Development of An Automated Satellite Image Collection and Processing System for Image Utilization

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Abstract: The growing demand for satellite imagery has attracted interest from non-traditional users such as local governments and industry practitioners. However, many find the process of searching, collecting, and utilizing satellite data too technical, requiring expertise in remote sensing and image processing. To address this challenge, we developed an automated system that manages the entire workflow from image acquisition to pre- and post-processing for both satellite and UAV imagery. Users can define search criteria such as region of interest, time, image type, and cloud coverage, after which the system automatically retrieves and downloads matching data via APIs or official websites. The collected data are then stored in a database and prepared for various applications, including time-series analysis, AI-based object detection, and change monitoring. This automation is expected to significantly lower entry barriers, making satellite imagery more accessible and efficiently usable across diverse fields.

Keywords: Satellite Imagery, Automated Collection, Image Utilization, Satellite Application

1. Introduction

The value and demand for satellite imagery have been increased significantly in various fields recently. Especially in areas such as disaster management, environmental monitoring, urban planning, and agricultural management, there is an expanding use of satellite images with various spatial resolutions, including optical and synthetic aperture radar (SAR) imagery, for data-based decision making. However, recent interviews related to the expansion of satellite utilization revealed that non-expert users face several difficulties in accessing and utilizing satellite data. These users include local government officials and practitioners who need to use satellite images in their work.

They pointed out that the requirement for expertise in remote sensing and image processing constitutes the primary barrier to entry and found that the process of searching and collecting images over a region of interest (ROI) is overly complex and specialized. These difficulties have limited the practical use of satellite imagery in the field.

Therefore, this study proposes an automated collection system that reduces these difficulties in the collection and utilization of satellite imagery and allows non-expert users to easily acquire and analyze data. This system automatically collects satellite images based on the selected ROI and user-defined searching conditions. The system also supports fast and reliable data use for subsequent analysis,

2. Methodology

The developed automated collection system manages the complete workflow. This includes satellite imagery collection, database storage, and both preprocessing and postprocessing stages. Users can define search criteria including ROI, date, image type (Optical/SAR), and cloud coverage. Based on these criteria, the system generates a list of matching images. Users can review metadata and spatial coverage to select desired data, which is then automatically downloaded and stored in the database. The stored data is automatically input to follow-up processing steps and is used for various applications including time-series analysis, AI-based object detection, and change monitoring.

Image collection is automated by utilizing predefined APIs (e.g., Landsat, Sentinel) and official web portals (e.g., CAS500-1). After image data collection, the system executes preprocessing steps including geometric correction, cloud masking, and coordinate transformation. Subsequently, user-defined algorithms can be applied during postprocessing, depending on the specific application requirements.

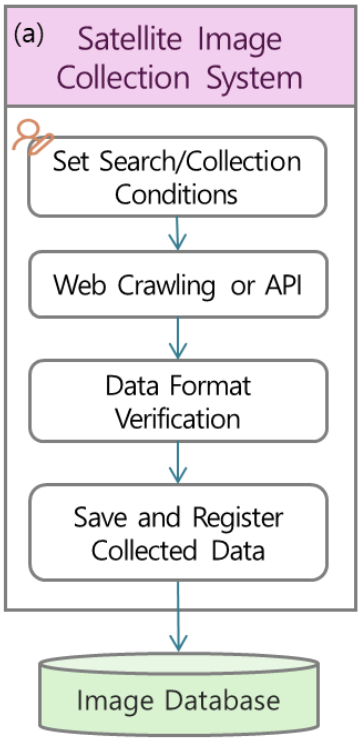
3. Results/Findings

The system's main workflow and automated collection process reduce the dependency on user expertise compared to manual satellite image collection and processing methods. This approach enhances not only the efficiency but also the reliability of data access and use. In particular, the system enables non-expert users to specify search criteria with ease and rapidly employ satellite imagery through automated downloading, storage, and processing procedures. Furthermore, the proposed system has the potential for integration with AI-based analysis models, facilitating advanced applications such as object detection and change monitoring.

4. Conclusion

This study proposed and implemented an automated system for collecting and processing satellite and UAV imagery. The system comprehensively supports the entire process from ROI-based conditional search and automatic collection to database storage and follow-up processing, providing a user-friendly environment for data utilization. The results demonstrate that the proposed automated collection system facilitates more efficient data collection than manual methods and significantly lowers the entry barrier for non-expert users, thereby enhancing practical utilization of satellite imagery. Next steps include adding automated data collection features for GK-2A and GK-2B (GEMS) geostationary satellites. In addition, future work will focus on integrating large

language models (LLMs) to enable automated satellite image search and intelligent user guidance for image selection and analysis.



(b) Type	Satellite Name	Input Method	Collection Method
Optical	Kompsat-2	Manual	-
	Kompsat-3/3A	Manual	-
	CAS500-1	Automatic	Web Crawling
	Skysat	Manual	-
	Landsat-8/ Landsat-9	Automatic	API
	Sentinel-2	Automatic	API
	WorldView-3	Manual	-
	Planetscope	Manual	-
	Blacksky	Manual	-
	GOCI-2	Automatic	API
SAR	Kompsat-5	Manual	-
	Sentinel-1	Automatic	API
	ICEYE constellation	Manual	-

Figure 1: System workflow(a), Data collection method by satellite image(b)

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