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Smart File Manager: Your All-in-One File Management Solution

1st Jay Gulhane

Department of Computer Engineering
Government College of Engineering,
Yavatmal
Yavatmal, India
jaygulhanecse@gmail.com

2nd Aaditya Sirsat

Department of Computer Engineering
Government College of Engineering,
Yavatmal
Yavatmal, India
aadityasirsathcse@gmail.com

3rd Shreejay Fuke

Department of Computer Engineering
Government College of Engineering,
Yavatmal
Yavatmal, India
shreejayfukecse@gmail.com

4th Mayur Uparikar

Department of Computer Engineering
Government College of Engineering,
Yavatmal
Yavatmal, India
mayuruparikarcse@gmail.com

5th Dhiraj Shirbhate

Assiseant Professor
Department of Computer Engineering
Government College of Engineering,
Yavatmal
Yavatmal, India
dhirajshirbhatecse@gmail.com

Abstract- People's personal computers are often filled with digital files that make managing and utilizing them extremely hard. Added to the problem, with so many copies of nearly the same file, it becomes challenging to maintain a tidy and useful space within the digital workplace. Most tools found serve either to organize the files or locate the duplicates but rarely both in one. This paper discusses a new computer application that performs two jobs: Desktop Cleaner sorts your files and eliminates extras. Written in the language Python, with various libraries, will be used to organize files into folders categorized by the type of file and also locate and eliminate duplicates using a strong method. We will test Desktop Cleaner as far as its performance is concerned. The results state that it makes people work better and utilize space better. The paper describes the actual technology behind Desktop Cleaner. This includes how the application looks and acts for the user, its attitude to files, various ways it identifies duplicates, and how the whole system is configured.

Keywords: File Organization, Duplicate Elimination, Desktop Application, Python, Efficiency, User Interface, Storage Optimization.

I. Introduction

The digital era produced a gigantic amount of data that individuals have to create and store on their personal computers. This explosion includes countless numbers of file types: documents and spreadsheets, to newsreels and video clips. And with this, the more documents a user creates over time, the harder it gets for them to handle and manage their digital stuff. This usually leads to a chaotic desktop trouble in searching for a certain file and reduces productivity. If files are duplicated, this problem worsens, because they occupy some valuable space and make things disorganized.

Good file management would have a huge impact on productivity when looking at the amount as well as the type of file that individuals are constantly working with. For instance, PDF documents, Word files, as well as different image formats. All these require to be stored in such a way that makes them easily accessible and readily available for use. Poor file management makes digital workspaces less

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organized; all this contributes to frustration as well as slows down individuals. This, therefore, simply means that there is the need for tools that do not merely orchestrate files but also find out and remove duplicates.

A. Problem Statement

Though so many file management tools exist in the market, maintaining the tidy digital space is challenging. The current system majorly possesses two categories of applications: attempts to keep all of your files organized or attempts to track down the duplicates, but fails both tasks simultaneously. This has the consequence that the users face significant hurdles in improving their digital workspace due to which they lose much-needed storage space, computers become slower, and more time is wasted to find files.

This project addresses that major problem, which is that file and folder management on personal computers is always difficult to manage for the users. The reason is that until now, there still isn't one tool that can do both job: the job of sorting files by type and removing the duplicates.

B. Objective

The primary objective of this project is to create Desktop Cleaner: a computer application that helps resolve two major issues pertaining to files organization and elimination of duplicates. Desktop Cleaner desires users to have an easy way to sort files into the right folders using what the file actually is like (pictures, documents, or videos) and locate duplicate files with a strong file-matching system. This space-saving tool in storage hopes to make computers work more efficient, saving the user from all sorts of cumbersome hardware and helping them work better by keeping all their digital files clean and sorted.

The project also aims to ensure that its use is not limited to experts of technology. The project has

ensured that the application layout is simple enough to allow users to organize their files and deal with dups without much hassle.

C. Overview

This paper closely looks at Desktop Cleaner, focusing on the tech and methods used to develop it. First, its background and research already done on file management, as well as the removal of duplicates, are discussed. Later on in the sections, this system is described with how it was designed, including Desktop Cleaner's architecture and parts. This paper will elaborate on working of the app, including tools and technology employed, along with a manner it categorizes files and identifies duplicates. Obstacles encountered during development are addressed, and the paper concludes with a culmination of effect of the tool and its possible upgrades in the future.

II. Background and Literature Review

A. Background

The rapid increase in digital data makes it necessary to have good file management systems. People use their computers and laptops for many things, which leads to a buildup of different kinds of files over time. These files include documents, spreadsheets, pictures, and videos, and they can get messy if you don't keep them organized. The problem gets worse when you have duplicate files, which take up extra space and can make your system run slower causing frustration for users.

Keeping files organized needs a clear plan for sorting and storing them so you can find them easily. Trying to organize files by hand takes a lot of time and people often make mistakes leaving messy folders and desktops. Files that are the same, which often happen when you download something more than once or move files around, make things worse. They take up

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extra space and make it harder to keep everything in order. Because of this, we need computer programs that can organize files and get rid of extras.

B. Literature Review

File Manager Tools

Simple file manager tools only provide basic functions, like arranging file by name, date, or type. Much more advanced are the features of Total Commander and Directory Opus with possibilities like dual views and multiple name changes at one time. Still, these tools demand technical know-how and do not help in arranging files by type. This absence of alternatives spells out that we really do need stronger tools to manage files with less manual effort.

Duplicate File Finders

Duplicate file finding programs like Cleaner, Duplicate Cleaner, and others employ some proprietary techniques to find files with the same names, sizes, or content. While such tools are great at identifying duplicates, they work standalone and are not supposed to help sort all the files. Moreover, a heuristic-based matching algorithm might generate false positives, and vice versa-miss true duplicates.

Hash-Based Algorithms for Deduplication

Nowadays, these hashing algorithms namely MD5 SHA-1, and SHA-256 have a big impact on modern duplicate file finders. They generate hash values that uniquely represent file content to identify duplicates when files are named differently. One chooses SHA-256 because it is robust and precise but tends to be a bit slow for big files and a lot of folders.

C. Integrated Solutions

New tools are now trying to integrate file sorting and duplicate removal within one package. For example, Hazel for Mac organizes files according to rules one

sets up but will not recognize the presence of duplicates on its own. Another example, Gemini 2 can find duplicates but never tries its hand at file organization. So, we clearly need one tool that does both its jobs superbly.

III. System Design and Architecture

A. Overall Design

Desktop Cleaner should give a holistic solution in handling files. It aims at organizing them according to type and deleting duplicates. The system is modular by division into different portions that tackle different issues. This makes the portions work together to give users the easiest time when using the system.

The layers involved in the structure of the system are;

User Interface (UI) Layer: The layer provides a friendlier interface for interaction with the system.

File Organization Module: It uses the file type to categorize the files.

Duplication Detection Module: It finds and deletes duplicate files through hash algorithms.

Backend Processing: Manages file operations and talks to the system's filesystem.

B. User Interface (UI) Layer

That is made using the Tkinter library available in Python, which is very user-friendly. Users can choose what folders to scan, initiate file organization, and view duplicate files found using the interface as well. It lets users know exactly how files will be sorted and to do with duplicates also.

C. File Organization Module

This module organizes the files into the given types- eg .png, .docx, .pdf .mp4. It creates a separate folder

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for any given type of file and places them into the proper folders. The Os and shutil libraries handle files and a bit well in Python.

D. Duplication Detection Module

The module has a feature of duplicate file detection. It accomplishes that through the generation of unique hash values, using the SHA-256 algorithm. For making these hashes, it uses the hashlib library. This enables it to find duplicates when their names are different. Users can view and delete the system detected duplicates.

E. Backend Processing

The backend considered scanning directories, moving, and deleting them. It uses Python's os and shutil libraries that operate on the filesystem. This makes sure it carries out file operations and the backend are designed to be robust cutting down the possibility of losing data.

IV. Workflow

A. Launch Initial Run Initialization Launch:
The user launches the Desktop Cleaner application and finds itself on the main screen.

B. Directory Selection:
The user selects the folder that he wants to organize and scan for duplicate files.

C. File Organization
Scan: The system scans the selected folder, finding all the files on it.
Categorize: The system classifies and separates files based on their file type, and makes a new set of folders (like "Documents," "Images," "Videos").
Sort: The system sorts files into the correct folders so that things get sorted in place.

D. Duplicate Detection

Hash files: The system employs SHA-256 hashing each file in the directory to obtain unique identifiers.

Compare hashes: Hash values are compared to find the duplicated files.

Manage Duplicates: Users are presented with the list of duplicates and are given options to delete or otherwise manage them.

V. Tools and Technologies

a. Programming Language: Python
b. The developers use Python because it is readable, writable, and there are many excellent utilities that help them to create things and implement additional functionality like file handling or complicated math operations. It can run on a number of computer types; Desktop Cleaner can be operated on Windows, Mac, and Linux.

c. GUI Library: Tkinter

Desktop Cleaner uses Tkinter for developing its interface. Now, some positives about Tkinter include:

Very Easy to Use: Tkinter is so easy to learn and to develop with that any developers will find it quite easy to get the hang of it.

It Fits and Works Well: Since Tkinter forms an integral part of Python, it gets the perfect fit in the overall context of language and other tools that Desktop Cleaner is using.

Flexible Layout: Tkinter has lots of building blocks and controls that you can tweak to create a simple user-friendly interface.

Managing Files: os and shutil

The os and shutil modules of Python affect

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Directory Listing: Digging through files and directories which exist in a given path.

File Manipulations: Move files to other directories and activities such as renaming files and deleting files.

SHA-256: A code-maker function from the Python's hashlib library, affects: Hashing Algorithm: SHA-256.

VI. Implementation Details

A. User Interface

The UI must be intuitive enough so that the users can work with the app without much hassle. Important features are:

B. Directory Selection: A file dialog for directory selection.

Progress Indicators: The visual feedback when the file organization and duplicate detection are in progress.

Summary of Results: A preview that displays the number of organized files and detected duplicates.

C. File Organization

File organization affects the following:

Creating Folders: Arranging folders for file types.

Moving Files: Using shutil. move() to move files into the correct folder.

Error Handling: Implementing protections against errors, such as accessing file permissions.

D. Duplicate Detection

The detection of duplicates involves:

Hash Creation: The program creates SHA-256 hashes for all files using hashlib.

Hash Check: It compares hashes to identify duplicates and puts them in a list.

Talking to Users: It provides users with options to view and manipulate duplicate files.

VII. Problems and Fixes

A. Speeding It Up

One of the issues we encountered was actually scanning files and searching for duplicate files within massive folders.

Productivity Gains: We implemented fast file handling and hashing to reduce the processing time.

Chunk Processing: We processed files by chunks, helping us lessen the number of memory used so as to yield better performance

B. User Interface

Great time to the user was ensured. We had quite some constraints, like designing a usable interface and sending transparent messages to the user.

C. UI Design:

We developed a clean and simple interface that is intuitive and displays progress.

D. Error Handling:

We established very good error handling mechanisms where clear error messages and solutions could be offered for common errors.

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E. Compatibility

To confirm Desktop Cleaner works on different systems, we needed to test it on other operating systems. Here is how we approached it

Cross-Platform Libraries: In order to see that everything behaves the same way, we used libraries that work on several platforms.

F. Testing:

We did several tests on Windows, macOS, and Linux to find and solve any compatibility problems.

VIII. CONCLUSION

Desktop Cleaner is that sort of file management utility that organizes each type of digital space with the very essence of techniques of file organization. It's a deep tool facing two fundamental problems of users concerning the organization of digital space: strong file organizing capabilities and advanced duplicate detection to serve within one application. Given that it supports strong libraries and is written in the Python language, the application forms excellent contribution towards an efficient user-friendly optimizing tool for file handling. Designed to be intuitive, yet at the same time accessible to any user regardless of the level of experience, the application offers

efficiency at its best and in all operations remains performance-oriented; however, speed would never be allowed to compromise accuracy. An additional feature that renders the navigation much easier is the sensible interface in generally improving user experience, which is much easier to handle files compared with years gone by. The ability to enhance productiveness, free up valuable storage space, and keep a digital habitat organized underlines Desktop Cleaner's utility as an essential tool in this computerized world.

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