables individuals, amplifies the efforts of environmental organizations, and streamlines the cleanup process. By transforming public observation into actionable information, TrashTag represents an organized and scalable solution for a problem otherwise dependent on inconsistent reporting and manual labor.

2 Product Description

TrashTag is a web-based reporting and cleanup coordination tool intended to help communities identify and clean up trash and illegal dumping in their natural and recreational areas. It is a tool that allows users to upload images of the trash they see, automatically tag their own location, and share those reports on a map. Cleanup organizations have access to these reports and are able to claim and clean them up, making the process more efficient with less time and resources. The purpose and goal of the TrashTag tool is to reduce pollution in the environment and increase safety and transparency with a more organized approach to cleaning up the environment.

2.1 Key Product Features and Capabilities

TrashTag also provides users with the opportunity to report trash by uploading a photo. The photo will be stamped with the location and date of the photo. The reported trash will be displayed on a map, and users can easily see the reported trash and the extent of the problem. Additionally, trash cleanup organizations can use this tool to claim the reported trash and update the status once the trash has been cleaned up.

The uniqueness of TrashTag can be identified in the way it provides users with the opportunity to make casual observations and transform them into useful data. Unlike other methods of reporting trash, which rely on word of mouth, phone calls, and emails, TrashTag provides users with the opportunity to make real-time and location-based reports. This way, users can be sure of the location of the trash and the efforts needed to clean it up. This will prevent duplication of efforts and wasted resources.

2.2 Major Components (Hardware/Software)

TrashTag is designed as a web application, so no specialized hardware is required beyond a standard internet-enabled device. Users and cleanup organizations access the system through a normal browser, while the backend runs on cloud-hosted servers that store data, process images, and manage authentication.

Based on our MFCD, TrashTag is structured into three layers. The model consists of the database that stores users, trash reports, photos, events, organizations, and cleanup records. The functional layer includes the business logic that handles photo uploads, EXIF data extraction, map rendering, report claiming, and point tracking. The component layer consists of the web interface, the REST API, the database engine, and cloud-based image storage.

The software stack includes a JavaScript-based frontend for the user interface, a Django backend with ORM-based data management, a SQLite database (since it is embedded into Django by default) with geographic data support, and cloud storage for images. Together, these components provide a scalable, secure, and responsive platform capable of handling real-time reporting and mapping.

3 Identification of Case Study

TrashTag is being designed for people who frequently visit outdoor recreational sites like rivers, parks, and trails, as well as organizations that are tasked with keeping these sites clean. This includes environmental non-profits, clean-up groups, and local government bodies. The need for TrashTag arises from the fact that these groups do not have an effective means of identifying and coordinating trash clean-up efforts.

The initial case study group will include a small number of local volunteers and clean-up groups who will test the TrashTag prototype for reporting trash, assigning clean-up tasks, and evaluating usability. Feedback from this group will help to shape the features and functionality of the system.

TrashTag could potentially be used by city governments, park departments, schools, environmental organizations, and even property owners in the future. The system has the potential to be used on a large scale for environmental monitoring and data-informed policy-making.

4 Glossary

Illegal Dumping: The unauthorized disposal of trash and other hazardous materials onto private and or public property.

Metadata: Descriptive information within data files such as date, location, and timestamp data in photos to be submitted to Trashtag.

Geotagging: The addition of GPS coordinates to images that enable precise location identification where trash was reported.

Live Real-Time Updates: Live data synchronization displaying trash reports to both users and cleanup organizations instantaneously.

Gamification: The incorporation of game-like mechanics such as rankings to motivate user participation and skyrocket cleanup operations.

5 References

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